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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | Q122244 1090US.C2 |

**CONFIRMATION NO. 6110**

26158
WOMBLE BOND DICKINSON (US) LLP
ATTN: IP DOCKETING
P.O. Box 570489
ATLANTA, GA 30357-0037

**POA ACCEPTANCE LETTER**

*OC000000074747914*

Date Mailed: 07/03/2024

## NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/20/2024.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/atesfai/



SAMSUNG 1002

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|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 |

**CONFIRMATION NO. 6110**

158747
LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

**POWER OF ATTORNEY NOTICE**

Date Mailed: 07/03/2024

## NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/20/2024.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/atesfai/

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# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **17/670,419** | **06/20/2024 02:07:27 PM Z ET** | **B-10124CON1 633517-8** |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | 12004262 |
| CONFIRMATION # | 6110 | FILED BY | Trexo Global |
| PATENT CENTER # | 66046180 | FILING DATE | 02/11/2022 |
| CUSTOMER # | 158747 | FIRST NAMED INVENTOR | Geonjung KO |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | Young Seok Koo |

## Documents

**TOTAL DOCUMENTS: 3**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| Q122244 1090US.C2_3.73_2.pdf | 3 | Assignee showing of ownership per 37 CFR 3.73 | 220 KB |
| Q122244 1090US.C2_3.73_1.pdf | 3 | Assignee showing of ownership per 37 CFR 3.73 | 220 KB |
| Q122244 1090US.C2_POA.pdf | 3 | Power of Attorney | 677 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|

| | |
|---|---|
| Q122244 1090US.C2_3.73_2.pdf | 43BA976650B64F25B6088FDC2F7F85EB1955E9301C8CEA6E7B0F838E88DF75F30682B2BA6F3E94CA03A07B5DDEF4855D7313B89F73ACDAB4285612518C922EB0 |
| Q122244 1090US.C2_3.73_1.pdf | 22AF0C7F743FC31C3CCC4D8B8A6915EB498A1C737CB028DB85705A3359F71FF27DCF76167577F360D04F6999C1AFF3EABB35A94CADEA69E6E235C276307E612E |
| Q122244 1090US.C2_POA.pdf | 6161861A627000B812E640E880B02D85D345ED8A9D1A4BAAC4F205DE80939E218DAE434A6E13DBF2D5C062693A0655A6CFC8E6B37DA499BF24DDF7FB815E9180 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (11-23)
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# STATEMENT UNDER 37 CFR 3.73(c)

First Named Inventor/Patent Owner: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD.

Application No./Patent No.: 12004262 Filed/Issue Date: 2024-06-04

Titled: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC., a INSTITUTE

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   SK TELECOM CO., LTD.

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 067199, Frame 0598, or for which a copy thereof is attached*.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached*.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached*.



A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 12 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

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## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached*.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached*.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached*.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached*.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ *As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

| | |
|---|---|
| /Young Seok Koo 76255/ | 2024/06/20 |
| Signature | Date |
| Young Seok Koo | 76255 |
| Printed or Typed Name | Title or Registration Number |

[Page 2 of 2]

# Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013). https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;

2) a federal, state, local, or international agency, in response to its request;

3) a contractor of the USPTO having need for the information in order to perform a contract;

4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;

5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;

6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;

7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;

8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));

9) the Office of Personnel Management (OPM) for personnel research purposes; and

10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

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# STATEMENT UNDER 37 CFR 3.73(c)

First Named Inventor/Patent Owner: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD.

Application No./Patent No.: 12004262 Filed/Issue Date: 2024-06-04

Titled: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

SK TELECOM CO., LTD., a CORPORATION

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 067199, Frame 0598, or for which a copy thereof is attached*.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached*.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached*.



A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 12 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

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## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached*.

5. From: _____ To: _____

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[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

| | |
|---|---|
| /Young Seok Koo 76255/ | 2024/06/20 |
| Signature | Date |
| Young Seok Koo | 76255 |
| Printed or Typed Name | Title or Registration Number |

[Page 2 of 2]

# Privacy Act Statement

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Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;

2) a federal, state, local, or international agency, in response to its request;

3) a contractor of the USPTO having need for the information in order to perform a contract;

4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;

5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;

6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;

7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;

8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));

9) the Office of Personnel Management (OPM) for personnel research purposes; and

10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
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# TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

| | |
|---|---|
| Application Number | 17/670,419 |
| Filing Date | 2022-02-11 |
| First Named Inventor | Geonjung KO |
| Title | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| Art Unit | 2467 |
| Examiner Name | MOHAMMED SHAMSUL CHOWDHURY |
| Attorney Docket Number | Q122244 1090US.C2 |

## SIGNATURE of Applicant or Patent Practitioner

| | | | |
|---|---|---|---|
| Signature | /Young Seok Koo 76255/ | Date (Optional) | 2024/06/20 |
| Name | Young Seok Koo | Registration Number | 76255 |
| Title (if Applicant is a juristic entity) | | | |
| Applicant Name (if Applicant is a juristic entity) | | | |

**NOTE:** This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 2 forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

Corresponding to PTO/AIA/82B (07/13)

# POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

| Application Number | Filing Date |
|---|---|
| | |

(Note: The boxes above may be left blank in information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

26158

**Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:**

☒ The address associated with the above-mentioned Customer Number:

**OR**

☐ The address associated with the Customer Number:

**OR**

| | | |
|---|---|---|
| ☐ Firm or individual name | | |
| Address | | |
| City | State | Zip |
| Country | | |
| Telephone | Email | |

The undersigned Applicant hereby authorizes the U.S. attorneys and agents of Womble Bond Dickinson (US) LLP, to accept and follow instructions from QUS INTERNATIONAL PATENT & LAW FIRM as to any action to be taken in the Patent and Trademark Office regarding US patent applications of the undersigned Applicant without direct communication between the U.S. attorney or agent and the undersigned Applicant. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned Applicant.

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.

☐ Inventor or Joint Inventor (title not required below)
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

**SIGNATURE of Applicant for Patent**

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

| | |
|---|---|
| Signature | Date (Optional) May 2, 2024 |
| Name JIN SAM KWAK | Telephone |
| Title CEO | |

Note: Signature – This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

Corresponding to PTO/AIA/82B (07/13)

# POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

| Application Number | Filing Date |
|---|---|
| | |

(Note: The boxes above may be left blank in information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

26158

**Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:**

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Address

| City | State | Zip |
|---|---|---|
| | | |

Country

| Telephone | Email |
|---|---|
| | |

The undersigned Applicant hereby authorizes the U.S. attorneys and agents of Womble Bond Dickinson (US) LLP, to accept and follow instructions from QUS INTERNATIONAL PATENT & LAW FIRM as to any action to be taken in the Patent and Trademark Office regarding US patent applications of the undersigned Applicant without direct communication between the U.S. attorney or agent and the undersigned Applicant. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned Applicant.

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

SK TELECOM CO., LTD.

☐ Inventor or Joint Inventor (title not required below)
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

**SIGNATURE of Applicant for Patent**

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

| | |
|---|---|
| Signature Chanho Yun | Date (Optional) May 7, 2024 |
| Name Chahho Yun | Telephone |
| Title Director of IPR Team | |

Note: Signature – This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

158747 7590 06/04/2024

LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

| EXAMINER | |
|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2467 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 06/04/2024 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

LA_MAIL@la.ladas.com
achinaryan@la.ladas.com
dzhang@la.ladas.com

| APPLICATION NO. | ISSUE DATE | PATENT NO. |
|---|---|---|
| 17/670,419 | 04-Jun-2024 | 12004262 |

LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
LOS ANGELES, CA 90010

# EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

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Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 06/04/2024 | 12004262 | B-10124CON1 633517-8 | 6110 |

158747 7590 05/15/2024

LADAS & PARRY
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4525 WILSHIRE BOULEVARD
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LOS ANGELES, CA 90010

# ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

**Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)**
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (https://patentcenter.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Geonjung KO, Seoul, KOREA, REPUBLIC OF;
Woojin AHN, Gyeonggi-do, KOREA, REPUBLIC OF;
Juhyung SON, Gyeonggi-do, KOREA, REPUBLIC OF;
Jinsam KWAK, Gyeonggi-do, KOREA, REPUBLIC OF;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC., Gyeonggi-do, KOREA, REPUBLIC OF;
SK TELECOM CO., LTD., Seoul, KOREA, REPUBLIC OF;

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

158747 7590 05/02/2024

LADAS & PARRY
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4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

| EXAMINER | |
|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2467 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 05/02/2024 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

LA_MAIL@la.ladas.com
achinaryan@la.ladas.com
ykoo@la.ladas.com

| Response to Rule 312 Communication | Application No. | Applicant(s) | |
|---|---|---|---|
| | 17/670,419 | KO et al. | |
| | Examiner | Art Unit | AIA (FITF) Status |
| | MOHAMMED S CHOWDHURY | 2467 | Yes |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

1. ☑ The amendment filed on 25 April 2024 under 37 CFR 1.312 has been considered, and has been:

a) ☑ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.

Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

f) ☐ not entered because the supplemental or corrected Application Data sheet (ADS)

☐ was not accompanied by a petition to accept an unintentionally delayed claim under 37 CFR 1.55 or 27 CFR 1.78;

☐ did not identify the information being changed in accordance with 37 CFR 1.76(c)(2);

☐ was not properly signed in accordance with 37 CFR 1.76(e) (or 37 CFR 1.33(b) for applications filed prior to September 16, 2012).

/MOHAMMED S CHOWDHURY/
Primary Examiner, Art Unit 2467

OK TO ENTER: /M.S.C./ 04/27/2024

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| First Named Inventor: Geonjung KO | Examiner: MOHAMMED SHAMSUL CHOWDHURY |
| Application No.: 17/670,419 | Group: 2467 |
| Filing Date: February 11, 2022 | Our Ref.: B-10124CON1 633517-8 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Date: April 23, 2024 |
| | Re: Amendment After Notice of Allowance under 37 C.F.R. §1.312 |

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P.O. Box 1450
Alexandria, Virginia 22313-1450

**AMENDMENTS AFTER NOTICE OF ALLOWANCE UNDER 37 C.F.R. §1.312**

Sir:

This paper is timely submitted in response to the Notice of Allowance mailed on February 16, 2024 for the subject application. Please amend the application as follows and consider the Remarks set forth below.

**Amendments to the Claims** begin on page 2 of this paper.

**Remarks** begin on page 5 of this paper.

All Amendments and Remarks are made without prejudice or disclaimer.

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# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **17/670,419** | **04/26/2024 01:10:03 PM Z ET** | **B-10124CON1 633517-8** |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Lianne Herbert |
| PATENT CENTER # | 65261572 | FILING DATE | 02/11/2022 |
| CUSTOMER # | 158747 | FIRST NAMED INVENTOR | Geonjung KO |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | Young Seok Koo |

## Documents

**TOTAL DOCUMENTS: 1**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| 633517-IssueFee-Transmittal.pdf | 1 | Issue Fee Payment (PTO-85B) | 143 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| 633517-IssueFee-Transmittal.pdf | 5EA75D05E6AE6A2E95E817E4C5365767BDACCA22569A9E5581004EAB3E610D589DAE4DB997D82D670BA22CF3CB9E52901EC20012D561839A302CFDEAA2E5A5AE |

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

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# ELECTRONIC PAYMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| 17/670,419 | 04/26/2024 01:10:03 PM Z ET | B-10124CON1 633517-8 |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Lianne Herbert |
| PATENT CENTER # | 65261572 | AUTHORIZED BY | Young Seok Koo |
| CUSTOMER # | 158747 | FILING DATE | 02/11/2022 |
| CORRESPONDENCE ADDRESS | - | FIRST NAMED INVENTOR | Geonjung KO |

## Payment Information

| PAYMENT METHOD | PAYMENT TRANSACTION ID | PAYMENT AUTHORIZED BY |
|---|---|---|
| CARD / 1025 | E20244PD11189122 | Lianne Herbert |

| FEE CODE | DESCRIPTION | ITEM PRICE($) | QUANTITY | ITEM TOTAL($) |
|---|---|---|---|---|
| 1501 | UTILITY ISSUE FEE | 1200.00 | 1 | 1200.00 |
| | | | TOTAL AMOUNT: | $1,200.00 |

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**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C.

371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

## PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

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CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

158747 7590 02/16/2024
LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

| (Typed or printed name) |
|---|
| (Signature) |
| (Date) |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

TITLE OF INVENTION: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $1200 | $0.00 | $0.00 | $1200 | 05/16/2024 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | 2467 | 370-442000 |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Ladas & Parry, LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

| (A) NAME OF ASSIGNEE | (B) RESIDENCE: (CITY and STATE OR COUNTRY) |
|---|---|
| 1. WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | GYEONGGI-DO, REPUBLIC OF KOREA |
| 2. SK TELECOM CO., LTD. | SEOUL, REPUBLIC OF KOREA |

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ☒ Corporation or other private group entity ❑ Government

4a. Fees submitted: ☒ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via the USPTO patent electronic filing system ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 12-0415

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Young Seok Koo 76,255/ Date April 26, 2024

Typed or printed name Young Seok Koo Registration No. 76,255

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | |
|---|---|---|
| First Named Inventor: Geonjung KO | ) | Examiner: MOHAMMED SHAMSUL CHOWDHURY |
| Application No.: 17/670,419 | ) | |
| Filing Date: February 11, 2022 | ) | Group: 2467 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | ) | Our Ref.: B-10124CON1 633517-8 |
| | ) | Date: April 23, 2024 |
| | ) | Re: Amendment After Notice of Allowance under 37 C.F.R. §1.312 |

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

**AMENDMENTS AFTER NOTICE OF ALLOWANCE UNDER 37 C.F.R. §1.312**

Sir:

This paper is timely submitted in response to the Notice of Allowance mailed on February 16, 2024 for the subject application. Please amend the application as follows and consider the Remarks set forth below.

**Amendments to the Claims** begin on page 2 of this paper.

**Remarks** begin on page 5 of this paper.

All Amendments and Remarks are made without prejudice or disclaimer.

## AMENDMENTS TO THE CLAIMS

Please amend the claims to read as indicated in the following list of claims:

### Listing of claims

1-20. (Canceled).

21. (Currently Amended) A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color to be indicated by a trigger-based PPDU based on ~~the value of~~ the BSS color indicated by the ~~PPDU including the trigger frame~~ field,

when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmit the trigger-based PPDU based on the trigger frame,

wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element,

wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change, and

wherein the BSS color is one of identifiers identifying a BSS.

22. (Previously Presented) The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

23. (Previously Presented) The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero,

wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

24. (Currently Amended) A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color to be indicated by a trigger-based PPDU based on ~~the value of~~ the BSS color indicated by the ~~PPDU including the trigger frame~~ field,

when the format of the PPDU including the trigger frame is a PPDU format in which any physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color to be indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmitting the trigger-based PPDU based on the trigger frame,

wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element,

wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point

indicated by the information on the BSS color change is reached, the active BSS color is set to a value of a BSS color indicated by the information on the BSS color change, and

wherein the BSS color is one of identifiers identifying a BSS.

## REMARKS

In this Amendment, claims 21 and 24 are amended for clarification purposes only. Claims 1-20 were canceled previously. No new matter is presented as a result of these amendments. No claim is added or canceled. Therefore, the Applicant respectfully requests approval of the amendment to claims 21 and 24.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415.

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

April 23, 2024
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

/ Young Seok Koo 76255 /

Young Seok Koo
Attorney for Applicants
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LADAS & PARRY LLP
4525 Wilshire Blvd., Suite 240
Los Angeles, CA 90010
Tel No.: (323) 934-2300
Fax No.: (323) 266-0373

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# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **17/670,419** | **04/25/2024 06:44:39 PM Z ET** | **B-10124CON1 633517-8** |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Azatuhi Chinaryan |
| PATENT CENTER # | 65215775 | FILING DATE | 02/11/2022 |
| CUSTOMER # | 158747 | FIRST NAMED INVENTOR | Geonjung KO |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | Young Seok Koo |

## Documents

**TOTAL DOCUMENTS: 3**

| DOCUMENT | | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|---|
| 2024-04-23_633517_312Amendments.pdf | | 5 | - | 148 KB |
| 2024-04-23_633517_312Amendments-A.NA.pdf | (1-1) | 1 | Amendment after Notice of Allowance (Rule 312) | 77 KB |
| 2024-04-23_633517_312Amendments-CLM.pdf | (2-4) | 3 | Claims | 97 KB |
| 2024-04-23_633517_312Amendment | (5-5) | 1 | Applicant Arguments/Remarks Made in an Amendment | 129 KB |

s-REM.pdf

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| 2024-04-23_633517_312Amendments.pdf | 633BD1B84CB685BADD6E9314ACF3C01E8C3C971A7FA33874DBCE7D495C18B53D869A5FB067001DEF90519FB169C2FBBF1EAF592347BB71C3987972F7C2D58D2E |
| 2024-04-23_633517_312Amendments-A.NA.pdf | 3CE23645432BC3D39A18B939D5BB97155FB58D055AEC4CCD57B0E777F4303671F756EAF5C67DE25F809069134786D4AF987D72CDA413EB906505A2D9507CBC3A |
| 2024-04-23_633517_312Amendments-CLM.pdf | 876C5B2AC68A8AFE6BA1B5398164B43134CB621877363833A2814EF7DA7DD9E11EEC0B7DCE22FEF64B0FA275615D669D7CA7205FA2CF94B482232F106CD1232B |
| 2024-04-23_633517_312Amendments-REM.pdf | D7F8C6A29E3DF14CE39FFDB049CBDCB7939B8FD01374E19D855C04289CFA7FE7E99341F27626FFAC59C2055325C3D393BA5DDB02CFFD9A661B5795E0909FF7B5 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TO: ykoo@la.ladas.com,achinaryan@la.ladas.com,LA_MAIL@la.ladas.com
FROM: noreply@uspto.gov
CC: patentcenter_eofficeaction@uspto.gov
SUBJECT: USPTO: Patent Electronic System - e-Postcard Notification for Customer Number 158747

Fri Feb 23 05:52:55 EST 2024

Dear Patent Center Customer:

Correspondence Address:

LADAS &PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES,CALIFORNIA,90010
UNITED STATES

An email notification regarding the correspondence was sent to the following email address(es) associated with customer number 158747:

ykoo@la.ladas.com
achinaryan@la.ladas.com
LA_MAIL@la.ladas.com

This is a courtesy reminder that new correspondence is available for the application. If you have not done so already, please review the correspondence listed below. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

| Application | Document | Mailroom Date | Attorney Docket No. |
|---|---|---|---|
| 17670419 | NOA | 02/16/2024 | B-10124CON1 633517-8 |
| 17670419 | 1449 | 02/16/2024 | B-10124CON1 633517-8 |
| 17670419 | EXIN | 02/16/2024 | B-10124CON1 633517-8 |

To view your correspondence online, please sign in to Patent Center and then select Workbench/View correspondence. Or to update your email addresses, select Manage/Manage customer numbers.

If you have any questions, please contact the Patent Electronic Business Center (EBC) at ebc@uspto.gov or 866-217-9197 Monday – Friday, 6 a.m. to midnight ET.

Please do not reply to this email as it was sent from an unmonitored mailbox.

Sincerely,

The Patent Center Team

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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# NOTICE OF ALLOWANCE AND FEE(S) DUE

158747 7590 02/16/2024

LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

| EXAMINER |
|---|
| CHOWDHURY, MOHAMMED SHAMSUL |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2467 | |

DATE MAILED: 02/16/2024

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

TITLE OF INVENTION: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $1200 | $0.00 | $0.00 | $1200 | 05/16/2024 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

**HOW TO REPLY TO THIS NOTICE:**

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.**

## PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

158747 7590 02/16/2024
LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

**Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

| (Typed or printed name) |
|---|
| (Signature) |
| (Date) |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

TITLE OF INVENTION: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

| APPLN. TYPE | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|---|---|---|---|---|---|---|
| nonprovisional | UNDISCOUNTED | $1200 | $0.00 | $0.00 | $1200 | 05/16/2024 |

| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|---|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | 2467 | 370-442000 |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via the USPTO patent electronic filing system ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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UNITED STATES DEPARTMENT OF COMMERCE
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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

158747 7590 02/16/2024

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4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

| EXAMINER | |
|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | |
| ART UNIT | PAPER NUMBER |
| 2467 | |

DATE MAILED: 02/16/2024

**Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)**
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

## OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## Privacy Act Statement

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/ owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

| Notice of Allowability | Application No. 17/670,419 | Applicant(s) KO et al. | |
|---|---|---|---|
| | Examiner MOHAMMED S CHOWDHURY | Art Unit 2467 | AIA (FITF) Status Yes |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--***

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 12/11/2023 & 01/30/2024.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 21-24 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   **Certified copies:**

   a) ☑ All  b) ☐ Some*  c) ☐ None of the:

   1. ☑ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   **Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MOHAMMED S CHOWDHURY/
Primary Examiner, Art Unit 2467

## *Detailed action*

1. The notice of allowance is in response to applicant's arguments/remarks filed on **12/11/2023** for response of the office action mailed on **09/08/2023** along with an interview held on **01/30/2024**.

2. The text of those sections of Title 35 U.S. Code not included in this section can be found in the prior office action. The prior office actions are incorporated herein by reference. In particular, the observations with respect to claim language, and response to previously presented arguments.

### *Notice of Pre-AIA or AIA Status*

3. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

### *Information Disclosure Statement*

4. The information disclosure statement (IDS) submitted on **10/25/2023** is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### *Response to Arguments*

5. Applicant's arguments with respect to claims **21-24** (*renumbered **1-4,** respectively*) along with arguments presented in remarks filed on **12/11/2023** have been fully considered and are persuasive along with an interview held on **01/30/2024**. The objections/rejections of these claims have accordingly been withdrawn.

***Allowable Subject Matter***

6. Claims **21-24** (*renumbered **1-4,** respectively*) are allowed in light of applicant's arguments filed on **12/11/2023** along with an interview held on **01/30/2024** and in light of prior art(s) of record.

***Terminal Disclaimer(s)***

7. The terminal disclaimer filed on **02/01/2024** disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of **US Patent No. 11, 284,475** has been reviewed and is accepted. The terminal disclaimer has been recorded.

8. The terminal disclaimer filed on **02/01/2024** disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of co-pending application No. **17/670,424** has been reviewed and is accepted. The terminal disclaimer has been recorded.

***Reasons for Allowance***

9. The following is a statement of reasons for the indication of allowable subject matter: the prior art taken either singularly or in a combination fails to anticipate or fairly suggest the limitations of the independent claims, in such a manner that rejection under 35 U.S.C. 102 or 103 would be proper.

10. Based on the claim amendments and remarks, examiner contacted attorney Young Seok Koo (Reg. # 76,255) on **30 January 2024,** to submit terminal disclaimer (TD) for the patent **11,284,475** corresponding to parent application (16/590,302) and terminal disclaimer (TD) for co-pending application (**17/670,424**). On **02/01/2024,** applicant submitted terminal disclaimers for the parent application (**16/590,302 ⇔ US PAT #11,284,475**) and for the co-pending application **(17/670,424**) and accepted by the office on the same day. Claims **22-23** are allowable for depending on independent claim **21.**

11. Examiner performed updated search and additional search does not yield other specific references that reasonably, either singularly or in combination with cited references, would result a proper rejection that would have anticipated or made obvious combination of all the steps disclosed in **independent claims** **21** and **24** with proper motivation at or before the time it was effectively filed.

12. Any comments considered necessary by applicant must be submitted no later than payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MOHAMMED SHAMSUL CHOWDHURY whose telephone number is (571)272-0485. The examiner can normally be reached on Monday-Thursday 9 AM- 6 PM EST (Friday Var.).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Phillips can be reached on 571-272-3940. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MOHAMMED S CHOWDHURY/
Primary Examiner, Art Unit 2467

| *Examiner-Initiated Interview Summary* | **Application No.** 17/670,419 | **Applicant(s)** KO et al. | | |
|---|---|---|---|---|
| | **Examiner** MOHAMMED S CHOWDHURY | **Art Unit** 2467 | **AIA (First Inventor to File) Status** Yes | **Page** 1 of 1 |

| **All Participants** (applicant, applicants representative, PTO personnel) | **Title** | **Type** |
|---|---|---|
| MOHAMMED S CHOWDHURY | Primary Examiner | Telephonic |
| Young Seok Koo (Reg. # 76,255) | Attorney | |

**Date of Interview:** 30 January 2024

**Issues Discussed:**

**Non-statutory Double Patenting**

Based on the claim amendments and remarks, examiner contacted attorney Young Seok Koo (Reg. # 76,255) on 30 January 2024, to submit terminal disclaimer (TD) for the patent 11,284,475 corresponding to parent application (16/590,302) and terminal disclaimer (TD) for co-pending application (17/670,424). On 02/01/2024, applicant submitted terminal disclaimers for the parent application (16/590,302) and for the co-pending application (17/670,424) and accepted by the office on the same day.

| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |
|---|---|

**Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04**
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

**Applicant recordation instructions:** It is not necessary for applicant to provide a separate record of the substance of interview.

**Examiner recordation instructions:** Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | **Examiner** | **Art Unit** |
| | MOHAMMED S CHOWDHURY | 2467 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

**CLAIMS**

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/18/2023 | 05/14/2023 | 09/02/2023 | 01/29/2024 | 02/10/2024 | | | | |
| - | 1 | - | - | - | - | - | | | | |
| - | 2 | - | - | - | - | - | | | | |
| - | 3 | - | - | - | - | - | | | | |
| - | 4 | - | - | - | - | - | | | | |
| - | 5 | - | - | - | - | - | | | | |
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| - | 7 | - | - | - | - | - | | | | |
| - | 8 | - | - | - | - | - | | | | |
| - | 9 | - | - | - | - | - | | | | |
| - | 10 | - | - | - | - | - | | | | |
| - | 11 | - | - | - | - | - | | | | |
| - | 12 | - | - | - | - | - | | | | |
| - | 13 | - | - | - | - | - | | | | |
| - | 14 | - | - | - | - | - | | | | |
| - | 15 | - | - | - | - | - | | | | |
| - | 16 | - | - | - | - | - | | | | |
| - | 17 | - | - | - | - | - | | | | |
| - | 18 | - | - | - | - | - | | | | |
| - | 19 | - | - | - | - | - | | | | |
| - | 20 | - | - | - | - | - | | | | |
| 1 | 21 | ✓ | ✓ | ✓ | ✓ | = | | | | |
| 2 | 22 | ✓ | ✓ | ✓ | ✓ | = | | | | |
| 3 | 23 | ✓ | ✓ | ✓ | ✓ | = | | | | |
| 4 | 24 | ✓ | ✓ | ✓ | ✓ | = | | | | |
| | | | | | | | | | | |

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | **Examiner** | **Art Unit** |
| | MOHAMMED S CHOWDHURY | 2467 |

| CPC | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Symbol** | | | | | | **Type** | **Version** |
| H04W | / | 80 | / | 08 | | F | 2013-01-01 |
| H04W | / | 76 | / | 11 | | I | 2018-02-01 |
| H04W | / | 72 | / | 0446 | | I | 2013-01-01 |
| H04W | / | 72 | / | 1268 | | I | 2013-01-01 |
| H04W | / | 74 | / | 0866 | | I | 2013-01-01 |

| CPC Combination Sets | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Symbol** | | | | | | **Type** | **Set** | **Ranking** | **Version** |
| | / | | / | | | | | | |

| NONE | | Total Claims Allowed: | |
|---|---|---|---|
| (Assistant Examiner) | (Date) | 4 | |
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | 10 February 2024 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Fig. 23 |

U.S. Patent and Trademark Office — Part of Paper No.: 20240129

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | **Examiner** | **Art Unit** |
| | MOHAMMED S CHOWDHURY | 2467 |

| INTERNATIONAL CLASSIFICATION | | | | |
|---|---|---|---|---|
| **CLAIMED** | | | | |
| H04W80/08 | / | 80 | / | 08 |
| H04W76/11 | / | 76 | / | 11 |
| H04W72/0446 | / | 72 | / | 0446 |
| H04W72/1268 | / | 72 | / | 1268 |
| H04W74/08 | / | 74 | / | 08 |

| NON-CLAIMED | | | | |
|---|---|---|---|---|
| | / | | / | |

| US ORIGINAL CLASSIFICATION | |
|---|---|
| **CLASS** | **SUBCLASS** |
| 370 | 442 |

| CROSS REFERENCES(S) | | | | | | |
|---|---|---|---|---|---|---|
| **CLASS** | **SUBCLASS (ONE SUBCLASS PER BLOCK)** | | | | | |
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| NONE<br>(Assistant Examiner) (Date) | **Total Claims Allowed:**<br>4 | |
|---|---|---|
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467<br>(Primary Examiner) 10 February 2024 (Date) | O.G. Print Claim(s)<br>1 | O.G. Print Figure<br>Fig. 23 |

| Issue Classification | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | **Examiner** | **Art Unit** |
| | MOHAMMED S CHOWDHURY | 2467 |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

**CLAIMS**

| Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | 1 | - | 10 | - | 19 | | | | | | | | | | |
| - | 2 | - | 11 | - | 20 | | | | | | | | | | |
| - | 3 | - | 12 | 1 | 21 | | | | | | | | | | |
| - | 4 | - | 13 | 2 | 22 | | | | | | | | | | |
| - | 5 | - | 14 | 3 | 23 | | | | | | | | | | |
| - | 6 | - | 15 | 4 | 24 | | | | | | | | | | |
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| - | 8 | - | 17 | | | | | | | | | | | | |
| - | 9 | - | 18 | | | | | | | | | | | | |

| NONE | | **Total Claims Allowed:** | |
|---|---|---|---|
| (Assistant Examiner) | (Date) | 4 | |
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | 10 February 2024 | O.G. Print Claim(s) | O.G. Print Figure |
| (Primary Examiner) | (Date) | 1 | Fig. 23 |

U.S. Patent and Trademark Office — Part of Paper No.: 20240129

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| CPC - Searched* | | |
|---|---|---|
| **Symbol** | **Date** | **Examiner** |
| H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

| CPC Combination Sets - Searched* | | |
|---|---|---|
| **Symbol** | **Date** | **Examiner** |
| | | |

| US Classification - Searched* | | | |
|---|---|---|---|
| **Class** | **Subclass** | **Date** | **Examiner** |
| | | | |

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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|---|---|
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| Search Notes | | |
|---|---|---|
| **Search Notes** | **Date** | **Examiner** |
| East Text Search (See search history printout) | 06/10/2021 | MC |
| Inventor search (PALM and EAST) | 06/10/2021 | MC |
| Assignee Search (PALM and EAST) | 06/10/2021 | MC |
| No 101 or double patenting or 112 (b) issues are found. | 06/10/2021 | MC |
| IEEE Technical Specification Search (Relevant documents attached) . See PTO-892 | 06/10/2021 | MC |
| IP.COM (Patent & NPL Search), Google Patent Search (attached) | 06/13/2021 | MC |
| No 101 or 112 (b) issues are found but double patenting issues are found, addressed accordingly. It's a continuation of 16/590,302 (US Pat. No. 11,284,475) as prosecuted by the same examiner. | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 01/11/2023 | MC |
| Updated search from IP.COM (Patent & NPL Search), Google Patent Search (attached) | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 05/05/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 08/28/2023 | MC |
| IEEE Technical Specification updated Search (Relevant documents attached). See PTO-892 | 08/28/2023 | |
| Based on the claim amendments and remarks, examiner contacted attorney Young Seok Koo (Reg. # 76,255) on 30 January 2024, to submit terminal disclaimer (TD) for the patent 11,284,475 corresponding to parent application (16/590,302) and terminal disclaimer (TD) for co-pending application (17/670,424). On 02/01/ 2024, applicant submitted terminal disclaimers for the parent application (16/590,302) and for the co-pending application (17/ 670,424) and accepted by the office on the same day. See interview summary. | 02/09/2024 | MC |
| Updated search from "SEARCH" tool. ... attached | 02/09/2024 | MC |
| Updated search from IP.COM. ... attached | 02/09/2024 | MC |

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|---|---|
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| Interference Search | | | |
|---|---|---|---|
| **US Class/CPC Symbol** | **US Subclass/CPC Group** | **Date** | **Examiner** |
| H04W,Y02D | H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W | H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

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|---|---|
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

# 17/670,419 - IP.COM SEARCH

**Report Run Date:** 2024-02-10
**Results included:** 250
**Results Priority Date Range:**
**Results Publication Date Range:** 1996-01-01 to 2024-01-03

**Main Concept Text:** A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive...
**Concept Modifier:** More Like Document: CN110574441A
**Collections (24):** IEEE Xplore Publications: IEEE Periodicals, IEEE Xplore Publications: IEEE Conferences, IEEE Xplore Publications: IEEE Standards, IEEE Xplore Publications: IEEE Early Access, IEEE Xplore Publications:...

Publication contains information from a representative family member.

## Search Criteria

**Main Concept Text:** A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element, wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, and wherein the BSS color is one of identifiers identifying a BSS.

**Concept Modifier:**

**More Like Document:** CN110574441A

**Collections (24):** IEEE Xplore Publications: IEEE Periodicals, IEEE Xplore Publications: IEEE Conferences, IEEE Xplore Publications: IEEE Standards, IEEE Xplore Publications: IEEE Early Access, IEEE Xplore Publications: SMPTE Periodicals, IEEE Xplore Publications: SMPTE Conferences, IEEE Xplore Publications: SMPTE Standards, IEEE Xplore Publications: MIT Press eBooks, IEEE Xplore Publications: Wiley-IEEE eBooks, IEEE Xplore Publications: IBM Periodicals, IEEE Xplore Publications: URSI Periodicals, IEEE Xplore Publications: VDE Conferences, IEEE Xplore Publications: Periodicals from China, IEEE Xplore Publications: Ericsson Technology Review, IP.com Prior Art Database: The IP.com Journal, IP.com Prior Art Database: Internet Society RFC, IP.com Prior Art Database: IBM TDB Archive, IP.com Prior Art Database: Legacy Journals, IP.com Prior Art Database: Software Patent Institute, OnePetro.org: Periodicals at OnePetro.org, OnePetro.org: Conferences at OnePetro.org, Other Literature: IBM Redbooks, Other Literature: PubMed Central, Other Literature: arXiv.org

8694787 | **Publication Date: 2019-04-19** |

## Bridging the Transition from IEEE 802.11ac to IEEE 802.11ax: Survival of EDCA in a Coexistence Environment



Image not currently available

**Abstract:**
TGax aims at developing the IEEE 802.11ax protocol to provide enhanced throughput and power efficiency in dense WiFi deployment environments. The new specification shifts the focus from EDCA access to point coordination access, which aims at improving network utilization and power efficiency. Furthermore, it introduces, for the first time, the concept of RU allocation and orthogonal frequency division multiple access (OFDMA) techniques. The new specification addresses the spectral inefficiency in existing transmission by including schedule-based multi-user multiple-input, multiple- output (MU-MIMO) and multi-user OFDMA (MU-OFDMA) techniques to facilitate multi-user uplink transmission for high efficiency (HE) devices. However, complete adoption of the HE protocol is likely to take place over a period of time to offset the deployment cost. To ensure the coexistence of non-HE devices during the transition period, EDCA based single user transmission will remain the basic access technique...

5951707 | **Publication Date: 2011-07-01** |

## IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Policies and procedures for operation in the TV Bands

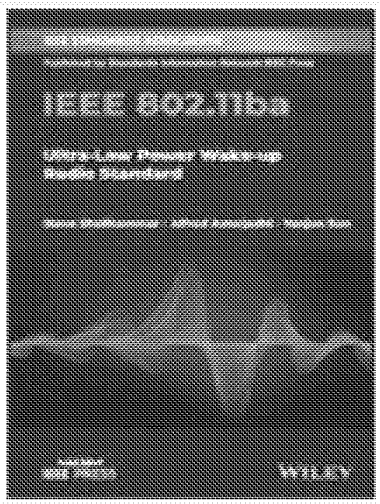


Image not currently available

**Abstract:**
This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks comprised of a professional fixed base station with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz.

10017397 | **Publication Date: 2023-01-01** |

## Medium Access Control Frame Design




**Abstract:**
This chapter helps the readers, even those unfamiliar with the IEEE 802.11 standard, to quickly grasp the idea of how information that is relevant to the functionalities is signaled in IEEE 802.11 frames. It provides the design details for the information elements, main radio (MR) medium access control (MAC) frames and wake - up radio (WUR) MAC frames. Information elements are small containers that carry management information. This information is shared by including one or more elements in Management frames that are exchanged between devices. The chapter describes the IEs transmitted in management frames by the MR to specify the capabilities and operation parameters of the associated WUR STA. The WUR Capabilities element advertises support for WUR functionalities. IEEE 802.11ba has defined several WUR frames with different functionalities and purposes. WUR Discovery frames contain a minimum amount of network information that is useful for discovering a specific network.

8468986 | **Publication Date: 2018-09-19** |

## A Tutorial on IEEE 802.11ax High Efficiency WLANs

Image not currently available

**Abstract:**
While celebrating the 21st year since the very first IEEE 802.11 "legacy" 2 Mbit/s wireless local area network standard, the latest Wi-Fi newborn is today reaching the finish line, topping the remarkable speed of 10 Gbit/s. IEEE 802.11ax was launched in May 2014 with the goal of enhancing throughput-per-area in high-density scenarios. The first 802.11ax draft versions, namely, D1.0 and D2.0, were released at the end of 2016 and 2017. Focusing on a more mature version D3.0, in this tutorial paper, we help the reader to smoothly enter into the several major 802.11ax breakthroughs, including a brand new orthogonal frequency-division multiple access-based random access approach as well as novel spatial frequency reuse techniques. In addition, this tutorial will highlight selected significant improvements (including physical layer enhancements, multi-user multiple input multiple output extensions, power saving advances, and so on) which make this standard a very significant step forward...

9442429 | **Publication Date: 2021-05-19** |

IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks--Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 1: Enhancements for High-Efficiency WLAN



Image not currently available

**Abstract:**
Modifications to both the IEEE 802.11 physical layer (PHY) and medium access control (MAC) sublayer for high-efficiency operation in frequency bands between 1 GHz and 7.125 GHz are defined in this amendment to IEEE Std 802.11-2020. (The PDF of this standard is available at no cost to you via the IEEE GET program at https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

7786995 | **Publication Date: 2016-12-14** |

IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
Technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANs) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions are specified in this revision. Amendments 1 to 5 published in 2012 and 2013 have also been incorporated into this revision.

7920364 | **Publication Date: 2017-05-05** |

IEEE Standard for Information technology--Telecommunications and information exchange between systems - Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 2: Sub 1 GHz License Exempt Operation



Image not currently available

**Abstract:**
Modifications to both the IEEE 802.11(TM) physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt IEEE 802.11 wireless networks in frequency bands below 1 GHz, excluding the television (TV) White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s are defined in this amendment.

190704141 | **Publication Date: 2019-07-09** |

Spatial Reuse in IEEE 802.11ax WLANs



Image not currently available

**Abstract:**
Dealing with massively crowded scenarios is one of the most ambitious goals of next-generation wireless networks. With this goal in mind, the IEEE 802.11ax amendment includes, among other techniques, the Spatial Reuse (SR) operation. The SR operation encompasses a set of unprecedented techniques {that are expected to significantly boost Wireless Local Area Networks (WLANs) performance in dense environments}. In particular, the main objective of the SR operation is to maximize the utilization of the medium by increasing the number of parallel transmissions. Nevertheless, due to the novelty of the operation, its performance gains remain largely unknown. In this paper, we first provide a gentle tutorial of the SR operation included in the IEEE 802.11ax. Then, we analytically model SR and delve into the new kinds of MAC-level interactions among network devices. Finally, we provide a simulation-driven analysis to showcase the potential of SR in various deployments, comprising different...

8345727 | **Publication Date: 2018-04-18** |

IEEE Standard for Information Technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 3: Enhancements for Very High Throughput to Support Chinese Millimeter Wave Frequency Bands (60 GHz and 45 GHz)



Image not currently available

**Abstract:**
The IEEE 802.11™ directional multi-gigabit (DMG) physical layer (PHY) and the medium access control (MAC) layer are modified by this amendment to IEEE Std 802.11™-2016 to enable operation in the Chinese millimeter wave frequency band around 60 GHz. This amendment also defines modifications to the IEEE 802.11 PHY and MAC layer to enable operation in the Chinese millimeter wave frequency band around 45 GHz.

6178212 | **Publication Date: 2012-03-29** |

IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.

8361248 | **Publication Date: 2012-11-21** |

ISO/IEC/IEEE International Standard - Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.

8343100 | **Publication Date: 2018-01-01** |

A study for improvement of throughput in high-density wireless networks using transmitting opportunity control



Image not currently available

**Abstract:**
In recent years, the demand for low-delay and high-throughput wireless communication has increased remarkably, leading to a proliferation of wireless access points (APs) compliant with IEEE Standard 802.11. In order to cope with the increased communication volume, the IEEE 802.11 Standardization Committee launched the IEEE 802.11ax Task Group (TGax), which plans to complete a new standard in 2019. As a method for improving the throughput for each terminal, a dynamic sensitivity control algorithm and basic service set color are being adopted as the main enhancements in IEEE 802.11ax. However, in environments where a large number of terminals and APs are densely arranged, the uplink (UL) throughput of terminals far from the AP may decrease. In this paper, we propose a transmitting opportunity control (TOC) method to improve the UL throughput of terminals far from an AP using a clear-to-send-to-self mechanism. In simulations using the outdoor scenario of IEEE 802.11ax, it was shown that...

8303870 | **Publication Date: 2018-02-27** |

## IEEE Standard for Air Interface for Broadband Wireless Access Systems



Image not currently available

**Abstract:**
This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support the WirelessMAN-SC, WirelessMAN-OFDM, and WirelessMAN-OFDMA PHY specifications, each suited to a particular operational environment. The standard enables rapid worldwide deployment of innovative, cost-effective, and interoperable multi-vendor broadband wireless access products, facilitates competition in broadband access by providing alternatives to wireline broadband access, encourages consistent worldwide spectrum allocation, and accelerates the commercialization of broadband wireless access systems.

9329263 | **Publication Date: 2021-01-19** |

## IEEE Standard for Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications



Image not currently available

**Abstract:**
Physical (PHY) and media access control (MAC) layers of a broadband powerline communication technology for local area networks (LANs), Smart Energy, Smart Grid, Internet of Things, transportation platforms (vehicle) applications, and other data distribution are defined in this standard. The balanced and efficient use of the power line communications channel by all classes of BPL devices is the main focus of this standard, defining detailed mechanisms for coexistence and interoperability between different BPL devices, and ensuring that desired bandwidth and quality of service may be delivered. The necessary security questions are addressed to ensure the privacy of communications between users and to allow the use of BPL for security sensitive services.

7551170 | **Publication Date: 2016-01-01** |

## On Quality-of-Service Provisioning in IEEE 802.11ax WLANs




**Abstract:**
A revolutionary effort to seek fundamental improvement of 802.11, known as IEEE 802.11ax, has been approved to deliver the next-generation wireless local area network (WLAN) technologies. In WLANs, medium access control protocol is the key component that enables efficient sharing the common radio channel while satisfying the quality of service (QoS) requirements for multimedia applications. With the new physical layer design and subsequent new medium access control functions under more demands on QoS and user experience, in this paper, we first survey the QoS support in legacy 802.11. Then, we summarize the IEEE 802.11ax standardization activities in progress and present an overview of current perspectives and expected features on medium access control protocol design to better support QoS and user experience in 802.11ax. We present the motivation behind, explain design principles, and identify new research challenges. To better satisfy customer needs on high bandwidth and low latency,...

1603394 | **Publication Date: 2006-02-28** |

## IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems - Amendment for Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands




**Abstract:**
This document provides enhancements to IEEE Std 802.16-2004 to support subscriber stations moving at vehicular speeds and thereby specifies a system for combined fixed and mobile broadband wireless access. Functions to support higher layer handoff between base stations or sectors are specified. Operation is limited to licensed bands suitable for fixed/mobile use below 6 GHz. Fixed 802.16-2004 subscriber capabilities shall not be compromised. In addition to mobility enhancements, this document contains substantive corrections to IEEE 802.16-2004 regarding fixed operation.

9086951 | **Publication Date: 2020-05-05** |

IEEE Standard - Information Technology-Telecommunications and information exchange between systems-Wireless Regional Area Networks-Specific requirements-Part 22: Cognitive Wireless RAN MAC and PHY specifications: Policies and Procedures for Operation in the Bands that Allow Spectrum Sharing where the Communications Devices May Opportunistically Operate in the Spectrum of Primary Service



Image not currently available

**Abstract:**
This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks (WRANs) comprised of a professional fixed base station (BS) with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and potentially in the 1300 MHz to 1750 MHz, and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it.

5062485 | **Publication Date: 2009-05-29** |

IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Broadband Wireless Access Systems



Image not currently available

**Abstract:**
This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support multiple physical layer (PHY) specifications, each suited to a particular operational environment. The standard enables rapid worldwide deployment of innovative, cost effective, and interoperable multivendor broadband wireless access products, facilitates competition in broadband access by providing alternatives to wireline broadband access, encourages consistent worldwide spectrum allocations, and accelerates the commercialization of broadband wireless access systems. The standard is a revision of IEEEE Std 802.16-2004, and consolidates material from IEEE Std 802.16eTM-2005, IEEE 802.16-2004/Cor1-2005, IEEE 802.16fTM-2005, and IEEE Std 802.16gTM-2007, along with additional maintenance items and enhancements to the...

5307322 | **Publication Date: 2009-10-29** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC)and Physical Layer (PHY) Specifications Amendment 5: Enhancements for Higher Throughput



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the IEEE 802.11 medium access control (MAC) sublayer so that modes of operation can be enabled that are capable of much higher throughputs, with a maximum throughput of at least 100 Mb/s, as measured at the MAC data service access point (SAP).

8198802 | **Publication Date: 2017-12-01** |

IEEE 802.11ax: Highly Efficient WLANs for Intelligent Information Infrastructure



Image not currently available

**Abstract:**
Recently, IEEE 802.11ax, introducing the fundamental improvement of WLANs, was approved as the next generation WLAN technology. Satisfying tremendous user demands for user experience, IEEE 802.11ax will fuel the future intelligent information infrastructure to serve big data transportation and diverse smart application scenarios. In this article, we overview the key technology features of IEEE 802.11ax such as OFDMA PHY, UL MU-MIMO, spatial reuse, OFDMA random access, power saving with TWT, and STA-2-STA operation, and explain translating these features to enhance user experience, highlighting the design principles to facilitate smart environments and identifying new technological opportunities.

6272299 | **Publication Date: 2012-08-17** |

IEEE Standard for Air Interface for Broadband Wireless Access Systems




**Abstract:**
This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support the WirelessMAN-SC, WirelessMAN-OFDM, and WirelessMAN-OFDMA PHY specifications, each suited to a particular operational environment. The standard enables rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless access products, facilitates competition in broadband access by providing alternatives to wireline broadband access, encourages consistent worldwide spectrum allocation, and accelerates the commercialization of broadband wireless access systems.

5673097 | **Publication Date: 2010-12-20** |

IEEE Draft Standard for Information Technology -Telecommunications and information exchange between systems - Wireless Regional Area Networks (WRAN) - Specific requirements - Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Policies and procedures for operation in the TV Bands




**Abstract:**
This standard specifies the air interface, including the medium access control layer(MAC) and physical layer (PHY), of the fixed and portable point-to-multipoint wireless regional area networks operating in spectrum allocated to the Television Broadcasting Service in the frequency range 54 MHz to 862 MHz.

8485317 | **Publication Date: 2018-01-01** |

The Race to 5G Era; LTE and Wi-Fi




**Abstract:**
We are on the brink of a new era for the wireless telecommunications, an era that will change the way that business is done. The fifth generation (5G) systems will be the first realization in this new digital era where the various networks will be interconnected forming a unified system. With support for higher capacity as well as low-delay and machine-type communication services, the 5G networks will significantly improve performance over the current fourth generation (4G) systems and will also offer seamless connectivity to numerous devices by integrating different technologies, intelligence, and flexibility. In addition to ongoing 5G standardization activities and technologies under consideration in the Third Generation Partnership Project (3GPP), the Institute of Electrical and Electronic Engineers (IEEE)-based technologies operating on unlicensed bands, will also be an integral part of a 5G eco-system. Along with the 3GPP-based cellular technology, the IEEE standards and...

6392842 | **Publication Date: 2012-12-24** |

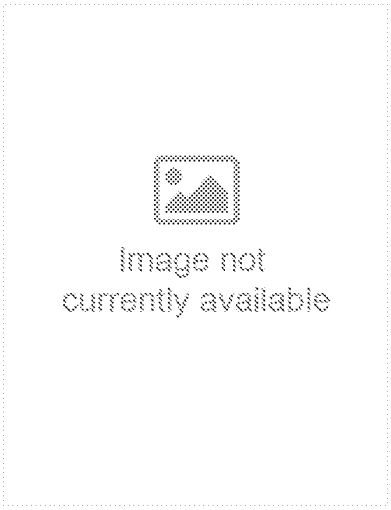
IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 3: Enhancements for Very High Throughput in the 60 GHz Band




**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layers (PHYs)and the IEEE 802.11 medium access control layer (MAC) to enable operation in frequencies around 60 GHz and capable of very high throughput.

5678772 | **Publication Date: 2010-12-30** |

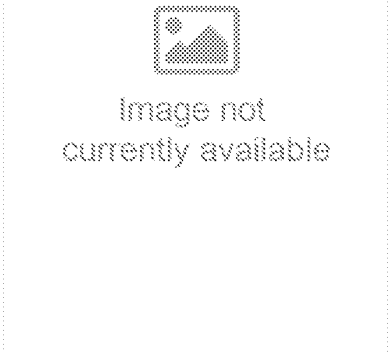
## IEEE Standard for Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications




**Abstract:**
A standard for high-speed communication devices via electric power lines, so called broadband over power line (BPL) devices, is defined. Transmission frequencies below 100 MHz are used. All classes of BPL devices can use this standard, including BPL devices used for the first-mile/last-mile connection to broadband services as well as BPL devices used in buildings for local area networks (LANs), Smart Energy applications, transportation platforms (vehicle) applications, and other data distribution. The balanced and efficient use of the power line communications channel by all classes of BPL devices is the main focus of this standard, defining detailed mechanisms for coexistence and interoperability between different BPL devices, and ensuring that desired bandwidth and quality of service may be delivered. The necessary security questions are addressed to ensure the privacy of communications between users and to allow the use of BPL for security sensitive services.

4140843 | **Publication Date: 2005-09-30** |

## ISO/IEC International Standard - Information technology--Telecommunications and information exchange between systems-- Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications




**Abstract:**
The medium access control (MAC) and physical characteristics for wireless local area networks (LANs) are specified in this standard, which is part of a series of standards for local and metropolitan area networks. The medium access control unit in this standard is designed to support physical layer units as they may be adopted dependent on the availability of spectrum. This standard contains five physical layer units: four radio units, operating in the 2400-2500 MHz band and in the bands comprising 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.725-5.825 GHz, and one baseband infrared (IR) unit. One radio unit employs the frequency-hopping spread spectrum (FHSS) technique, two employ the direct sequence spread spectrum (DSSS) technique, and another employs the orthogonal frequency division multiplexing (OFDM) technique.

6774849 | **Publication Date: 2014-03-14** |

ISO/IEC/IEEE International Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 3: Enhancements for Very High Throughput in the 60 GHz Band (adoption of IEEE Std 802.11ad-2012)



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layers (PHYs)and the IEEE 802.11 medium access control layer (MAC) to enable operation in frequencies around 60 GHz and capable of very high throughput.

10058117 | **Publication Date: 2023-03-03** |

IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks--Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 4: Enhancements for Positioning



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 medium access control layer (MAC) and physical layers (PHY). Compared to IEEE Std 802.11-2020 it enables absolute and relative position estimation with higher accuracy, and reduces wireless medium utilization and power consumption, is scalable to dense deployments, and includes security features. (The PDF of this standard is available at not charge compliments of the IEEE GET program https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

4248378 | **Publication Date: 2007-06-12** |

IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 through 8 including a corrigendum.

9282259 | **Publication Date: 2020-05-05** |

IEEE Standard - Information Technology-Telecommunications and information exchange between systems-Wireless Regional Area Networks-Specific requirements-Part 22: Cognitive Wireless RAN MAC and PHY specifications: Policies and Procedures for Operation in the Bands that Allow Spectrum Sharing where the Communications Devices May Opportunistically Operate in the Spectrum of Primary Service - Redline




**Abstract:**
This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks (WRANs) comprised of a professional fixed base station (BS) with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and potentially in the 1300 MHz to 1750 MHz, and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it. (The PDF of this standard is available at no cost to you compliments of the IEEE GET program at https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

1389197 | **Publication Date: 2003-01-01** |

IEEE Standard for Information Technology- Telecommunications and Information Exchange Between Systems- Local and Metropolitan Area Networks- Specific Requirements- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**

7716530 | **Publication Date: 2011-02-09** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 8: IEEE 802.11 Wireless Network Management



Image not currently available

**Abstract:**
This amendment provides Wireless Network Management enhancements to the IEEE 802.11 MAC, and PHY, extending radio measurements to effect a complete and coherent upper layer interface for managing IEEE 802.11 devices in wireless networks.

654749 | **Publication Date: 1997-11-18** |

IEEE Standard for Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications



Image not currently available

**Abstract:**
SUPERSEDED BY ISO/IEC 8802-11:1999 The medium access control and physical characteristics for wireless local area networks are specified in this standard, part of a series of standards for local and metropolitan area networks. The medium access control unit in this standard is designed to support physical layer units as they may be adopted dependent on the availability of spectrum. This standard contains three physical layer units: two radio units, both operating in the 2400-2500 MHz band, and one baseband infrared unit. One radio unit employs the frequency-hopping spread spectrum technique, and the other employs the direct sequence spread spectrum technique.

5765736 | **Publication Date: 2011-05-06** |

## IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Broadband Wireless Access Systems Amendment 3: Advanced Air Interface

Image not currently available

**Abstract:**
This amendment specifies the WirelessMAN-Advanced Air Interface, an enhanced air interface designated as "IMT-Advanced" by the International Telecommunication Union- Radiocommunication Sector (ITU-R). The amendment is based on the WirelessMAN-OFDMA specification and provides continuing support for legacy subscriber stations.

9966905 | **Publication Date: 2022-11-02** |

## Performance Study of High-Efficiency IEEE 802.11ax WLAN Standard Using NS-3 Simulator

Image not currently available

**Abstract:**
The future Wireless Local Area Network (WLAN) networks are expected to cater to the high-density use-case scenarios such as airports, residential apartments, outdoor stadiums, etc., where numerous Access Points (APs) are deployed to cover the given geographical area. The IEEE 802.11ax is the current generation WLAN standard designed to cater to such high-density networks. To meet the demands of high-density networks, the 802.11ax standard uses a novel frequency reuse mechanism known as Basic-Service Set (BSS)-Coloring. In this paper, we have studied the impact of the BSS-Coloring feature on the performance of the up-link throughput of 802.11ax WLAN. To this end, we have carried out Network-Simulator (NS)-3-based simulation study. Further, we have simulated a multi-BSS environment and studied the performance of throughput due to variation in the following key WLAN parameters: (i) Modulation & Coding Scheme (MCS) Index, (ii) Channel bandwidth, (iii) Number of antennas, (iv)...

6687187 | **Publication Date: 2013-12-18** |

IEEE Standard for Information technology-- Telecommunications and information exchange between systemsLocal and metropolitan area networks-- Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications--Amendment 4: Enhancements for Very High Throughput for Operation in Bands below 6 GHz.



Image not currently available

**Abstract:**
The purpose of this amendment is to improve the IEEE 802.11 wireless local area network (WLAN) user experience by providing significantly higher basic service set (BSS) throughput for existing WLAN application areas and to enable new market segments for operation below 6 GHz including distribution of multiple multimedia/data streams.

6547982 | **Publication Date: 2013-06-25** |

IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems --- Amendment 2: Higher Reliability Networks

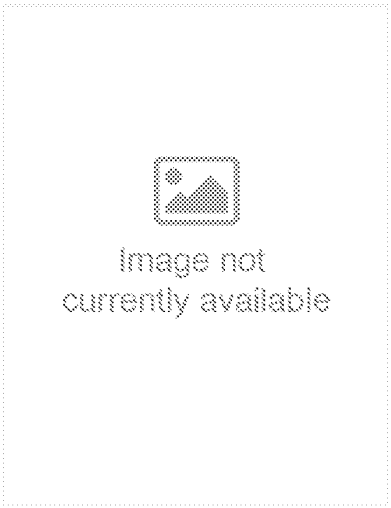


Image not currently available

**Abstract:**
Enhancements to the WirelessMAN-Advanced Air Interface to support high-reliability networks are specified in this amendment to IEEE Std 802.16.1-2012.

9217315 | **Publication Date: 2020-08-01** |

## An IEEE 802.11ax Interference-Aware MAC Queue




**Abstract:**
The first wave of IEEE 802.11ax capable devices have already hit the market, aiming at enhancing the Quality of Experience (QoE) for the users in dense deployments, by enabling novel features to improve throughput and spectrum efficiency. One of these features is Spatial Reuse (SR) mechanism, which is introduced for coping with the exposed node problem. Under the SR operation, nodes belonging on different Basic Service Sets (BSSs) are allowed to initiate concurrent transmissions, utilising the spectrum resources and improving throughput. However, the main challenge for this enabling technology is the increased interference level that is introduced by the concurrent transmissions. Even though, there are a few algorithms available in the literature that study this issue for the IEEE 802.11ax, in this article we look into that issue from a different perspective. We propose an Interference-Aware scheduler for the Medium Access Control (MAC) queue based on the interference level observed...

IPCOM000269891D | **Publication Date: 2022-05-04** |

## Coordination of Mixed APs and STAs




**Abstract:**
Devices, Systems and Methods for sharing time frequency resource in a TXOP between the first device and secondary device

7420884 | **Publication Date: 2015-11-01** |

## IEEE 802.11ax: How to Build High Efficiency WLANs




**Abstract:**
Wi-Fi was designed just to replace wired Internet connection, but it has changed the Internet as a whole. Wireless devices generate the largest percentage of the Internet traffic and the Wi-Fi market is continuously raising, which brings new challenges connected with more devices, more data, and higher Quality of Experience expectations. Since todays Wi-Fi is inefficient in terms of these challenges, in 2013, IEEE LAN/MAN Standard Committee launched a new task group, which aims to improve Wi-Fi by 2019. In a short time, the group has attracted much attention from leading telecommunication manufacturers. In the paper, we observe activities of the group, paying much attention to the challenges and to those solutions, which have been proposed by November 2015.

10063942 | **Publication Date: 2023-03-08** |

## IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks--Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 5: Enhancements for Next Generation V2X




**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer for next generation vehicle-to-everything (V2X) communication in the 5.9 GHz and 60 GHz frequency bands.(The PDF of this standard is available at no charge compliments of the IEEE GET program https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

8018236 | **Publication Date: 2011-09-10** |

## IEEE Standard for Information Technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 10: Mesh Networking



Image not currently available

**Abstract:**
This amendment describes protocols for IEEE 802.11 stations to form self-configuring multi-hop networks that support both broadcast/multicast and unicast data delivery.

8432266 | **Publication Date: 2018-05-01** |

## Dynamic Sensitivity Control Based on Two-Hop Farthest Terminal in Dense WLAN



Image not currently available

**Abstract:**
The explosive usage of IEEE 802.11 Wireless Local Area Network (WLAN) has resulted in its dense deployments and excessive interference between Basic Service Sets (BSSs) in urban area such as an apartment building and an airport. Serious problems of hidden/exposed terminal in high-density condition negatively impact system throughput. To improve the system efficiency, IEEE 802.11ax TG has been assembled. TG aims at realizing High-Efficiency- WLAN (HEW) by utilizing special reuse technologies including Dynamic Sensitivity Control (DSC), Transmit Power Control (TPC), and BSS Color Filtering (BCF). In this paper, we propose a DSC based on two-hop farthest terminal for dense WLAN. This scheme with minimum transmission power resolves the hidden terminal problem. Propagation loss of received signal from associated communication pair is used for the proper values of transmission power and carrier sense level. Furthermore, adjusting these parameters destination by destination can reduce exposed...

7336461 | **Publication Date: 2015-10-30** |

IEEE Standard for Information Technology--Telecommunications and information exchange between systems - Wireless Regional Area Networks (WRAN)--Specific requirements - Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications:Policies and Procedures for Operation in the TV Bands - Amendment 2: Enhancement for Broadband Services and Monitoring Applications




**Abstract:**
Alternate physical layer (PHY) and necessary medium access control layer (MAC) enhancements to IEEE Std 802.22-2011 are specified in this amendment for operation in very high frequency/ultra-high frequency (VHF/UHF) television broadcast bands between 54 MHz and 862 MHz to support enhanced broadband services and monitoring applications. The amendment supports aggregate data rates greater than the maximum data rate supported by the IEEE Std 802.22-2011. This amendment defines new classes of IEEE 802.22(TM) devices to address these applications and supports more than 512 devices in a network. This amendment also specifies techniques to enhance communications among the devices and makes necessary amendments to the cognitive, security, and parameters and connection management clauses. This amendment supports mechanisms to enable coexistence with other IEEE 802(R) systems in the same band.

1350465 | **Publication Date: 2004-01-01** |

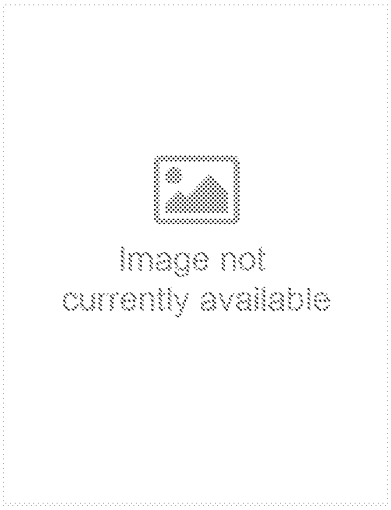
IEEE Standard for Local and Metropolitan Area Networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems




**Abstract:**
This standard specifies the air interface of fixed broadband wireless access (BWA) systems supporting multimedia services. The medium access control layer (MAC) supports a primarily point-to-multipoint architecture, with an optional mesh topology. The MAC is structured to support multiple physical layer (PHY) specifications, each suited to a particular operational environment. For operational frequencies from 10-66 GHz, the PHY is based on single-carrier modulation. For frequencies below 11 GHz, where propagation without a direct line of sight must be accommodated, three alternatives are provided, using OFDM, OFDMA, and single-carrier modulation. This standard revises and consolidates IEEE Std 802.16-2001, IEEE Std 802.16aTM-2003, and IEEE Std 802.16cTM-2002.

5538195 | **Publication Date: 2010-07-30** |

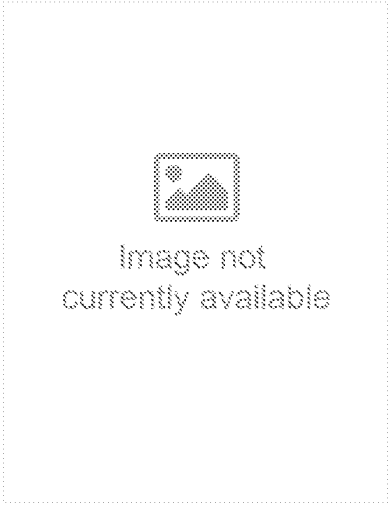
IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Broadband Wireless Access Systems Amendment 2: Improved Coexistence Mechanisms for License-Exempt Operation




**Abstract:**
This amendment specifies improved mechanisms, as policies and medium access control enhancements, to enable coexistence among license-exempt systems based on IEEE Std 802.16 and to facilitate the coexistence of such systems with primary users.

7452560 | **Publication Date: 2016-04-14** |

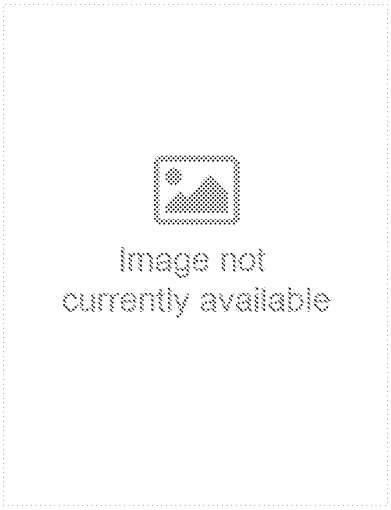
A Survey on High Efficiency Wireless Local Area Networks: Next Generation WiFi




**Abstract:**
The emerging paradigm of the Internet of Everything, along with the increasing demand of Internet services everywhere, results in a remarkable and continuous growth of the global Internet traffic. As a cost-effective Internet access solution, WiFi networks currently generate a major portion of the global Internet traffic. Furthermore, the number of WiFi public hotspots worldwide is expected to increase by more than sevenfold by 2018. To face this huge increase in the number of densely deployed WiFi networks, and the massive amount of data to be supported by these networks in indoor and outdoor environments, it is necessary to improve the current WiFi standard and define specifications for high efficiency wireless local area networks (HEWs). This paper presents potential techniques that can be applied for HEWs, in order to achieve the required performance in dense HEW deployment scenarios, as expected in the near future. The HEW solutions under consideration includes physical layer...

5167148 | **Publication Date: 2009-06-12** |

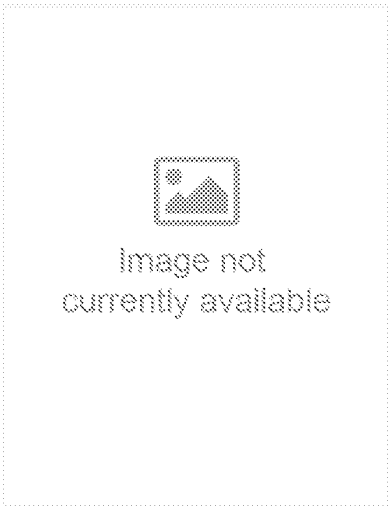
IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Broadband Wireless Access Systems Amendment 1: Multihop Relay Specification




**Abstract:**
This amendment specifies OFDMA physical layer and medium access control layer enhancements to IEEE Std 802.16 for licensed bands to enable the operation of relay stations.

190608063 | **Publication Date: 2019-06-19** |

On the Performance of the Spatial Reuse Operation in IEEE 802.11ax WLANs




**Abstract:**
The Spatial Reuse (SR) operation included in the IEEE 802.11ax-2020 (11ax) amendment aims at increasing the number of parallel transmissions in an Overlapping Basic Service Set (OBSS). However, many unknowns exist about the performance gains that can be achieved through SR. In this paper, we provide a brief introduction to the SR operation described in the IEEE 802.11ax (draft D4.0). Then, a simulation-based implementation is provided in order to explore the performance gains of the SR operation. Our results show the potential of using SR in different scenarios covering multiple network densities and traffic loads. In particular, we observe significant improvements on the channel utilization when applying SR with respect to the default configuration, thus allowing to increase the throughput and reduce the delay. Interestingly, the highest improvements provided by the SR operation are observed in the most pessimistic situations in terms of network density and traffic load.

6297413 | **Publication Date: 2012-09-07** |

IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems

Image not currently available

**Abstract:**
The WirelessMAN-Advanced Air Interface, an enhanced air interface designated as "IMT-Advanced" by the International Telecommunication Union-Radiocommunication Sector (ITU-R), is specified in this standard.

6530596 | **Publication Date: 2013-06-12** |

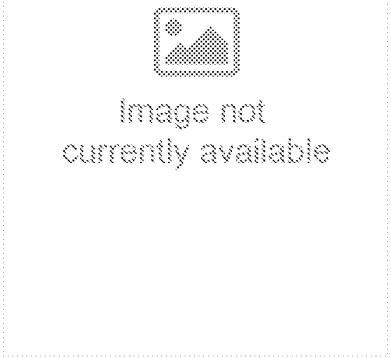
IEEE Standard for Air Interface for Broadband Wireless Access Systems--Amendment 2: Higher Reliability Networks

Image not currently available

**Abstract:**
Enhancements to the Wireless MAN-OFDMA air interface to support higher reliability networks are specified in this amendment to IEEE Std 802.16-2012.

8438465 | **Publication Date: 2018-01-01** |

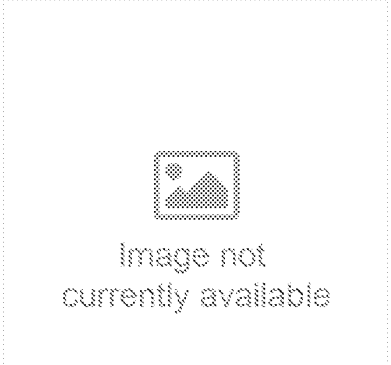
On Energy Saving in IEEE 802.11ax




**Abstract:**
Wi-Fi access has become a fundamental technology for smart building as reliable and efficient Wi-Fi is the foundation that effectively enable indoor smart devices in smart buildings. Recently, the IEEE 802.11ax standards were introduced to facilitate high-bandwidth wireless transmission in high-density environment as the new generation wireless local area network technology. In the IEEE 802.11ax, for the sake of energy-efficient smart devices, power saving mechanisms were included to further reduce Wi-Fi power consumption beyond the existing Wi-Fi power saving mechanisms. In this paper, a power saving design designated on the uplink multi-user system in 802.11ax is proposed. Additionally, an analytical analysis is developed to evaluate the effectiveness of the proposed power saving mechanism with further computer simulations to verify.

4431839 | **Publication Date: 2007-12-31** |

IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems - Amendment 3: Management Plane Procedures and Services




**Abstract:**
This standard defines management procedures as enhancements to the IEEE 802.16 air interface standard for fixed and mobile broadband wireless systems. It specifies the management functions, interfaces, and protocol procedures.

9566607 | **Publication Date: 2021-10-09** |

## Performance Analysis of the IEEE 802.11ax OBSS_PD-Based Spatial Reuse




**Abstract:**
Network densification has led to a renewed emphasis on means to improve aggregate network throughput for next-gen (High Efficiency) WLANs. The introduction of BSS color feature in support of enhanced spatial reuse sets IEEE 802.11ax apart from legacy WLAN. BSS color enables stations within a network to identify whether a transmission originates from an overlapped BSS and provides an option for mitigating the exposed node problem by allowing it to transmit (over the on-going OBSS transmission) albeit with reduced transmit power. As a result, distances between networks can be reduced, thereby improving the area spectral efficiency. To the best of our knowledge, this is the first work to develop an analytical model for IEEE 802.11ax spatial reuse that provides useful rules for optimizing network area throughput. We show that the spatial reuse gain is tightly linked to the interference range properties of each BSS in the network. Further, the analytical model predictions are validated and...

817038 | **Publication Date: 2000-01-20** |

## IEEE Standard for Information Technology - Telecommunications and information exchange between systems - Local and Metropolitan networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Higher Speed Physical Layer (PHY) Extension in the 2.4 GHz band




**Abstract:**
Changes and additions are provided for IEEE Std 802.11b-1999 to support the higher rate Physical Layer for operation in the 2.4 GHz band.

6891185 | **Publication Date: 2014-01-01** |

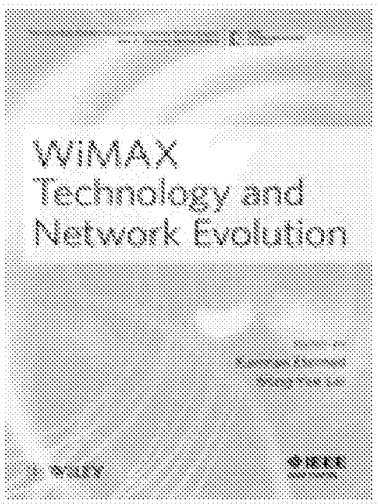
## Radio Interface Evolution Towards 5G and Enhanced Local Area Communications

Image not currently available

**Abstract:**
The exponential growth of mobile data in macronetworks has driven the evolution of communications systems toward spectrally efficient, energy efficient, and fast local area communications. It is a well-known fact that the best way to increase capacity in a unit area is to introduce smaller cells. Local area communications are currently mainly driven by the IEEE 802.11 WLAN family being cheap and energy efficient with a low number of users per access point. For the future high user density scenarios, following the 802.11 HEW study group, the 802.11ax project has been initiated to improve the WLAN system performance. The 3GPP LTE-advanced (LTE-A) also includes new methods for pico and femto cell's interference management functionalities for small cell communications. The main problem with LTE-A is, however, that the physical layer numerology is still optimized for macrocells and not for local area communications. Furthermore, the overall complexity and the overheads of the control plane...

5732853 | **Publication Date: 2011-01-01** |

## Overview of IEEE 802.16m Radio Access Technology




**Abstract:**
This chapter contains sections titled: Introduction to IEEE 802.16m IEEE 802.16m System Requirements and Evaluation Methodology IEEE 802.16m Reference Model and Protocol Structure IEEE 802.16m Mobile Station State Diagram Overview of IEEE 802.16m Physical Layer Overview of the IEEE 802.16m MAC Layer PHY and MAC Aspects of Multicarrier Operations PHY and MAC Aspects of Multicast and Broadcast Services Summary

8580778 | **Publication Date: 2018-09-01** |

## Control OBSS/PD Sensitivity Threshold for IEEE 802.11ax BSS Color




**Abstract:**
IEEE 802.11ax Spatial Reuse (SR) is a new category in the IEEE 802.11 family, aiming at improving the spectrum efficiency and the network performance in dense deployments. The main and perhaps the only SR technique in that amendment is the Basic Service Set (BSS) Color. It aims at increasing the number of concurrent transmissions in a specific area, based on a newly defined Overlapping BSS/Preamble-Detection (OBSS/PD) threshold and the Received Signal Strength Indication (RSSI) from Overlapping BSSs (OBSSs). In this paper, we propose a Control OBSS/PD Sensitivity Threshold (COST) algorithm for adjusting OBSS/PD threshold based on the interference level and RSSI from the associated recipient(s). In contrast to the Dynamic Sensitivity Control (DSC) algorithm that was proposed for setting OBSS/PD, COST is fully aware of any changes in OBSSs and can be applied to any IEEE 802.11ax node. Simulation results in various scenarios, show a clear performance improvement of up to 57% gain in...

6744586 | **Publication Date: 2014-02-19** |

## IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 5: Television White Spaces (TVWS) Operation




**Abstract:**
Enhancements to the IEEE 802.11 physical layers (PHYs) and medium access control (MAC) sublayer to support operation in the white spaces in television bands are defined.

9152055 | **Publication Date: 2020-07-28** |

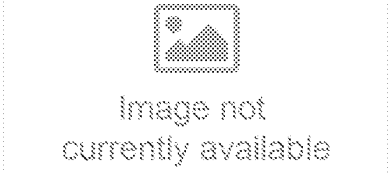
## IEEE 802.11be Wi-Fi 7: New Challenges and Opportunities




**Abstract:**
With the emergence of 4k/8k video, the throughput requirement of video delivery will keep grow to tens of Gbps. Other new high-throughput and low-latency video applications including augmented reality (AR), virtual reality (VR), and online gaming, are also proliferating. Due to the related stringent requirements, supporting these applications over wireless local area network (WLAN) is far beyond the capabilities of the new WLAN standard – IEEE 802.11ax. To meet these emerging demands, the IEEE 802.11 will release a new amendment standard IEEE 802.11be – Extremely High Throughput (EHT), also known as Wireless-Fidelity (Wi-Fi) 7. This article provides the comprehensive survey on the key medium access control (MAC) layer techniques and physical layer (PHY) techniques being discussed in the EHT task group, including the channelization and tone plan, multiple resource units (multi-RU) support, 4096 quadrature amplitude modulation (4096-QAM), preamble designs, multiple link operations (e.g.,...

9363693 | **Publication Date: 2021-02-25** |

## IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**
Technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANs) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions are specified in this revision. Amendments 1 to 5 published in 2016 and 2018 have also been incorporated into this revision. (The PDF of this standard is available at no cost to you compliments of the IEEE GET program https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

9447964 | **Publication Date: 2021-06-01** |

## Will OFDMA Improve the Performance of 802.11 Wifi Networks?




**Abstract:**
WiFi 6 based on the IEEE 802.11ax amendment is intended to improve spectral efficiency and area throughput operations in high density environments. This is achieved (among other methods) by the introduction of Orthogonal Frequency Division Multiple Access (OFDMA) and enhanced multi-user Multiple Input Multiple Output (MU-MIMO) features. In this work, we explore the performance of downlink and uplink OFDMA in 802.11ax via extensive simulation based evaluation (latency, throughput, range) compared to conventional single user (SU) transmissions. Based on our results, we conclude that OFDMA can reduce the median latency from 5 ms to less than 1 ms in non-saturation conditions. When used in conjunction with efficient multi-user buffer status report and restricted EDCA mechanisms, OFDMA can increase the saturation throughput by more than 10 percent. Moreover, UL OFDMA also improves aggregate throughput at longer ranges due to the narrower sub-channels (equivalently increased transmit power...

5116805 | **Publication Date: 2009-06-01** |

## An overview of next-generation mobile WiMAX technology




**Abstract:**
The growing demand for mobile Internet and wireless multimedia applications has motivated the development of broadband wireless access technologies in recent years. Mobile WiMAX has enabled convergence of mobile and fixed broadband networks through a common wide-area radio-access technology and flexible network architecture. Since January 2007, the IEEE 802.16 working group has been developing a new amendment of the IEEE 802.16 standard (i.e., IEEE 802.16m) as an advanced air interface to meet the requirements of ITU-R/IMT-advanced for 4G systems, as well as for the next-generation mobile network operators. Depending on the available bandwidth and multi-antenna mode, the next-generation mobile WiMAX will be capable of over-the-air data-transfer rates in excess of 1 Gb/s and of supporting a wide range of high-quality and high-capacity IP-based services and applications while maintaining full backward compatibility with the existing mobile WiMAX systems to preserve investments and...

6016195 | **Publication Date: 2011-09-06** |

IEEE Standard for Local and Metropolitan Area Networks--Part 15.7: Short-Range Wireless Optical Communication Using Visible Light

Image not currently available

**Abstract:**
A PHY and a MAC layer for short-range optical wireless communications using visible light in optically transparent media are defined. The visible light spectrum extends from 380 nm to 780 nm in wavelength. The standard is capable of delivering data rates sufficient to support audio and video multimedia services and also considers mobility of the visible link, compatibility with visible-light infrastructures, impairments due to noise and interference from sources like ambient light and a MAC layer that accommodates visible links. The standard adheres to applicable eye safety regulations.

190801834 | **Publication Date: 2019-08-05** |

Performance analysis of IEEE 802.11ax heterogeneous network in the presence of hidden terminals

Image not currently available

**Abstract:**
Performance improvement has been among the foci of all previous amendments of IEEE 802.11 protocol. In addition, the draft high efficiency (HE) amendment IEEE 802.11ax, proposed by TGax, aims at increasing network performance. One of the main obstacles to improving spectral and power efficiency is the presence of hidden terminals which degrade throughput, in particular in uplink transmission. IEEE 802.11ax does provide mechanisms such as trigger based uplink transmission that mitigate this degradation to some extent, but are incapable of eliminating it, esp. at high arrival rates. To combat the hidden terminal problem, we propose to increase the carrier sensing threshold (CSTH) of STAs during association with an HE access point. Our results confirm that the proposed mechanism can lead to significant reduction of collision probability in uplink transmission.

997967 | **Publication Date: 2002-04-08** |

IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems



Image not currently available

**Abstract:**
This standard specifies the air interface of fixed (stationary) point-to-multipoint broadband wireless access systems providing multiple services. The medium access control layer is capable of supporting multiple physical layer specifications optimized for the frequency bands of application. The standard includes a particular physical layer specification applicable to systems operating between 10 and 66 GHz.

4544755 | **Publication Date: 2008-06-12** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC)and Physical Layer (PHY) Specifications Amendment 1: Radio Resource Measurement of Wireless LANs



Image not currently available

**Abstract:**
This amendment specifies the extensions to IEEE Std 802.11 for Wireless LANs providing mechanisms for Radio Resource Measurement.

200713401 | **Publication Date: 2020-07-27** |

## IEEE 802.11be-Wi-Fi 7: New Challenges and Opportunities

Image not currently available

**Abstract:**
With the emergence of 4k/8k video, the throughput requirement of video delivery will keep grow to tens of Gbps. Other new high-throughput and low-latency video applications including augmented reality (AR), virtual reality (VR), and online gaming, are also proliferating. Due to the related stringent requirements, supporting these applications over wireless local area network (WLAN) is far beyond the capabilities of the new WLAN standard -- IEEE 802.11ax. To meet these emerging demands, the IEEE 802.11 will release a new amendment standard IEEE 802.11be -- Extremely High Throughput (EHT), also known as Wireless-Fidelity (Wi-Fi) 7. This article provides the comprehensive survey on the key medium access control (MAC) layer techniques and physical layer (PHY) techniques being discussed in the EHT task group, including the channelization and tone plan, multiple resource units (multi-RU) support, 4096 quadrature amplitude modulation (4096-QAM), preamble designs, multiple link operations...

9502043 | **Publication Date: 2021-02-26** |

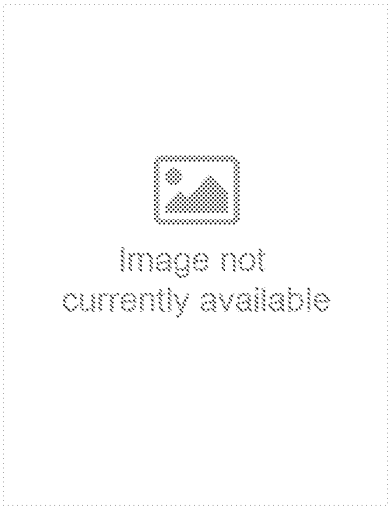
## IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Redline

Image not currently available

**Abstract:**
Technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANs) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions are specified in this revision. Amendments 1 to 5 published in 2016 and 2018 have also been incorporated into this revision. (The PDF of this standard is available at no cost to you compliments of the IEEE GET program https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

180605908 | **Publication Date: 2018-06-15** |

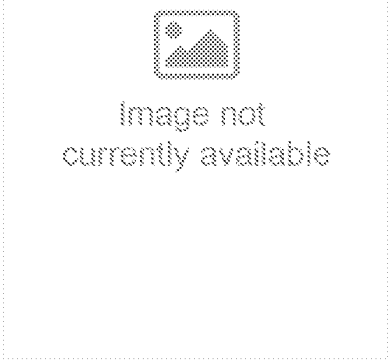
## Survey and Performance Evaluation of the Upcoming Next Generation WLAN Standard - IEEE 802.11ax




**Abstract:**
With the ever-increasing demand for wireless traffic and quality of serives (QoS), wireless local area networks (WLANs) have developed into one of the most dominant wireless networks that fully influence human life. As the most widely used WLANs standard, Institute of Electrical and Electronics Engineers (IEEE) 802.11 will release the upcoming next generation WLANs standard amendment: IEEE 802.11ax. This article comprehensively surveys and analyzes the application scenarios, technical requirements, standardization process, key technologies, and performance evaluations of IEEE 802.11ax. Starting from the technical objectives and requirements of IEEE 802.11ax, this article pays special attention to high-dense deployment scenarios. After that, the key technologies of IEEE 802.11ax, including the physical layer (PHY) enhancements, multi-user (MU) medium access control (MU-MAC), spatial reuse (SR), and power efficiency are discussed in detail, covering both standardization technologies as...

5724253 | **Publication Date: 2011-03-02** |

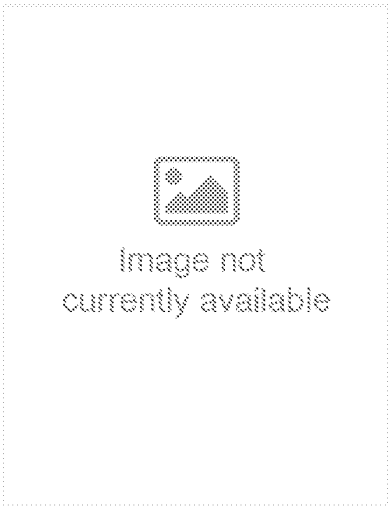
## IEEE Draft Standard for Information Technology -Telecommunications and information exchange between systems - Wireless Regional Area Networks (WRAN) - Specific requirements - Part 22: Cognitive Wireless RAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Policies and procedures for operation in the TV Bands




**Abstract:**
This standard specifies the air interface, including the medium access control layer(MAC) and physical layer (PHY), of the fixed and portable point-to-multipoint wireless regional area networks operating in spectrum allocated to the Television Broadcasting Service in the frequency range 54 MHz to 862 MHz.

8931315 | **Publication Date: 2019-10-01** |

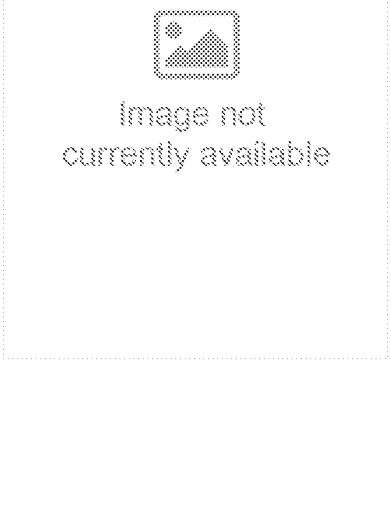
## On the Performance of the Spatial Reuse Operation in IEEE 802.11ax WLANs




**Abstract:**
The Spatial Reuse (SR) operation included in the IEEE 802.11ax-2020 (11ax) amendment aims at increasing the number of parallel transmissions in an Overlapping Basic Service Set (OBSS). However, many unknowns exist about the performance gains that can be achieved through SR. In this paper, we provide a brief introduction to the SR operation described in the IEEE 802.11ax (draft D4.0). Then, a simulation-based implementation is provided in order to explore the performance gains of the SR operation. Our results show the potential of using SR in different scenarios covering multiple network densities and traffic loads. In particular, we observe significant improvements on the channel utilization when applying SR with respect to the default configuration, thus allowing to increase the throughput and reduce the delay. Interestingly, the highest improvements provided by the SR operation are observed in the most pessimistic situations in terms of network density and traffic load.

8714105 | **Publication Date: 2019-05-11** |

## IEEE Draft Standard for Information Technology - Local and Metropolitan Area Networks - Specific Requirements - Part 22: Cognitive Radio Wireless Regional Area Networks (WRAN) Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the Bands that Allow Spectrum Sharing where the Communications Devices may Opportunistically Operate in the Spectrum of the Primary Service




**Abstract:**
This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks (WRANs) comprised of a professional fixed base station (BS) with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and potentially in the 1300 MHz to 1750 MHz, and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it.

PMC7765964 | **Publication Date: 2020-12-17** |

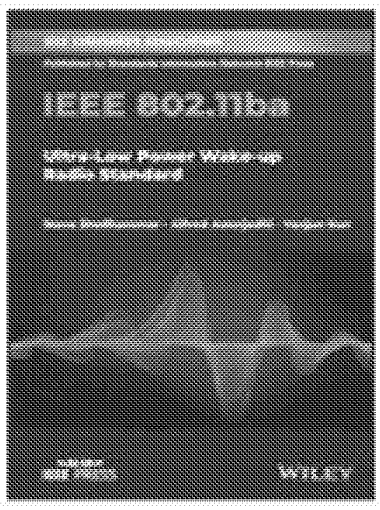
## Novel Multi-AP Coordinated Transmission Scheme for 7th Generation WLAN 802.11be

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**Abstract:**
The demand for high-data-rate and time-sensitive applications, such as 4k/8k video streaming and real-time augmented reality (AR), virtual reality (VR), and gaming, has increased significantly. Addressing the inefficiency of distributed channel access and the fairness problem between uplink and downlink flows is crucial for the development of wireless local area network (WLAN) technologies. In this study, we propose a novel transmission scheme for IEEE 802.11be networks that addresses the fairness problem and improves the system throughput. Utilizing the concept of multi-AP coordinated OFDMA introduced in the 7th-generation WLAN IEEE 802.11be, the proposed transmission scheme allows an AP to share a granted transmission opportunity (TXOP) with nearby APs. A mathematically analysis of the throughput performance of the proposed schemes was performed using a Markov chain model. The simulation results verify that the scheme effectively improves the downlink fairness and the system...

10017394 | **Publication Date: 2023-01-01** |

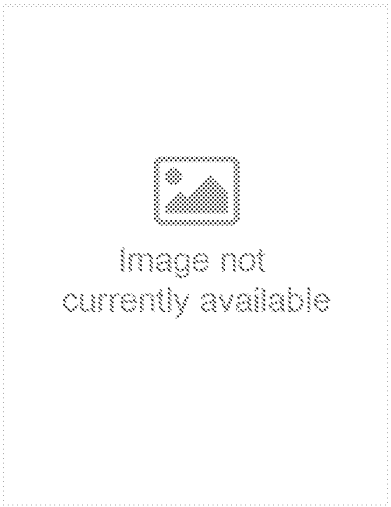
## Wake‐up Radio Medium Access Control




**Abstract:**
This chapter describes the key functionalities of the medium access control layer of IEEE 802.11ba, with a focus on how wake‐up radio (WUR) is integrated into and improves network discovery, connectivity, synchronization, and power management. During network discovery a station (STA) scans the available channels in the frequency bands it supports to discover a suitable access point to which the STA may associate with or eventually roam to, at some point in the future. The chapter also describes how frequency division multiple access (FDMA) and protected WUR frames are utilized to improve efficiency and security of transmissions over the WUR. IEEE 802.11ba has defined new frames and procedures for both the MR and the WUR to achieve both low latency and lower power consumption in an IEEE 802.11 network. To improve the scalability of WUR operation, WUR FDMA operation is defined to enable the transmission of multiple WUR wake‐up frames multiplexed in frequency.

8971156 | **Publication Date: 2019-11-01** |

## Assessment of novel solutions for throughput enhancement in IEEE 802.11ax networks




**Abstract:**
IEEE 801.11 Working Group is developing the sixth generation of wireless local area network (WLAN) standards, denoted as 802.11ax. The main goal of the new standard is to improve 2,4GHz and 5GHz network performance, in scenarios with multiple overlapping and dense basic service sets (BSSs). In this paper we highlight two novel solutions proposed in the new standard, i.e. implementation of 1024-QAM in modulation and coding scheme (MCS) 11 and BSS color for avoiding interference in overlapping BSSs. For assessment of the level of throughput enhancement attained through implementation of MCS 11, we compare 802.11ax and 802.11ac network performance in indoor communication scenario, assuming multi-user environment. For examining BSS color efficiency, we compare throughput of three overlapping BSSs in an outdoor environment, in scenarios with BSS color enabled and disabled at network nodes. All results are obtained using ns-3 network simulator and they confirm the efficiency of the novel...

IPCOM000265472D | **Publication Date: 2021-04-13** |

## Apparatus and methods for OFDMA transmission in wireless




**Abstract:**
The first part proposes mechanisms that enable a downlink (DL) OFMDA transmission that different PPDU format can be combined in a single OFDMA transmission. For this purpose, a frame that protects the DL OFDMA transmission indicates (i) a change of the primary channel and (ii) bandwidth to be used for each scheduled STA. With this indication, even if more than one PPDUs that have different format are combined in different frequency channel, a scheduled STA can receive the PPDU destined to the STA on the indicated channel.The second part discloses mechanisms for indicating uplink buffer status in wireless communication systems. More specifically, during a downlink transmission sequence, a non-AP MLD transmits an acknowledgement frame indicating that the non-AP MLD has buffered data to transmit to a serving AP MLD, especially when the non-AP MLD does not support simultaneous transmission on one link and reception on another link.

9993761 | **Publication Date: 2022-12-19** |

## Performance Analysis and Energy Efficiency of MU- (OFDMA & MIMO) Based Hybrid MAC Protocol of IEEE 802.11ax WLANs




**Abstract:**
Future wireless networks are characterized by densely populated stations (STAs) with limited battery capacity. These networks demand high aggregate throughput, increased energy efficiency, and high Random Access (RA) capability, i.e., the system's ability to allow new STAs to join the network quickly. WiFi-6 (also known as IEEE 802.11 ax) is the new generation WLAN standard proposed to meet these diverse system requirements. In this paper, we analyze the effect of Multi-User Multi-Input Multi-Output (MU-MIMO) $\&$ MU-Orthogonal Frequency Division Multiple Access (MU-OFDMA)-based Hybrid Access (HA) mechanism of WiFi-6 systems. We propose a fixed Point model for analyzing this HA mechanism. By solving the system model, we investigate the impact on critical system metrics such as throughput, energy efficiency, Random Access capability, and delay due to a variation in (i) the number of resource units (RUs), (ii) the channel sounding interval, and (iii) the Target Wake-Up time interval. We...

7792393 | **Publication Date: 2016-12-20** |

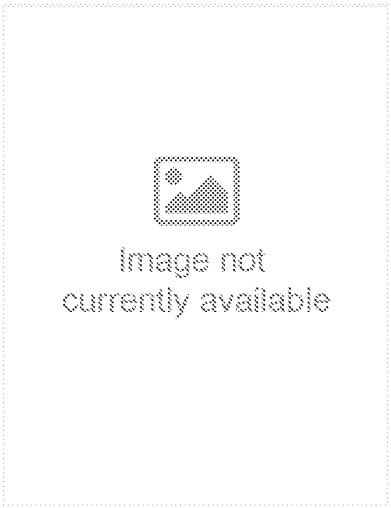
## IEEE 802.11ax: Challenges and Requirements for Future High Efficiency WiFi




**Abstract:**
The popularity of IEEE 802.11 based wireless local area networks (WLANs) has increased significantly in recent years because of their ability to provide increased mobility, flexibility, and ease of use, with reduced cost of installation and maintenance. This has resulted in massive WLAN deployment in geographically limited environments that encompass multiple overlapping basic service sets (OBSSs). In this article, we introduce IEEE 802.11ax, a new standard being developed by the IEEE 802.11 Working Group, which will enable efficient usage of spectrum along with an enhanced user experience. We expose advanced technological enhancements proposed to improve the efficiency within high density WLAN networks and explore the key challenges to the upcoming amendment.

8288165 | **Publication Date: 2017-09-01** |

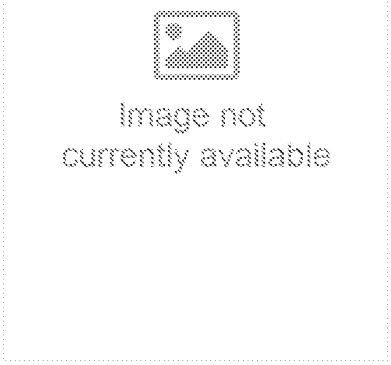
802.11ax: The Coming New WLAN System with More Than 4x MAC Throughput Enhancement




**Abstract:**
This paper introduces a new wireless LAN (WLAN) amendment to IEEE 802.11 WLAN specification. The new amendment is named High Efficiency WLAN (HEW), or IEEE 802.11ax. The new amendment is targeting dense WLAN deployments and deals with known WLAN issues including random channel access and the short packet length of most services. IEEE 802.11ax is intended to operate in the bands extending from 1 GHz to 6 GHz and increases the per-user throughput by 4 times compared to existing WLAN standards operating in the same band.

1210624 | **Publication Date: 2003-06-27** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Further Higher Data Rate Extension in the 2.4 GHz Band




**Abstract:**
Changes and additions to IEEE Std 802.11, 1999 Edition, as amended by IEEE Stds 802.11a-1999, 802.11b-1999, 802.11b-1999/Cor 1-2001, and 802.11d-2001, are provided to support the further higher data rate extension for operation in the 2.4 GHz band

772976 | **Publication Date: 1999-06-01** |

## GPRS-136: high-rate packet data service for North American TDMA digital cellular systems



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**Abstract:**
This article provides an overview of the flexible, high-performance packet data channel that has been designed for high-rate packet data services over IS-136 TDMA channels. To achieve the highest data rates in the limited 30 kHz channel bandwidth, the packet data channel is designed for adaptive modulation and, in addition to a fixed coding mode, permits operation using an incremental redundancy mode.

7968430 | **Publication Date: 2017-01-01** |

## Asymmetric Simultaneous Transmit and Receive in WiFi Networks

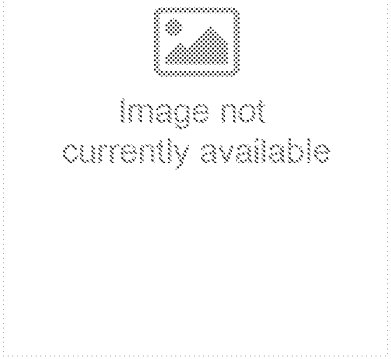


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**Abstract:**
Many researchers expect to see the efficiency of wireless local area networks (WLANs) increased by in-band simultaneous transmit and receive (STR). While insufficient suppression of self-interference has been a major obstacle to implementing the STR capability, an even bigger obstacle is the fact that enabling STR involves significant modification to the current IEEE 802.11 medium access control (MAC) protocol. In this paper, we propose MASTaR, a novel MAC protocol that enables STR in 802.11 WLAN using standard-compliant methods. The feasibility and performance of MASTaR are extensively evaluated via 3-D ray-tracing-based simulation. The simulation results demonstrate that significant performance enhancement, e.g., up to 2.58× higher throughput than the current 802.11 MAC protocol, can be achieved by an STR-capable access point.

8450365 | **Publication Date: 2018-06-01** |

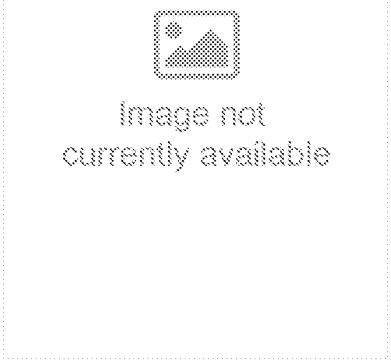
## Impact of hidden nodes on uplink transmission in IEEE 802.11ax heterogeneous network




**Abstract:**
The IEEE 802.11ax draft of high efficiency (HE) amendment to the ubiquitous 802.11 standard aims at increasing spectral and power efficiency of the network. However, the performance degradation due to hidden terminal problem had always been a concern especially in uplink transmission. Although the trigger based uplink transmission in IEEE 802.11ax is successful to some extent, the hidden node problem still persists in coexisting network. In particular, the uplink throughput is drastically reduced with the increase of packet arrival rate in presence of hidden node. To combat the hidden terminal problem, we propose to increase the carrier sensing threshold (CSTH) of STAs during association with HE access point (AP). Our analysis shows that this approach allows collision probability in uplink transmission to be reduced significantly.

8748231 | **Publication Date: 2019-06-26** |

## IEEE Draft Standard for Information Technology - Local and Metropolitan Area Networks - Specific Requirements - Part 22: Cognitive Radio Wireless Regional Area Networks (WRAN) Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the Bands that Allow Spectrum Sharing where the Communications Devices may Opportunistically Operate in the Spectrum of the Primary Service




**Abstract:**
This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks (WRANs) comprised of a professional fixed base station (BS) with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and potentially in the 1300 MHz to 1750 MHz, and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it.

8764091 | **Publication Date: 2019-07-12** |

IEEE Draft Standard for Information Technology - Local and Metropolitan Area Networks - Specific Requirements - Part 22: Cognitive Radio Wireless Regional Area Networks (WRAN) Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Policies and Procedures for Operation in the Bands that Allow Spectrum Sharing where the Communications Devices may Opportunistically Operate in the Spectrum of the Primary Service



Image not currently available

**Abstract:**
This standard specifies the air interface, including the cognitive medium access control layer (MAC) and physical layer (PHY), of point-to-multipoint wireless regional area networks (WRANs) comprised of a professional fixed base station (BS) with fixed and portable user terminals operating in the VHF/UHF TV broadcast bands between 54 MHz to 862 MHz, and potentially in the 1300 MHz to 1750 MHz, and 2700 MHz to 3700 MHz bands provided the regulatory regime allows it.

210813909 | **Publication Date: 2021-08-31** |

More WiFi for Everyone: Increasing Spectral Efficiency in WiFi6 Networks using OBSS/PD Mechanism



Image not currently available

**Abstract:**
This study aims to enhance spatial reuse by using the new features of IEEE 802.11ax WLANs. Since the wireless medium is a shared medium and there may be multiple basic service sets (BSS) in the same vicinity, BSSs may overlap, and interference occurs. In this situation, BSSs cannot transmit simultaneously due to the exposed node problem. The IEEE 802.11ax standard has a couple of mechanisms to resolve these spectral efficiency problems. One of the most effective mechanisms that address these problems is the overlapping BSS preamble detection (OBSS/PD) mechanism. OBSS/PD mechanism uses the color mechanism to distinguish OBSS signals. By using a signal threshold, the mechanism can ignore some of the signals, which cause interference. In this paper, we propose a rate-adaptive dynamic OBSS/PD threshold algorithm that tracks the changes in transmission rate and dynamically adjusts the threshold step by step considering the changes.
Comment: 6 figures

4289671 | **Publication Date: 2007-06-01** |

## Fast Handover Scheme for Real-Time Applications in Mobile WiMAX




**Abstract:**
Mobile WiMAX is one of the most promising technologies for broadband wireless communication. The IEEE 802.16e standard for Mobile WiMAX, the enhanced version of the IEEE 802.16 standard with mobility support, defines the implementation of hard handover is mandatory. However, the long interruption of hard handover is horrible for delay and packet loss sensitive real-time applications such as IPTV, VoIP, SatTV. To solve this problem without many changes to 802.16e equipments, we propose an enhanced link-layer QoS aware handover scheme - passport handover to accelerate handover process. We also propose a connection CID assignment strategy to avoid confliction of CIDs of handing over services with that of ongoing services in the target BS. Simulation results prove that the scheme makes real-time downlink data transmission interruption so brief that users will not perceive the interruption. And it also greatly reduces uplink data transmission delay and packet loss probability.

4014509 | **Publication Date: 2006-08-15** |

## ISO/IEC/IEEE 8802-11:2005/AMD4 [IEEE Std 802.11g-2003] Information technology-- Local and metropolitan area networks-- Part 11: Wireless LAN Medium Access Control (Mac) and Physical Layer (PHY) Specifications--Amendment 4: Further Higher Data Rate Extension in the 2.4 GHz Band




**Abstract:**
Changes and additions to IEEE Std 802.11, 1999 Edition, as amended by IEEE Stds 802.11a-1999, 802.11b-1999, 802.11b-1999/Cor 1-2001, and 802.11d-2001, are provided to support the further higher data rate extension for operation in the 2.4 GHz band.

1435520 | **Publication Date: 2005-06-01** |

## Two-step multipolling MAC protocol for wireless LANs




**Abstract:**
The IEEE 802.11 standard defines two coordination functions: distributed coordination function (DCF) and point coordination function (PCF). These coordination functions coordinate the shared wireless medium. The PCF uses a centralized polling-based channel access method to support time-bounded services. To design an efficient polling scheme, the point coordinator (PC) needs to obtain information about the current transmission status and channel condition for each station. To reduce overhead caused by polling frames, it is better to poll all stations using one polling frame containing the transmission schedule. In this paper, we propose an efficient polling scheme, referred to as two-step multipolling (TS-MP), for the PCF in wireless local area networks (WLANs). In this new scheme, we propose to use two multipolling frames with different purposes. The first frame is broadcast to collect information such as the numbers of pending frames and the physical-layer transmission rates for the...

9570110 | **Publication Date: 2021-10-08** |

## IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems--Local and Metropolitan Area Networks-Specific Requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 3: Wake-Up Radio Operation




**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the IEEE 802.11 medium access control (MAC) sublayer for wake-up radio operation. (The PDF of this standard is available at no cost to you complements of the IEEE GET program at https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68)

9930960 | **Publication Date: 2022-10-26** |

ISO/IEC/IEEE - International Standard - Telecommunications and information exchange between systems--Specific requirements for local and metropolitan area networks--Part 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications



Image not currently available

**Abstract:**
Technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANs) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions are specified in this revision. Amendments 1 to 5 published in 2016 and 2018 have also been incorporated into this revision.

5605400 | **Publication Date: 2010-10-14** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 7: Extensions to Direct-Link Setup (DLS)

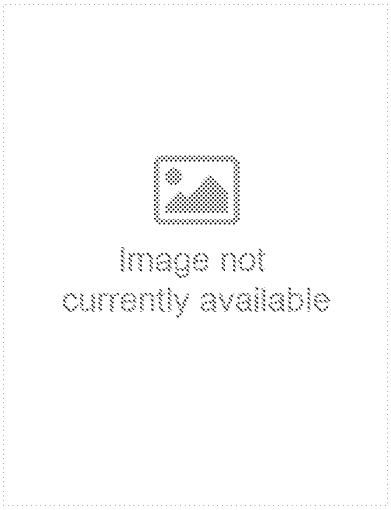


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**Abstract:**
This amendment provides direct-link setup enhancements to the IEEE 802.11 MAC and PHY, extending direct-link setup to be independent of the access point (AP), and adding power save capabilities. The direct-link setup is made independent of the AP by tunneling the protocol messages inside data frames.

7063199 | **Publication Date: 2015-03-16** |

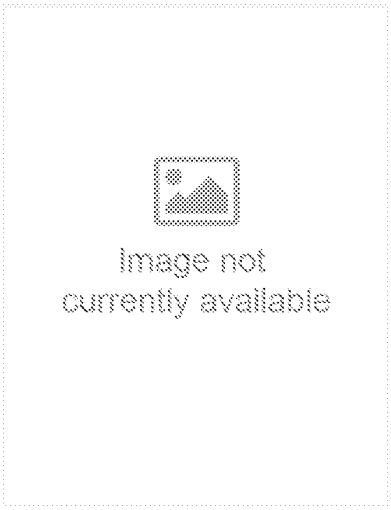
IEEE Standard for Air Interface for Broadband Wireless Access Systems--- Amendment 3: Multi-tier Networks




**Abstract:**
MAC/PHY protocol enhancements for cooperation among base stations in multi-tier networks to enhance interference mitigation, mobility management, and base station power management are specified in this amendment. Enhanced base stations shall support legacy mobile stations. PHY changes to any mobile stations are out of scope. In addition, these protocol enhancements include management messaging between base stations, and between base stations and mobile stations.

956123 | **Publication Date: 2001-10-01** |

Radio access selection for multistandard terminals




**Abstract:**
The race for higher data rates in wireless systems has produced a multiplicity of radio access methods to fulfill the quality of service needs for the next generation of mobile devices. This document presents an analysis of GERAN, UTRAN, WLAN, and Bluetooth as possible methods of accessing services via a wireless device. In light of the results, meaningful combinations for radio access methods of wireless devices are elaborated.

9090146 | **Publication Date: 2020-01-01** |

## Current Status and Directions of IEEE 802.11be, the Future Wi-Fi 7




**Abstract:**
While customers rivet their eyes on Wi-Fi 6, in the bowels of the IEEE 802.11 Working Group that creates Wi-Fi standards, the next generation Wi-Fi is being developed. At the very first sight, the new IEEE 802.11be amendment to the Wi-Fi standard is nothing but scaled 11ax with doubled bandwidth and the increased number of spatial streams, which together provide data rates as high as 40 Gbps. A bit deeper dive into the 802.11 activities reveals that 11be will support real-time applications. In reality, 11be introduces many more revolutionary changes to Wi-Fi, which will form a basement for further Wi-Fi evolution. Although by now (May 2020), the development process is at the very early phase without any draft specification, the analysis of the discussion in the 802.11 Working Group gives insights into the main innovations of 11be. In addition to the ones above, they include native multi-link operation, channel sounding optimization that opens the door for massive MIMO, advanced PHY and...

5491847 | **Publication Date: 2010-06-15** |

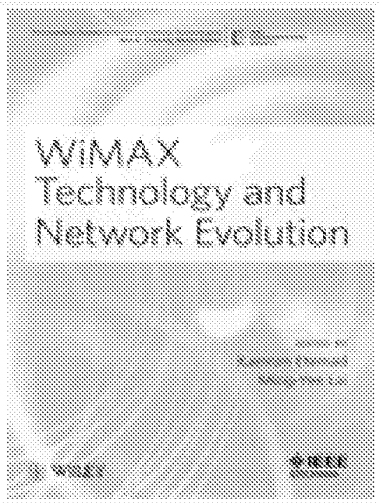
## IEEE Draft Standard for Information Technology-Telecommunications and information exchange between systems-Local and metropolitan networks-Specific requirements-Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 7: Interworking with External Networks




**Abstract:**
This amendment specifies enhancements to the 802.11 MAC that support WLAN interworking with External Networks. It enables higher layer functionalities to provide overall end-to-end solutions. The main goals of 802.1 lu are aiding network discovery and selection, enabling information transfer from external networks, enabling emergency services, and interfacing Subscription Service Provider Networks (SSPN) to 802.11 Networks that support Interworking with External Networks.

5732857 | **Publication Date: 2011-01-01** |

## Overview of Mobile WiMAX Air Interface in Release 1.0




**Abstract:**
This chapter contains sections titled: Introduction Overview of Mobile WiMAX PHY Layer (Release 1.0) Overview of Mobile WiMAX MAC Layer (Release 1.0) WiMAX Forum System and Certification Profiles in Release 1.0 Summary

5721908 | **Publication Date: 2011-02-25** |

## IEEE Standard for Information Technology-Telecommunications and information exchange between systems-Local and Metropolitan networks-specific requirements-Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 9: Interworking with External Networks

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**Abstract:**
This amendment specifies enhancements to the IEEE 802.11 medium access control (MAC) that support wireless local area network (WLAN) interworking with external networks. It enables higher layer functionalities to provide overall end-to-end solutions. The main goals of this amendment are aiding network discovery and selection, enabling information transfer from external networks, enabling emergency services, and interfacing subscription service provider networks (SSPNs) to IEEE 802.11 networks that support interworking with external networks.

6861932 | **Publication Date: 2014-04-10** |

IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment-Sub 1 GHz License-Exempt Operation



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**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

9708544 | **Publication Date: 2021-11-26** |

Performance Analysis of IEEE802.11ax (Wi-Fi 6) Technology using Multi-user MIMO and Up-Link OFDMA for Dense Environment

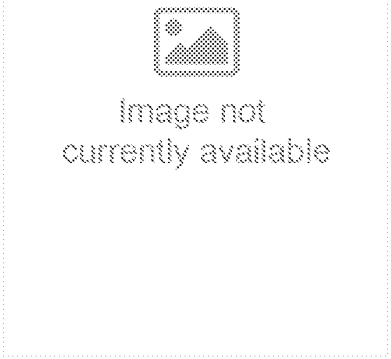


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**Abstract:**
Recently, there has been a concerted effort to upgrade the IEEE 802.11 Standard, also known as IEEE802.11ax Wi-Fi 6 technology. It was released due to its high-efficiency wireless local area network (WLAN) technologies for congested or crowded environments such as stadiums, public areas such as railway stations, theatres, and other similar venues. Wi-Fi 6 introduces new features as well as acronym. It is faster than expected, but not in the same sense that Wi-Fi has become a victim of its own popularity. Density refers to concentration, such as several users with wireless devices, and we are surrounded by access points all striving to service more data-hungry this has become our high density reality. The 802.11 families have been modified since 1997, with performance enhancements in three areas: modulation strategy, special streams, and channel bounding technique.Wi-Fi 6's popularity has risen dramatically as a result of its high data rate and OFDMA & MU-MIMO principles. It is...

9385748 | **Publication Date: 2021-03-16** |

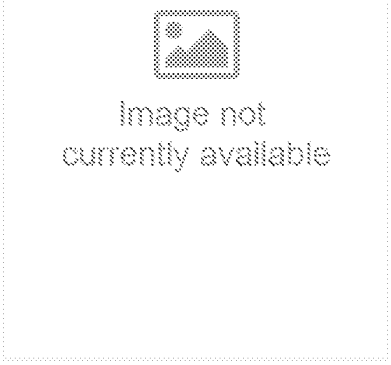
## An Empirical Analysis of IEEE 802.11 ax




**Abstract:**
An empirical analysis of the newly released standard IEEE 802.11ax, widely known as Wi-Fi 6, is presented in this paper. Several tests were conducted to evaluate key performance metrics, including throughput and jitter as a function of network parameters (e.g., packet size and window size), as well as environment variables (e.g., SNR). Empirical models were developed using collected results to quantify the behavior of said metrics. Channel utilization of the system was also investigated and compared to its precedent, 802.11ac.

4289469 | **Publication Date: 2007-06-01** |

## IEEE802.16e Best Effort Performance Investigation




**Abstract:**
IEEE 802.16 standard family enables the convergence of fixed and mobile broadband networks through a common wide area broadband access technology. With reference to the recent IEEE802.16e-2005 amendment, aimed at supporting user mobility, in this paper we propose a scheduling strategy aimed at providing a fair service to best effort users as well as a simple link adaptation strategy to dynamically adapt the physical level behavior to the channel reliability. Numerical results, obtained via simulation, showed the effectiveness of our proposals.

868157 | **Publication Date: 2000-09-01** |

## Packet mode in wireless networks: overview of transition to third generation




**Abstract:**
This article presents an overview of packet mode data transfer in cellular networks. Leading 2G+ cellular networks of GSM GPRS and IS-95B are introduced. The architecture and protocol layers in two leading third-generation cellular network proposals, cdma2000 and WCDMA, are presented. Mobile IP support in various cellular networks is discussed next. With efficient support of mobile IP in cellular networks, seamless integration of cellular networks with the Internet is expected to be reached at a rapid pace.

7794832 | **Publication Date: 2016-09-01** |

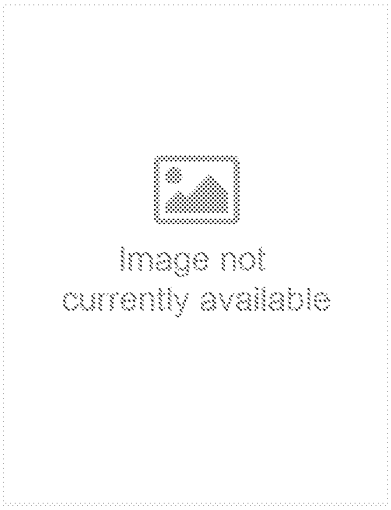
## Evaluation of the DSC algorithm and the BSS color scheme in dense cellular-like IEEE 802.11ax deployments




**Abstract:**
Coping with the extreme growth of the number of users is one of the main challenges for the future IEEE 802.11 networks. The high interference level, along with the conventional standardized carrier sensing approaches, will degrade the network performance. To tackle these challenges, the Dynamic Sensitivity Control (DSC) and the BSS Color scheme are considered in IEEE 802.11ax and IEEE 802.11ah, respectively. The main purpose of these schemes is to enhance the network throughput and improve the spectrum efficiency in dense networks. In this paper, we evaluate the DSC and the BSS Color scheme along with the PARTIAL-AID (PAID) feature introduced in IEEE 802.11ac, in terms of throughput and fairness. We also, exploit the performance when the aforementioned techniques are combined. The simulations show a significant gain in total throughput when these techniques are applied.

6654231 | **Publication Date: 2013-11-02** |

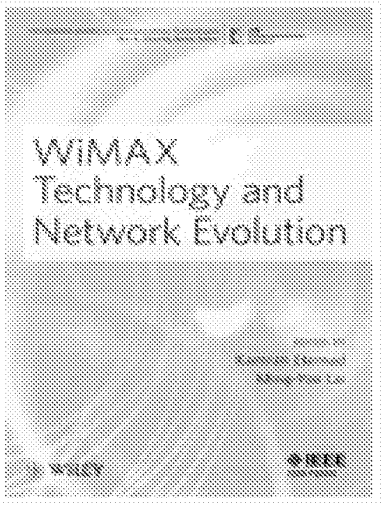
IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 forwireless local area networks (WLANS) as well as enhancements to the existing medium accesscontrol (MAC) and physical layer (PHY) functions. TBD: It also incorporates Amendments 1 and 2published in 2012.

5732785 | **Publication Date: 2011-01-01** |

WiMAX Technology and Network Evolution




**Abstract:**
Written and edited by experts who have developed WiMAX technology and standards WiMAX, the Worldwide Interoperability for Microwave Access, represents a paradigm shift in telecommunications technology. It offers the promise of cheaper, smaller, and simpler technology compared to existing broadband options such as DSL, cable, fiber, and 3G wireless. WiMAX Technology and Network Evolution is the first publication to present an accurate, complete, and objective description of mobile WiMAX technology. Each chapter was written and edited by experts, all of whom have been directly engaged in and lead the development of WiMAX either through the IEEE 802.16 Working Group or the WiMAX Forum. As a result, the book addresses not only key technical concepts and design principles, but also a wide range of practical issues concerning this new wireless technology, including: Detailed description of WiMAX technology features and capabilities from both radio and network perspectives WiMAX technology...

1599017 | **Publication Date: 2006-01-01** |

## Collision detection based on transmission time information in IEEE 802.11 wireless LAN




**Abstract:**
The standard exponential backoff mechanism and many proposed schemes for 802.11 wireless LAN behave adaptively to transmission failures, which occur by two causes: collision and channel noise. However, in 802.11 wireless LAN, a station cannot know the cause of a transmission failure, thus the adaptive schemes assume the ideal situation in which all transmission failures occur by one cause. Therefore, they may behave erroneously in the real world where transmission failures occur by both causes. In this paper, we propose a novel scheme to detect collision, which can help 802.11 and many adaptive schemes to differentiate the causes of transmission failures. In the proposed scheme, stations exchange transmission time information when transmission failures occur. The proposed scheme can detect collision accurately with low bandwidth overhead and it can be implemented without modifying the physical layer of existing wireless LAN devices. In addition, we model the bandwidth overhead of the...

9502046 | **Publication Date: 2021-07-28** |

## IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks--Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 2: Enhanced Throughput for Operation in License-exempt Bands above 45 GHz




**Abstract:**
In this amendment to IEEE Std 802.11-2020, standardized modifications to both the IEEE 802.11 physical layer (PHY) and the IEEE 802.11 medium access control (MAC) sublayer are defined to enable at least one mode of operation capable of supporting a maximum throughput of at least 20 gigabits per second (measured at the MAC data service access point), while maintaining or improving the power efficiency per station.

4799054 | **Publication Date: 2009-03-01** |

## Contention-polling duality coordination function for IEEE 802.11 WLAN family




**Abstract:**
The contention-based DCF suffers from collision seriously under heavy load conditions. In this paper, a novel medium access control protocol called contention-polling duality coordination function (CPDCF) is proposed to enhance the DCF-based MAC protocol. A polling ACK mechanism is introduced to admit the designated station to transmit without performing any contention process. By eliminating collisions and preventing waste from idle backoff slots, the system capacity is increased effectively. A mathematical model is developed to analyze the saturation throughput of the CPDCF with various CP combinations. The performance in terms of fairness is studied as well. The model accuracy is verified via extensive simulations. Numerical results show that the well-managed CPDCF can achieve a significantly higher system capacity than the legacy DCF does. The CPDCF is also employed to enhance the performance of IEEE 802.11e EDCA. We conclude that the proposed CPDCF is quite feasible, effective,...

6327306 | **Publication Date: 2012-10-08** |

## IEEE Standard for Air Interface for Broadband Wireless Access Systems--Amendment 1: Enhancements to Support Machine-to-Machine Applications




**Abstract:**
Enhancements to the WirelessMAN-OFDMA Air Interface, an air interface designated as "IMT-2000" by the International Telecommunication Union-Radiocommunication Sector (ITU-R), are specified by this amendment. The enhancements provide improved support for machine-to-machine applications. Keywords: amendment, broadband wireless access (BWA), IEEE 802.16, IEEE 802.16p, IMT-2000 radio interface, machine to machine (M2M), mobile broadband, orthogonal frequency-division multiple access (OFDMA), WirelessMAN-OFDMA Air Interface, wireless metropolitan area networks

6587723 | **Publication Date: 2012-03-29** |

IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Redline



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.

10205961 | **Publication Date: 2023-08-02** |

IEEE Standard for Multi-Gigabit per Second Optical Wireless Communications (OWC), with Ranges up to 200 m, for Both Stationary and Mobile Devices



Image not currently available

**Abstract:**
The protocol and compatible network equipment for optical wireless communications and its operation as an optical wireless personal area network (OWPAN), supporting data rates of multiple Gbit/s for wireless specialty applications, are defined in this standard. A medium access control (MAC) sublayer, supporting scheduled and polled medium access, as well as two physical layers (PHYs), enabling low complexity, low power, and high throughput are included.

10001702 | **Publication Date: 2022-12-04** |

## Scheduled Time-Sensitive Transmission Opportunities over Wi-Fi




**Abstract:**
Time-sensitive applications, such as industrial automation and extended reality (XR), require packets to be delivered within tight latency bounds and with high reliability. Meeting those requirements over Wi-Fi links is challenging even considering the efficient scheduling techniques provided by the latest Wi-Fi generations (e.g., based on IEEE 802.11ax). In this paper we introduce the concept of Scheduled Transmission Opportunities (S-TXOP) where the network controller exploits the deterministic traffic pattern associated with most time-sensitive applications to minimize the control overhead and provide scheduled channel access that can meet very low latency cycles. Our results show that the S-TXOP meets those challenges with higher robustness and efficiency compared to existing scheduling techniques in 802.11

778033 | **Publication Date: 1999-01-01** |

## Medium access control and radio resource management for packet data services over IS-136 channels




**Abstract:**
This paper provides an overview of the flexible, high performance packet data channel (PDCH) that has been designed for high rate packet data services over IS-136 TDMA channel. To achieve the highest data rates in the limited 30 kHz channel bandwidth, the packet data channel is designed for adaptive modulation and in addition to a fixed coding mode, permits operation using an incremental redundancy mode.

6482572 | **Publication Date: 2012-11-21** |

ISO/IEC/IEEE International Standard - Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Redline



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 to 10 published in 2008 to 2011.

1007415 | **Publication Date: 2002-06-01** |

IEEE standard 802.16: a technical overview of the WirelessMAN/sup TM/ air interface for broadband wireless access



Image not currently available

**Abstract:**
The broadband wireless access industry, which provides high-rate network connections to stationary sites, has matured to the point at which it now has a standard for second-generation wireless metropolitan area networks. The IEEE standard 802.16, with its WirelessMAN/sup TM/ air interface, sets the stage for widespread and effective deployments worldwide. This article overviews the technical medium access control and physical layer features of this new standard.

10006751 | **Publication Date: 2023-01-04** |

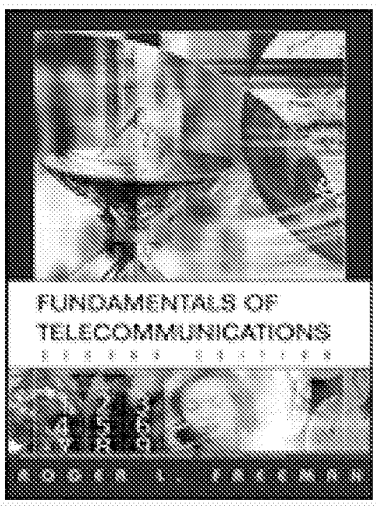
## Performance Evaluation of 802.11ax OFDMA Through Theoretical Analysis and Simulations

Image not currently available

**Abstract:**
With the introduction of Orthogonal Frequency Division Multiple Access (OFDMA) in 802.11ax, the role of the Access Point (AP) in Wi-Fi networks changes significantly, thanks to the opportunity of implementing more complex scheduling logic to handle Downlink (DL) traffic flows and simultaneously act as coordinator of Multi User (MU) Uplink (UL) transmissions. In this context, it becomes necessary to develop reliable network analysis and simulation tools that allow for an in-depth investigation of the trade-offs involved in the usage of OFDMA, especially considering that the standard leaves much of the actual scheduling algorithmic details to vendor-specific implementation. In this work we present a series of results highlighting how several network settings have an impact on throughput and Head-of-Line Delay, in a network that employs multiple 802.11ax features such as OFDMA and the MU Enhanced Distributed Channel Access (EDCA) Parameter Set, while also containing legacy devices. The...

5238189 | **Publication Date: 2005-01-01** |

## Metropolitan Area Networks




**Abstract:**
This chapter contains sections titled: Definition of a Metropolitan Area Network Design Approaches Fiber-Optic Ring Network IEEE 802.11 System IEEE 802.15 Standard IEEE 802.16 Standard Review Exercises References

1541572 | **Publication Date: 2005-11-11** |

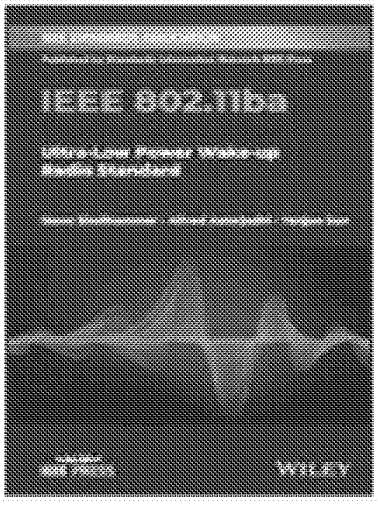
## IEEE Standard for Information technology--Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 8: Medium Access Control (MAC) Quality of Service Enhancements

Image not currently available

**Abstract:**
This amendment defines the medium access control (MAC) procedures to support local area network (LAN) applications with quality of service (QoS) requirements. The procedures include the transport of voice, audio, and video over IEEE 802.11 wireless LANs (WLANs)

10017283 | **Publication Date: 2023-01-01** |

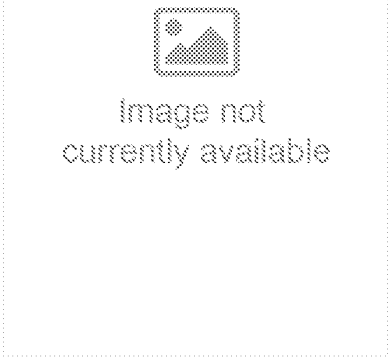
## IEEE 802.11ba: Ultra-Low Power Wake-up Radio Standard




**Abstract:**
IEEE 802.11ba Discover the latest developments in IEEE 802.11ba and Wake-up Radios In IEEE 802.11ba: Ultra-Low Power Wake-up Radio Standard, expert engineers Drs. Steve Shellhammer, Alfred Asterjadhi, and Yanjun Sun deliver a detailed discussion of the IEEE 802.11ba standard. The book begins by explaining the concept of a wake-up radio (WUR) and how it fits into the overall 802.11 standard, as well as how a WUR saves power and extends battery life. The authors go on to describe the medium access control (MAC) layer in detail and then talk about the various protocols used to negotiate WUR operation, its uses for different functionalities (like wake up of the main radio, discovery, synchronization, and security). The book offers a detailed description of the physical (PHY) layer packet construction and the rationale for the design, as well as the various design aspects of the medium access control layer. It also includes: A thorough introduction to the motivations driving the development...

6768213 | **Publication Date: 2006-04-01** |

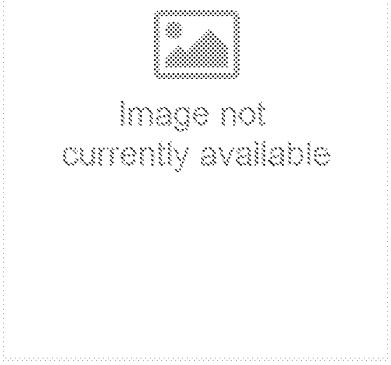
System aspects and handover management for IEEE 802.16e




**Abstract:**
The IEEE 802.16 family of standards that are currently being developed target wide area, cellular, high data rate transmission for non-line-of-sight terminals. The initial phase of the standard (802.16d) supports fixed terminal locations and the subsequent phase of the standard (802.16e) provides support for mobile terminals. The standards specify physical layer (PHY) and media access control (MAC) layer functionalities with several flexible options for frequency reuse and handover. We describe various system architectures for handling handovers in an 802.16e system based on the capabilities of the current draft standard (802.16e D8). The system architecture description combines the functionalities provided in the standard at the PHY and MAC layers with network layer signaling to provide a complete solution. Specifically, we propose hard handover with MAC context reset for a low mobility scenario and a layered migration procedure using fast base station switching (FBSS) with MAC...

9194746 | **Publication Date: 2020-01-01** |

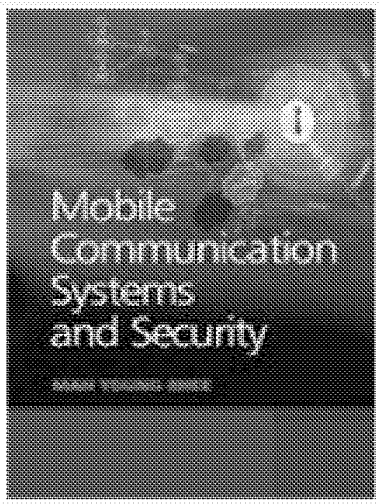
Rate Control With Spatial Reuse for Wi-Fi 6 Dense Deployments




**Abstract:**
To improve the performance of Wi-Fi networks in dense deployments, the recent IEEE 802.11ax standard introduces a palette of features improving spatial reuse. A key property of these features is dynamic changes in transmit power and the interference from the neighboring devices. The paper explains the basic operation of spatial reuse features and shows that their efficiency significantly depends on how the stations select appropriate modulation and coding schemes taking into account the variable transmission conditions. Nevertheless, the majority of existing studies in the literature leave this effect out of consideration, assuming an ideal rate control algorithm and obtaining wrong results. The paper fills this gap and presents a novel statistics-based rate control algorithm that selects modulation and coding schemes taking into account the effects induced by the recent spatial reuse features. With extensive simulation, it is shown that the algorithm significantly outperforms the...

5628363 | **Publication Date: 2010-01-01** |

Index




**Abstract:**
No abstract.

7051196 | **Publication Date: 2015-02-27** |

IEEE Draft Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation

Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

7294607 | **Publication Date: 2015-01-01** |

IEEE Standard for Information technology--Telecommunications and information exchange between systems - Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 2: Sub 1 GHz License Exempt Operation



Image not currently available

**Abstract:**
Modifications to both the IEEE 802.11(TM) physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt IEEE 802.11 wireless networks in frequency bands below 1 GHz, excluding the television (TV) White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s are defined in this amendment.

5158669 | **Publication Date: 2009-05-01** |

An overview of mobility management over IEEE802.16e



Image not currently available

**Abstract:**
Providing diverse broadband services economically every time, even to mobile subscribers will be a major challenge for the telecommunication community. IEEE 802.16 networks are going to provide broadband wireless access as a fixed wireless broadband solution. However, the IEEE 802.16e as an amendment to 802.16d which expands the standard to allow mobile subscriber station. As handover is an important aspect of mobile wireless communications, we have studied and analyzed concepts, functionalities and keys aspects to provide mobility over IEEE802.16e. This paper looks particularly at the advanced features introduced by the IEEE802.16e standard for mobility in WiMax systems in order to prove that the enhanced IEEE 802.16e system has the capability to fulfill the requirements regarding the mobility management of future telecommunication systems.

1612504 | **Publication Date: 2005-01-01** |

## Building industrial communication systems based on IEEE 802.11g wireless technology




**Abstract:**
Industrial communication systems (ICS) are specifically designed for deterministic communication between sensors, actuators, programmable logic controllers, monitoring systems, and operator workstations. These networks are traditionally based on wired technology and a deterministic medium access control. Nowadays, the emerging trend is the availability of wireless technology for ICS, since this leads to more flexible and mobile equipments at reduced cost. This article presents a performance analysis of wireless ICS based on the IEEE 802.11g standardized technology, considering the infrastructure mode with both distributed and point coordination functions. The time-critical messages are handled during the contention free period. The performance analysis allows to validate the ability of 802.11g technology to support time-critical traffic required by wireless ICS, being given the scheduling and characteristics of the messages. In addition, the configuration parameters of access points...

1195640 | **Publication Date: 2003-04-01** |

## Standard for Amendment to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz




**Abstract:**
Supeseded by IEEE Std 802.16-2004 (Amendment to IEEE Std 802.16-2001)
Abstract: This document amends IEEE Std 802.16-2001 by enhancing the medium access control layer and providing additional physical layer specifications in support of broadband wireless access at frequencies from 2-11 GHz. The resulting standard specifies the air interface of fixed (stationary) broadband wireless access systems providing multiple services. The medium access control layer is capable of supporting multiple physical layer specifications optimized for the frequency bands of application. The standard includes particular physical layer specifications applicable to systems operating between 2 and 66 GHz. It supports point-to-multipoint and optional mesh topologies.

7051191 | **Publication Date: 2015-02-27** |

IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. TBD: It also incorporates Amendments 1 and 2 published in 2012.

4392185 | **Publication Date: 2007-10-01** |

iDLS: Inter-BSS direct link setup in IEEE 802.11 WLANs



Image not currently available

**Abstract:**
Existing 802.11 direct link setup (DLS) protocol specifies procedures for direct communication between a pair of stations within the same basic service set (BSS). This eliminates the unnecessary triangular traffic route through an access point and increases the overall effective throughput within the BSS. In this paper, an inter-BSS direct link setup (iDLS) protocol is proposed to facilitate direct link set up across BSS with the aim of increasing the overall throughput of a set of BSS. A preliminary version of the proposed iDLS protocol is implemented on commercial Atheros chipset based WLAN cards using the MADWiFi open source Linux driver. Our indoor measurement showed that, with pre-calibration on the neighbor sensing range parameter, the average throughput performance of using iDLS can be 24 times that of the conventional infrastructure mode without iDLS.

4109889 | **Publication Date: 2006-09-01** |

## The WINNER B3G System MAC Concept




**Abstract:**
The European IST research projects WINNER and WINNER II aim at developing a single new ubiquitous radio access system concept that can be adapted for use in a wide variety of mobile communication scenarios, from wide area coverage to hot spots. This cellular packet data system uses a multicarrier-based air interface. Its medium access control (MAC) system layer is designed for either FDD or TDD cellular transmission. It supports adaptive transmission by tight interaction with the physical layer, and provides efficient resource allocation and scheduling within relay-enhanced cells. It also supports separate allocation of antenna resources per packet flow and furthermore provides support for spectrum sharing and flexible spectrum use. The paper outlines the resource allocation within a super-frame and the use of either opportunistic scheduling or diversity-based transmission within frames.

9070717 | **Publication Date: 2020-02-01** |

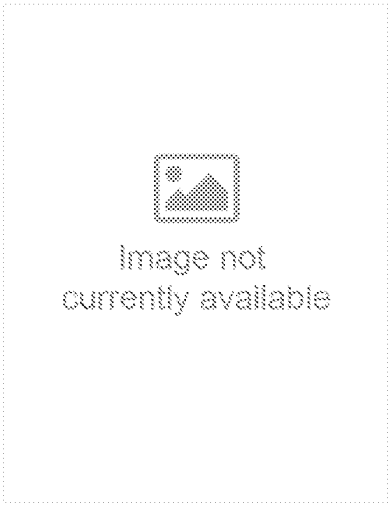
## Evaluating spatial reuse in 802.11ax networks with interference threshold adjustment




**Abstract:**
The sixth generation of Wi-Fi standards, denoted as IEEE 802.11ax, is gathering research interest as the first Wi-Fi standard to address the Quality of Experience (QoE) in dense environments. Members of the Task Group AX have proposed several solutions for improving spectrum efficiency in high density scenarios. In this paper we analyze efficiency of Basic Service Set (BSS) color, one of those solutions proposed for spatial reuse and improvement of area throughput. Using ns-3 network simulator, we model a hotspot scenario consisting of 7 overlapping basic service sets, implementing BSS color to identify the source of detected transmission. Nodes in each BSS use two Carrier Sense Thresholds (CSTs) for sensing the channel, where the higher threshold value is being applied for detection of inter-BSS frames. We show that, by selecting higher threshold for detecting frames from other access points (foreign frames), spectrum efficiency can be improved and area throughput can be increased....

7464739 | **Publication Date: 2016-01-01** |

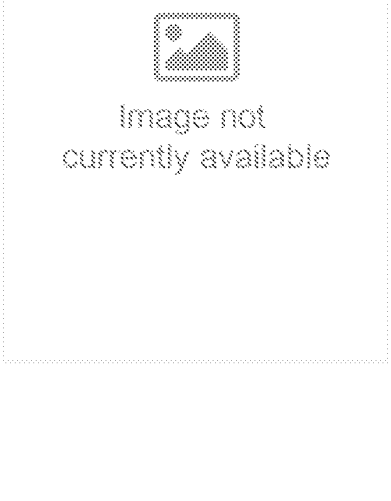
## IEEE Draft Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation




**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

8417828 | **Publication Date: 2018-06-01** |

## FFR Based Interference Coordination Scheme in the Next Generation WLAN




**Abstract:**
OBSS (overlapping basic service set) interference management is a major issue for designing the next generation WLAN with the dense deployment. DSC (dynamic sensitivity control) was proposed to increase the multiple concurrent transmissions to increase throughput, but it would introduce more hidden terminal problems. In this paper, we explore FFR (fractional frequency reuse) to coordinate interference between neighboring BSSs (basic service set). We study how to apply FFR in the existing WLAN system, and present the user identification approach and sub-channel allocation method. Afterwards, based on NS3 simulator platform, we conducted extensive simulations to evaluate the performance of FFR-based interference coordination scheme in WLAN with dense deployment. Our simulation results show that our proposed interference coordination scheme not only can effectively improve system throughput, but also provides fairness for each user.

9144691 | **Publication Date: 2020-07-20** |

## IEEE Standard for Low-Rate Wireless Networks




**Abstract:**
The physical layer (PHY) and medium access control (MAC) sublayer specifications for low-data-rate wireless connectivity with fixed, portable, and moving devices with no battery or very limited battery consumption requirements are defined in this standard. In addition, the standard provides modes that allow for precision ranging. PHYs are defined for devices operating in a variety of geographic regions.

620533 | **Publication Date: 1997-09-01** |

## IEEE 802.11 Wireless Local Area Networks




**Abstract:**
The draft IEEE 802.11 wireless local area network (WLAN) specification is approaching completion. In this article, the IEEE 802.11 protocol is explained, with particular emphasis on the medium access control sublayer. Performance results are provided for packetized data and a combination of packetized data and voice over the WLAN. Our performance investigation reveals that an IEEE 802.11 network may be able to carry traffic with time-bounded requirements using the point coordination function. However, our findings suggest that packetized voice traffic must be handled in conjunction with an echo canceler.

5337260 | **Publication Date: 2009-09-01** |

## Handover Optimization for Video Applications in WiMAX




**Abstract:**
Video broadcast applications have received significant interests from the Mobile WiMAX standard in terms of capabilities and means of delivery multimedia services, by providing high bandwidth over long-range transmission. However, one of the main problems of IEEE 802.16 is that it covers multi BS with too many profiled layers, which can lead to potential interoperability problems. The multi BS mode requires multiple BSs to be scanned synchronously before initiating the transmission of broadcast data. In this paper, we first identify the key issues for video application over WiMAX. Then we present a MAC Layer solution to guarantee the demanded bandwidth and supporting a higher possible throughput between two WiMAX end points during the handover. Moreover, we propose a PHY and MAC layers scheme to maintain the required communication channel quality for video streams during handover. Results show that our proposed schemes can significantly improve the network throughput up to 64%,...

1424728 | **Publication Date: 2005-01-01** |

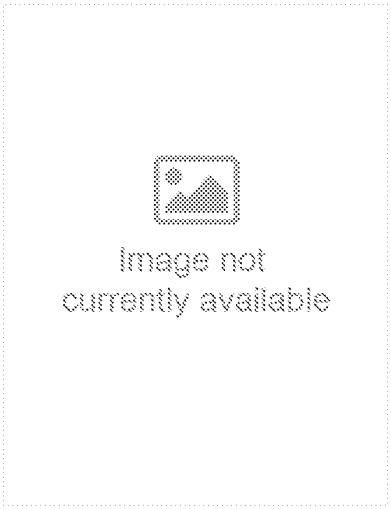
## Mobility support for IEEE 802.1.6d wireless networks




**Abstract:**
We study in this paper whether mobility can be supported by the 802.16d network without any change in the specification. Mobility capability involves two main issues: connection handoff and correct reception for moving terminals. We find that seamless connection handoff can be achieved within the 802.16d standard by: 1) applying some of the existing functionalities defined for the terminal initialization process; 2) devising a set of protocols for message exchanges for handoff; and 3) forwarding some of the operational parameters from the current base station to a new one via the backhaul network, instead of over the radio link. As for reception at moving terminals, our analysis of bit error rate for the OFDMA mode shows that, under typical radio conditions, the link can provide satisfactory error performance for terminal speed up to tens of kph. As a result, we show that the current 802.16d standard with our proposed technique can support user mobility.

9356503 | **Publication Date: 2021-01-19** |

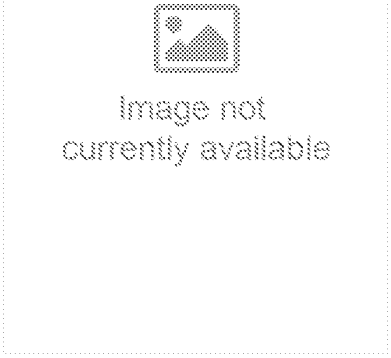
## IEEE Standard for Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications - Redline




**Abstract:**
Physical (PHY) and media access control (MAC) layers of a broadband powerline communication technology for local area networks (LANs), Smart Energy, Smart Grid, Internet of Things, transportation platforms (vehicle) applications, and other data distribution are defined in this standard. The balanced and efficient use of the power line communications channel by all classes of BPL devices is the main focus of this standard, defining detailed mechanisms for coexistence and interoperability between different BPL devices, and ensuring that desired bandwidth and quality of service may be delivered. The necessary security questions are addressed to ensure the privacy of communications between users and to allow the use of BPL for security sensitive services.

5385162 | **Publication Date: 2010-01-01** |

## Draft Standard for Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications




**Abstract:**
Defined is a standard for high speed communication devices via electric power lines, so called Broadband over Power Line (BPL) devices. The standard uses transmission frequencies below 100 MHz. This standard is usable by all classes of BPL devices, including BPL devices used for the first-mile/last-mile connection to broadband services as well as BPL devices used in buildings for LANs, Smart Energy applications, transportation platforms (vehicle) applications, and other data distribution. This standard focuses on the balanced and efficient use of the power line communications channel by all classes of BPL devices, defining detailed mechanisms for coexistence and interoperability between different BPL devices, and ensuring that desired bandwidth and quality of service may be delivered. The standard addresses the necessary security questions to ensure the privacy of communications between users and allow the use of BPL for security sensitive services.

180407717 | **Publication Date: 2018-04-20** |

## Target Wake Time: Scheduled access in IEEE 802.11ax WLANs




**Abstract:**
The increasing interest for ubiquitous networking, and the tremendous popularity gained by IEEE 802.11 Wireless Local Area Networks (WLANs) in recent years, is leading to very dense deployments where high levels of channel contention may prevent to meet the increasing users' demands. To mitigate the negative effects of channel contention, the Target Wake Time (TWT) mechanism included in the IEEE 802.11ax amendment can have a significant role, as it provides an extremely simple but effective mechanism to schedule transmissions in time. Moreover, in addition to reduce the contention between stations, the use of TWT may also contribute to take full advantage of other novel mechanisms in the IEEE 802.11 universe, such as multiuser transmissions, multi-AP cooperation, spatial reuse and coexistence in high-density WLAN scenarios. Overall, we believe TWT may be a first step towards a practical collision-free and deterministic access in future WLANs.

8360794 | **Publication Date: 2018-05-15** |

## ISO/IEC/IEEE - International Standard - Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications




**Abstract:**
Technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANs) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions are specified in this revision. Amendments 1 to 5 published in 2012 and 2013 have also been incorporated into this revision.

8360264 | **Publication Date: 2018-04-01** |

## High efficiency IEEE 802.11ax MU-MIMO and frame aggregation analysis

Image not currently available

**Abstract:**
High Efficiency Wireless Local Area Network IEEE 802.11ax was introduced as an amendment for the IEEE 802.11 standard following a long series of enhancements. Unlike its predecessor, it aims to improve the performance based on the efficiency instead of the throughput. Due to the newness of the standard, many aspects are still unexplored. In our paper, we shed light on the new concepts introduced in this amendment along with older one which have been enhanced to better suit higher efficiency. Most importantly, we examine the MU-MIMO and frame aggregation scenarios, which remain an open challenge. We then proceed to analyze the performance of this amendment under various parameters in order to cover several cases.

1378902 | **Publication Date: 2004-01-01** |

## Link-adaptable polling-based MAC protocol for wireless LANs

Image not currently available

**Abstract:**
The IEEE 802.11 standard defines a centralized polling-based channel access method, the point coordination function (PCF), to support time-bounded services. In this paper, we propose an efficient polling scheme, referred to as two-step multipolling (TS-MP), for the PCF in WLANs. In this new scheme, we propose to use two multi-polling frames for different purposes. The first frame is broadcasted to collect information such as the numbers of pending frames and the physical layer transmission rates for the communication links among all stations. The second frame is broadcasted with a polling sequence for data transmissions designed by utilizing the collected information. Extensive simulation studies show that TS-MP not only overcomes PCFs deficiencies, but also helps to implement rate adaptation over a time-varying wireless channel.

7489085 | **Publication Date: 2015-12-01** |

## Recent trends in next generation sub1GHz wireless local area network for Internet of Things




**Abstract:**
The next generation sub1GHz Wireless local area network (WLAN) IEEE802.11ah is being standardized to operate around 1GHz ISM band. It is currently much less congested and enable the WLAN devices to access the network to send burst data. It penetrates easily the obstacles and is less affected by frequency fading and thus offers a long range. It offers simple architecture, high energy efficiency, long life of sensor nodes, improvement in range capability with better data rates in comparison with present IEEE802.15.x WPAN (ZigBee, Bluetooth) which works at 2.4GHz for short ranges and due to high power consumption in Bluetooth sensor nodes life is very short. The ZigBee provides data rates up to 250kbps. The 802.11 ah based on Wi-Fi sensor nodes combines the sensors and communication applications together to obtain high data rates from 100kbps to several Mbps. In Internet of Things (IoT) the smart objects are coverted from physical to virtual world to connect with Internet. The Internet of...

6217919 | **Publication Date: 2011-11-01** |

## Packet scheduling and bandwidth allocation based on channel quality in WiMax




**Abstract:**
Although several studies were conducted on adaptive bandwidth allocation designs for bandwidth requests, previous research on both packet scheduling and bandwidth allocation based on channel quality are relatively limited. This study proposes a two-stage mechanism, called PSBA, to process the operations of packet scheduling and bandwidth allocation based on channel quality information. The service flow simulations in the IEEE 802.16e system indicate that PSBA achieved a lower delay time and a higher throughput among multiple users. For the purpose of performance evaluation, a Markov chain with bulk service was built to analyze the WiMax PMP network based on channel quality. The experimental results revealed that the throughput of PSBA is 21 % higher than that of the IEEE 802.16e standard model by using the bandwidth request message (BW-REQ).

9244111 | **Publication Date: 2020-01-01** |

## Parallel PPDU Transmission Mechanism for Wideband Wireless LANs




**Abstract:**
When the preambles of a wideband 802.11n/ac frame transmission are affected by a collision with a 20MHz frame on one of the subchannels, a receiver might fail to decode the whole wideband frame. Experimental evaluations with off-the-shelf 802.11n hardware showed that the vulnerability of wideband frame transmission to a narrowband collision/interference is a real problem. To mitigate the severe impact of narrowband collision/interference on wideband transmission, we propose to transmit several 20MHz frames in parallel instead of a single wideband frame so that a narrowband collision on one of the subchannels affects only the parallel frame transmitted on that subchannel. Performance evaluations demonstrated that the proposed parallel frame transmission scheme significantly improves the throughput and delay performance of wideband transmissions under different traffic and channel conditions. While the throughput performance of the proposed scheme for saturated traffic conditions was...

6463374 | **Publication Date: 2013-02-15** |

## PHY/MAC Enhancements and QoS Mechanisms for Very High Throughput WLANs: A Survey




**Abstract:**
Wireless local area networking has experienced tremendous growth in the last years with the proliferation of IEEE 802.11 devices in order to improve wireless technology. The first generation of high throughput networks known as IEEE 802.11n was developed in 2009 to reach 130 Mbps. Furthermore, to enhance the throughput, two new amendments for IEEE 802.11 are under developments which are IEEE 802.11ad and IEEE 802.11ac. The first one aims to reach 1Gbps with supporting multi-user access techniques. The second amendment aims to enable up to 7Gbp with the possibility of transmitting in the 60GHz band that provides the opportunity for much wider band channels. Another WLAN is already finalized called IEEE 802.11aa in the goal to provide a reliable multicast transport for video streaming. In this survey, we examine the dif-ferent PHY and MAC enhancements introduced by all these WLAN specifications. Particularly, we focus on the characteristics of each amendment as well as the main MAC...

1700009 | **Publication Date: 2006-09-07** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (WPANs)




**Abstract:**
IEEE Std 802.15.4-2003 defined the protocol and compatible interconnection for data communication devices using low-data-rate, low-power, and low-complexity short-range radio frequency (RF) transmissions in a wireless personal area network (WPAN). This revision extends the market applicability of IEEE Std 802.15.4, removes ambiguities in the standard, and makes improvements revealed by implementations of IEEE Std 802.15.4-2003. An Interpretation is available at http://standards.ieee.org/findstds/interps/802.15.4-2006.html

7558107 | **Publication Date: 2016-01-01** |

IEEE Draft Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation




**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

10058126 | **Publication Date: 2023-03-01** |

IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Enhancements for Extremely High Throughput (EHT)



Image not currently available

**Abstract:**

4489709 | **Publication Date: 2008-01-01** |

IEEE Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems Multihop Relay Specification



Image not currently available

**Abstract:**
This document specifies OFDMA physical layer and medium access control layer enhancements to IEEE Std 802.16 for licensed bands to enable the operation of relay stations. Subscriber station specifications are not changed.

7412659 | **Publication Date: 2016-01-01** |

IEEE Draft Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

7445803 | **Publication Date: 2016-01-01** |

IEEE Draft Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

6074906 | **Publication Date: 2011-11-09** |

IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1, 2, 3, 4, 5, 7, 8, 9, and 10

4573292 | **Publication Date: 2008-07-15** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 2: Fast Basic Service Set (BSS) Transition

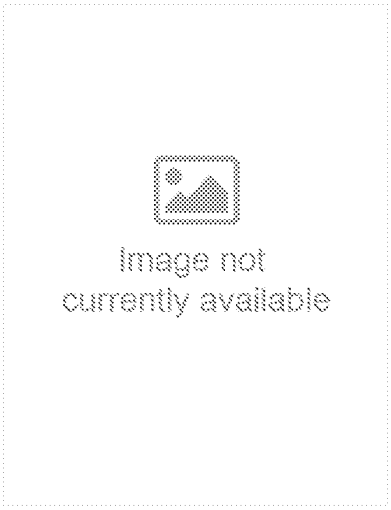


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**Abstract:**
This amendment specifies the extensions to IEEE Std 802.11-2007 for wireless local area networks (WLANs) providing mechanisms for fast basic service set (BSS) transition.

8496496 | **Publication Date: 2013-02-01** |

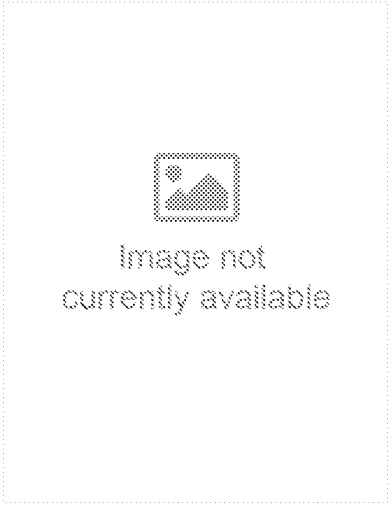
## Traffic based Duo-triggered handoff algorithm for enhanced buffer management and QoS in Wimax 16m networks




**Abstract:**
IEEE 802.16m standard redefined with many improvements on IEEE 802.16e standard to provide the best connectivity and to perform the error-free data transmission. In this paper, an improved Traffic based Duo triggered handoff algorithm for the buffer management is proposed to enhance the quality of service features in the air interface standard of IEEE 802.16 m. The standard aims to reduce overhead, improved coverage through optimized parameterization and excessive security measures. These parameters define the set of services that are provided for protection and they are agreed upon at the time of security association establishment. It includes the request and response of both the MS and the BS in order to measure the parametric values and the respective threshold values to find the optimum for handoff operations. Optimization in the threshold value is achieved through the calculation both SNR and delay in a combined manner to evaluate the heuristic handoff for a given scanning...

8012487 | **Publication Date: 2011-09-05** |

## IEEE Standard for Local and metropolitan area networks--Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPANs)




**Abstract:**
The protocol and compatible interconnection for data communication devices using low data-rate, low-power, and low-complexity short-range radio frequency (RF) transmissions in a wire less personal area network (WPAN) were defined in IEEE Std 802.15.4-2006. In this revision, the market applicability of IEEE Std 802.15.4 is extended, the ambiguities in the standard are removed, and the improvements learned from implementations of IEEE Std 802.15.4-2006 are included.

8734225 | **Publication Date: 2019-04-01** |

## Komondor: a Wireless Network Simulator for Next-Generation High-Density WLANs




**Abstract:**
Komondor is a wireless network simulator for next-generation wireless local area networks (WLANs). The simulator has been conceived as an accessible (ready-to-use) open source tool for research on wireless networks and academia. An important advantage of Komondor over other well-known wireless simulators lies in its high event processing rate, which is furnished by the simplification of the core operation. This allows outperforming the execution time of other simulators like ns-3, thus supporting large-scale scenarios with a huge number of nodes. In this paper, we provide insights into the Komondor simulator and overview its main features, development stages and use cases. The operation of Komondor is validated in a variety of scenarios against different tools: the ns-3 simulator and two analytical tools based on Continuous Time Markov Networks (CTMNs) and the Bianchi's DCF model. Results show that Komondor captures the IEEE 802.11 operation very similarly to ns-3. Finally, we discuss...

8042257 | **Publication Date: 2011-10-08** |

## IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1, 2, 3, 4, 5, 7, 8, 9, and 10

8672652 | **Publication Date: 2019-03-20** |

IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems Local and Metropolitan Area Networks - Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Enhancements for Positioning



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 medium access control layer (MAC) and physical layers (PHY). Compared to IEEE Std 802.11-2020 it enables absolute and relative position estimation with higher accuracy, and reduces wireless medium utilization and power consumption, is scalable to dense deployments, and includes security features.

9246317 | **Publication Date: 2020-10-29** |

IEEE Draft Standard for Information technology - Telecommunications and information exchange between systems Local and metropolitan area networks - Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 3: Enhancements for positioning



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 medium access control layer (MAC) and physical layers (PHY). Compared to IEEE Std 802.11-2020 it enables absolute and relative position estimation with higher accuracy, and reduces wireless medium utilization and power consumption, is scalable to dense deployments, and includes security features.

5871287 | **Publication Date: 2011-06-06** |

IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications



Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1, 2, 3, 4, 5, 6 and 7

7574262 | **Publication Date: 2016-01-01** |

IEEE Approved Draft Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks-Specific Requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Amendment 2: Sub 1 GHz License Exempt Operation



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 physical layer (PHY) and the medium access control (MAC) sublayer to enable operation of license-exempt 802.11 wireless networks in frequency bands below 1 GHz excluding the TV White Space bands, with a transmission range up to 1 km and a minimum data rate of at least 100 Kb/s.

6276283 | **Publication Date: 2012-08-21** |

IEEE Draft Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems - Amendment: Higher Reliability Networks

Image not currently available

**Abstract:**
Amendment to IEEE 802.16. This amendment specifies protocol enhancements to the medium access control layer (MAC) for enabling increased robustness and alternate radio path establishment in degraded network conditions. Amendment to IEEE Std 802.16. Limited WirelessMAN-Advanced physical layer extensions are included for enabling operation with radio path redundancy and direct communication between subscriber stations. Also mobile base stations and mobile relay stations are supported.

7383204 | **Publication Date: 2016-01-01** |

IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. TBD: It also incorporates Amendments 1 and 2 published in 2012.

1243201 | **Publication Date: 2003-01-01** |

## Improving the aggregate throughput of access points in IEEE 802.11 wireless LANs




**Abstract:**
In IEEE 802.11 wireless LANs, the DCF access method and the PCF access method operate alternatively within a superframe to service the time-varying traffic demands. Due to different medium access mechanisms deployed by DCF and PCF, they work well for some particular types of traffic scenarios respectively, while their performance may degrade under some other types of traffic demands. None of them can keep high performance under all types of traffic demands. In this paper, we propose an adaptive control algorithm to keep the aggregate throughput of access points close to the best capacity of both DCF mode and PCF mode upon various traffic requests, by dynamically adjusting the duration of DCF mode and PCF mode within a superframe based on recent traffic scenarios in wireless LANs. We modified the MAC module of IEEE 802.11 wireless LANs in OPNET to support our algorithm. Extensive simulations have been done using OPNET. The simulation results show that high performance of access points...

5937280 | **Publication Date: 2011-08-20** |

## IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10

8367982 | **Publication Date: 2018-01-01** |

## A Survey of Medium Access Mechanisms for Providing Robust Audio Video Streaming in IEEE 802.11aa Standard




**Abstract:**
The amendment of medium access control (MAC) in 802.11 has been published as the 802.11aa standard. The new standard enhances the quality of service (QoS) provisioning for robust audio--video (AV) streaming in wireless local area networks (WLANs). The 802.11aa standard is mainly an extension of the 802.11e, 802.11n, and 802.11v standards. In this survey, we describe the mechanisms of Medium Access Control (MAC) in 802.11aa in greater detail. The interworkings of the different network technologies of Quality of Service (QoS) WLAN and Ethernet are explained. We add mechanisms from the 802.1Q standard to complement 802.11aa regarding the stream reservation protocol and strict priority algorithm to provide a complete vision of the standard. Research challenges include incorporating a wide range of mechanisms in the 802.1Q wireline standard in the 802.11aa wireless standard. To enhance the interworking of the 802.1Q and 802.11aa standards, we propose to unify three mechanisms: the maps...

7051187 | **Publication Date: 2015-01-01** |

## IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. TBD: It also incorporates Amendments 1 and 2 published in 2012.

1175541 | **Publication Date: 2002-10-01** |

## Goodput analysis and link adaptation for IEEE 802.11a wireless LANs

Image not currently available

**Abstract:**
Link adaptation to dynamically select the data transmission rate at a given time has been recognized as an effective way to improve the goodput performance of the IEEE 802.11 wireless local-area networks (WLANs). Recently, with the introduction of the new high-speed 802.11a physical layer (PHY), it is even more important to have a well-designed link adaptation scheme work with the 802.11a PHY such that its multiple transmission rates can be exploited. In this paper, we first present a generic method to analyze the goodput performance of an 802.11a system under the distributed coordination function (DCF) and express the expected effective goodput as a closed-form function of the data payload length, the frame retry count, the wireless channel condition, and the selected data transmission rate. Then, based on the theoretical analysis, we propose a novel MPDU (MAC protocol data unit)-based link adaptation scheme for the 802.11a systems. It is a simple table-driven approach and the basic...

5510226 | **Publication Date: 2010-07-12** |

## IEEE Draft Amendment Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems - Advanced Air Interface

Image not currently available

**Abstract:**
This standard amends the IEEE 802.16 WirelessMAN-OFDMA specification to provide an advanced air interface for operation in licensed bands. It meets the cellular layer requirements of IMT-Advanced next generation mobile networks. This amendment provides continuing support for legacy WirelessMAN-OFDMA equipment.

4540170 | **Publication Date: 2008-01-01** |

IEEE Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems Multihop Relay Specification



Image not currently available

**Abstract:**
This document specifies OFDMA physical layer and medium access control layer enhancements to IEEE Std 802.16 for licensed bands to enable the operation of relay stations. Subscriber station specifications are not changed.

4505735 | **Publication Date: 2008-04-01** |

A Channel Management Scheme for Reducing Interference in Ubiquitous Wireless LANs Environment

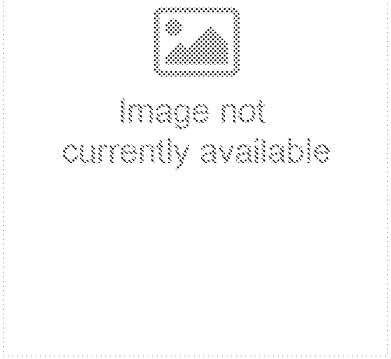


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**Abstract:**
For the successful ubiquitous environment, the channel management scheme for reducing the interference in wireless LANs environment is very important. And as the IEEE 802.11 family becomes popular, performance decline due to interference of network happens to be a brand new issue. In this paper, we introduce a channel management scheme for reducing the interference and maximizing the performance by channel assignment and load balancing. We present a distributed algorithm and the decision making basis for activating channel assignment and load balancing process under the current circumstances, which assumes network is managed by multiple individual manager and collects the channel information with the methods from IEEE 802.11k draft. The proposed scheme reduces the overhead and improves the performance of the network by reducing the number of times of unnecessary channel assignment and load balancing processes. And we test our algorithms with NS simulation and show that the proposed...

7393813 | **Publication Date: 2016-01-27** |

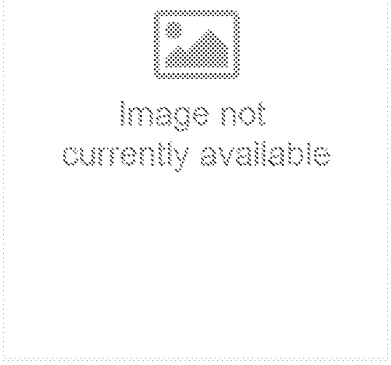
## Seamless Link-Level Redundancy to Improve Reliability of Industrial Wi-Fi Networks




**Abstract:**
The adoption of wireless communications and, in particular, Wi-Fi, at the lowest level of the factory automation hierarchy has not increased as fast as expected so far, mainly because of serious issues concerning determinism. Actually, besides the random access scheme, disturbance and interference prevent reliable communication over the air and, as a matter of fact, make wireless networks unable to support distributed real-time control applications properly. Several papers recently appearing in literature suggest that diversity could be leveraged to overcome this limitation effectively. In this paper, a reference architecture is introduced, which describes how seamless link-level redundancy can be applied to Wi-Fi. The framework is general enough to serve as a basis for future protocol enhancements, and also includes two optimizations aimed at improving the quality of wireless communication by avoiding unnecessary replicated transmissions. Some relevant solutions have been analyzed by...

7460875 | **Publication Date: 2016-04-22** |

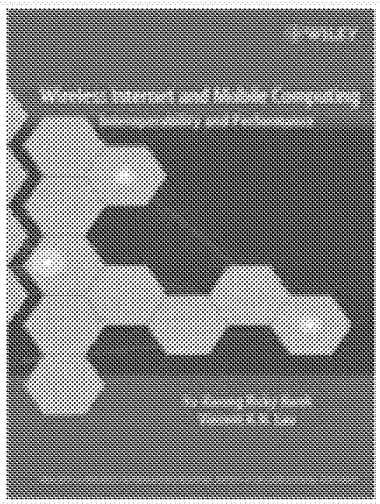
## IEEE Standard for Low-Rate Wireless Networks




**Abstract:**
The protocol and compatible interconnection for data communication devices using low-data-rate, low-power, and low-complexity short-range radio frequency (RF) transmissions in a wireless personal area network (WPAN) are defined in this standard. A variety of physical layers (PHYs) have been defined that cover a wide variety of frequency bands.

5201520 | **Publication Date: 2007-01-01** |

## Wireless Internet and Mobile Computing: Interoperability and Performance



**Abstract:**
This book describes the technologies involved in all aspects of a large networking system and how the various devices can interact and communicate with each other. Using a bottom up approach the authors demonstrate how it is feasible, for instance, for a cellular device user to communicate, via the all-purpose TCP/IP protocols, with a wireless notebook computer user, traversing all the way through a base station in a cellular wireless network (e.g., GSM, CDMA), a public switched network (PSTN), the Internet, an intranet, a local area network (LAN), and a wireless LAN access point. The information bits, in travelling through this long path, are processed by numerous disparate communication technologies. The authors also describe the technologies involved in infrastructure less wireless networks.

1577689 | **Publication Date: 2005-01-01** |

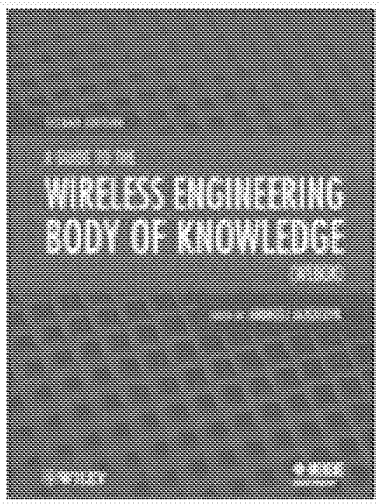
## On the performance enhancement of wireless LAN - a multi-polling mechanism with hidden terminal solution

Image not currently available

**Abstract:**
Current standardization activities for wireless local area networks (WLAN) have focused the effort on providing high throughput and supporting applications with QoS requirements. In order to achieve such goals, the MAC mechanisms of legacy IEEE 802.11 and .11e protocols need to be improved. Multipolling mechanisms are often employed to improve the protocol efficiency, however, current available multipolling mechanisms suffer from hidden terminal and/or inefficient channel usage problems. In this paper, we propose a multi-polling mechanism that utilizes novel metric for channel access and thus is capable to utilize channel resource efficiently and overcome the hidden terminal problem. Analysis shows that the proposed mechanism improves the throughput from 5% to 40% compared to legacy 802.11e.

6354035 | **Publication Date: 2012-01-01** |

## Wireless Access Technologies




**Abstract:**
This chapter contains sections titled: Introduction Wireless Access Mobile Cellular Architecture and Design Fundamentals Wireless Access Technology Standardization Digital Mobile Cellular Technologies-GS M to LTE 3GPP2 Radio Access Standards Evolution IEEE and Other Wireless Access Technologies Wireless Access Technology Roadmap: Vision of the Future

7489061 | **Publication Date: 2016-01-01** |

## IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems - Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

Image not currently available

**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. TBD: It also incorporates Amendments 1 and 2 published in 2012.

10059317 | **Publication Date: 2022-10-03** |

## SIGTAM: A Tampering Attack on Wi-Fi Preamble Signaling and Countermeasures



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**Abstract:**
The preamble is crucial for frame reception and interpretation in Wi-Fi networks. It carries essential information (e.g., length, rate, etc) in multiple Signal (SIG) fields that are needed to decode the payload portion of the frame. In this paper, we first use measurements and security analysis to identify the vulnerabilities of the SIG fields in terms of confidentiality, predictability, and integrity. Then, we introduce the SIG tampering attack (SIGTAM) in which the adversary exploits these vulnerabilities to craft and transmit a signal that tampers with legitimate SIG fields. This smart attack can pass the integrity validation including the even parity and cyclic redundancy check (CRC), hence deceiving the receiver(s). The resulting SIG fields not only lead to frame discard or decoding error at the receiver(s) but also channel access disorder at neighboring devices. We further strengthen this attack by making it robust to channel impairments and synchronization errors. The attack is...

8751172 | **Publication Date: 2019-04-23** |

## IEEE Standard for Local and metropolitan area networks--Part 15.7: Short-Range Optical Wireless Communications - Redline



Image not currently available

**Abstract:**
A physical layer (PHY) and medium access control (MAC) sublayer for short-range optical wireless communications (OWC) in optically transparent media using light wavelengths from 10 000 nm to 190 nm are defined. The standard is capable of delivering data rates sufficient to support audio and video multimedia services and also considers mobility of the optical link, compatibility with various light infrastructures, impairments due to noise and interference from sources like ambient light, and a MAC sublayer that accommodates the unique needs of visible links as well as the otherre targeted light wavelengths. It also accommodates optical communications for cameras where transmitting devices incorporate light-emitting sources and receivers are digital cameras with a lens and image sensor. The standard adheres to applicable eye safety regulations.

5336861 | **Publication Date: 2009-11-01** |

## Cochannel interference avoidance MAC in wireless cellular networks

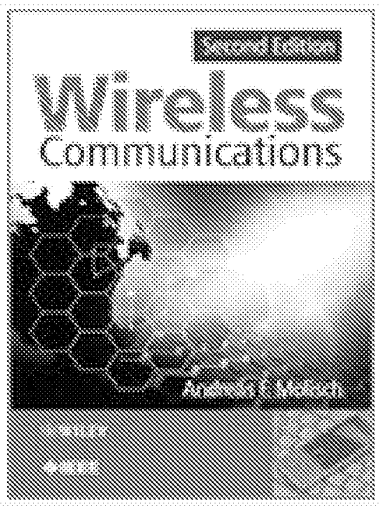


Image not currently available

**Abstract:**
Severe cochannel interference in wireless cellular networks significantly affects users at cell edges. We propose a cost-effective cochannel interference avoidance (CIA) medium access control (MAC) scheme to improve network performance. For CIA-MAC, base stations judged as severe interferers transmit randomly and the transmission is controlled by wireless channel states to optimize the overall network performance while maintaining proportional fairness among users. Conditions for triggering CIA-MAC are derived and two simple trigger mechanisms are obtained. The CIA-MAC scheme requires low signaling overhead and only minor changes to the existing mobile systems. Simulation results show that the proposed scheme, CIAMAC, significantly outperforms traditional approaches through the avoidance of severe cochannel interference as well as the exploitation of multiuser diversity through cross-layer design.

5635451 | **Publication Date: 2011-01-01** |

## GSM Global System for Mobile Communications




**Abstract:**
This chapter discusses the Global System for Mobile communications (GSM). The overall system consists of Base Station Subsystem (BSS), Network and Switching Subsystem (NSS), and Operation Support System (OSS). The BSS consists of Base Transceiver Stations (BTSs) and the Base Station Controllers (BSCs). The NSS consists of Mobile-services Switching Center (MSC), and several databases (e.g., HLR, VLR, EIR, and AUC). The OSS is responsible for organization and maintenance. We then discuss the air interface. Multiple access uses a combination of FDMA (with optional frequency hopping) and TDMA; FDD is used for duplexing. The time axis is divided into timeslots, which are grouped into frames, multiframes, and superframes. A combination of frequency band and timeslot index is a physical channel. GSM uses GMSK modulation; equalization is helped by a training sequence (midamble) in each timeslot. Coding employs unequal error protection, based on convolutional and/or block codes codes for bits...

567479 | **Publication Date: 1996-01-01** |

## Evaluation of a MAC protocol proposed for a general packet radio service in GSM




**Abstract:**
One major issue of the phase 2+ development of the pan-European Global System for Mobile communications (GSM) is to specify a general packet radio service (GPRS). Such a service is necessary to be able to fulfil the increased user requirements for reasonable data services. In this paper, an overview about the overall GPRS concept, its architecture and service characteristics is given. In addition, a medium access control protocol that controls access of multiple mobile stations onto the radio channel is introduced and evaluated by simulation. The protocol is mainly characterized by dynamic bandwidth allocation and its multi-slot features. Finally, conclusions are drawn and further work items are discussed.

4138226 | **Publication Date: 2006-09-01** |

## Performance Evaluation of Centralized and Distributed MAC Protocols in Coverage Overlapped WLANs




**Abstract:**
In this paper, we evaluated network capacity performance of two different principles of Wireless LAN (WLAN) medium access control (MAC) schemes, namely, the centralized coordination scheme (CCS) and the distributed coordination scheme (DCS), under highly unplanned and overlapped coverage areas. We examined the throughput performance variation of CCS and DCS based MAC protocols through extensive network simulations with an unplanned topology configuration that approximates to the "free-to-install" characteristic of WLANs. Our results showed that CCS experiences severe performance degradation, while DCS provides reasonable throughput performance under high inter-cell-interferences conditions and that CCS is capable of achieving higher throughput when inter-cell-interference is low

6596950 | **Publication Date: 1999-09-01** |

## Rapid implementation of the MAC and interface circuits for the wireless LAN cards using FPGA




**Abstract:**
This paper studies the rapid design and implementation of the medium access control (MAC) and related interface circuits for 802.11 wireless LANs based on the field programmed gate array (FPGA) technology. Our design is thus aimed to support both the distributed coordination function (DCF) and the point coordination function (PCF) with the aid of FPGA technology. Furthermore, in an infrastructure network, some stations may serve as the access points (APs) which may function like a learning bridge. This paper will also discuss how to design for such application. The hardware of the MAC and interface may at least consist of three major parts: wireless transmission and reception processes and interface, host (bus) interface, and the interface to the distributed system (optional). Through the increasing popularity of FPGA design, this paper presents how Complex Programmable Logic Devices (CPLD) can be utilized for speedy design of prototypes. It also demonstrates that there is much room...

9152948 | **Publication Date: 2020-01-01** |

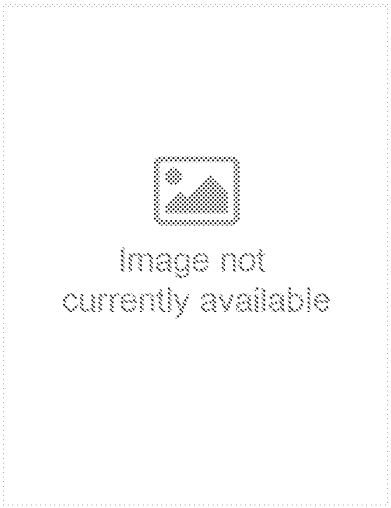
## IEEE 802.11ba Wake-Up Radio: Performance Evaluation and Practical Designs




**Abstract:**
Featuring a long operation time to avoid frequent battery replacements, highly energy-efficient radios have shown their pivotal functions for low-power and battery-driven devices in supporting manifold Internet-of-Things (IoT) services. To this end, prolific systems for highly energy-efficient radios have been widely deployed, but they impose a critical challenge of sacrificed data rates to preclude the applications that both require high energy efficiency and high data rates. Recently, this challenge has driven the concept of equipping two radio-chains on a low-power device, known as the primary connectivity radio (PCR) and companion connectivity radio (CCR). The PCR supports high data rate transmissions, and switches to the sleeping mode when no data should be received. In this case, the CCR stays awake to monitor traffic, and wakes up the PCR when data requiring to be received arrives. However, to practice such a concept, sophisticated operations in the physical (PHY) layer and...

5484870 | **Publication Date: 2010-05-01** |

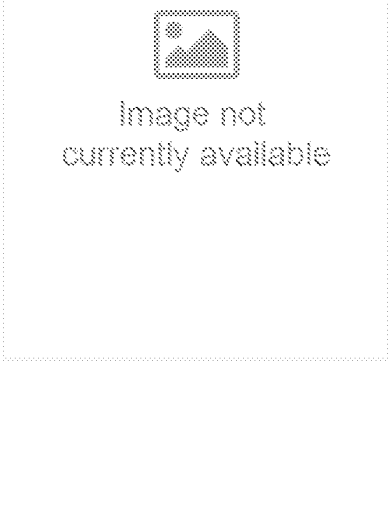
## A proposed model to implement load and throughput of W LAN implemented as Wi-Fi system




**Abstract:**
WLAN performance has been shaped by a family of standards under the 802.11 designation developed by the Institute of Electrical and Electronics Engineers, Inc. (IEEE). Interoperability between products is verified by the Wireless Ethernet Compatibility Alliance, which grants the use of its Wi-Fi (wireless fidelity) logo to products that pass its tests. This paper explains in detail the technical characteristics of different standards of Wi-Fi as well as differences between versions of different standards of Wi-Fi(802.11x). It also describes the technology positioning, and reviews the standards and technology associated with various usage models. An implementation of a simple Wi-Fi deployment using OPNET IT Guru Academics edition ver. 9.1 shows the results of this implementation.

6649432 | **Publication Date: 2013-06-01** |

## Advances in IEEE 802.11ah standardization for machine-type communications in sub-1GHz WLAN




**Abstract:**
The IEEE 802.11ah task group has been formed to develop the specification for sub-1GHz WLAN. Due to the low operating frequency, it is expected that the 802.11ah can support coverage up to 1km. Such large coverage is well-suited for machine-to-machine (M2M) or machine-type communication (MTC) applications like smart grid and sensor networks. These applications are characterized by large number of operating devices, small data packet size, and low-power operation, and they pose new problems that conventional 802.11 WLAN is not capable to address. Therefore they stimulate significant interest and discussion in the task group to define enhancements to improve the performance of 802.11ah WLAN. The objective of this paper is to present the recent advances in the IEEE 802.11ah standardization to enhance the MTC performance. In particular the emphasis is on the channel access enhancement, which lies in the core of MAC layer. Relevant works in the research community are also reviewed in the...

4064633 | **Publication Date: 2007-01-01** |

## WiFiRe: rural area broadband access using the WiFi PHY and a multisector TDD MAC




**Abstract:**
The needs of Indian rural telecom, and the economics of currently available broadband access technologies, motivate a new system for rural broadband access, which we call WiFiRe (WiFi rural extension). The system leverages the widely available, and highly cost-reduced, WiFi chipsets. We, however, retain only the PHY from these chipsets and propose a single-channel, multisector, TDD MAC using directional antennas. The proposed WiFiRe MAC is similar to the WiMAX MAC in several respects. In this article we motivate our approach, describe the system architecture and the MAC, analyse the spatial reuse, and then, using a simple scheduler, provide an assessment of the voice and data capacity of a WiFiRe system

5547891 | **Publication Date: 2010-08-11** |

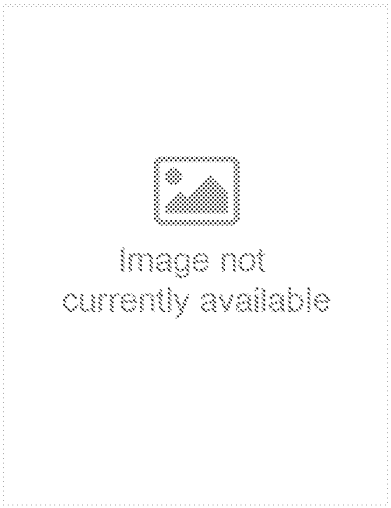
## IEEE Draft Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications




**Abstract:**
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1, 2, 3, 4, and 5

9482478 | **Publication Date: 2021-06-08** |

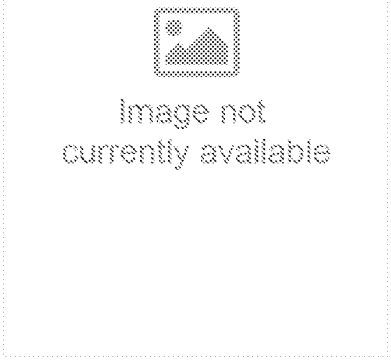
## ELioT: New Features in LiFi for Next-Generation IoT




**Abstract:**
The Internet of Things currently is predominantly narrowband and cannot always guarantee high reliability and low latency. Future IoT applications such as flexible manufacturing, augmented reality and self-driving vehicles need sophisticated real-time processing units in the cloud to which mobile IoT devices are connected. These high-capacity links meet the requirements of the upcoming 6G systems and cannot be facilitated by the current mobile communication infrastructure. Light communication, which is also denoted as LiFi, offers huge amounts of spectrum, extra security and interference-free transmission. We present the current state-of-the-art of LiFi systems and introduce new features needed for future IoT applications. We propose a distributed Multiple-Input Multiple-Output topology with a fronthaul using plastic optical fiber. Such a system offers seamless mobility between the light access points and also to 5G, besides low latency and integrated positioning. Future LiFi...

4312731 | **Publication Date: 2007-01-01** |

## IEEE Draft Standard for Local and Metropolitan Area Networks--Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems--Multihop Relay Specification




**Abstract:**

8751296 | **Publication Date: 2018-03-01** |

## High Efficiency WLANs IEEE 802.11ax Performance Evaluation




**Abstract:**
Users of wireless networks, require mostly speed and strength when it comes to connectivity. However, the increasing number of devices, diversity of traffic, and the density of networks, makes it difficult to maintain a reliable and efficient connection. Hence, the need for High Efficiency WLAN, often referred to as IEEE 802.11ax. Unlike the previous standards, that improved the physical layer data rate, IEEE 802.11ax aims to increase the medium access control layer speed by maximizing the capacity, thanks to a better use of the spectrum. In our paper, we offer a thorough evaluation of the performance by means of simulation, taking into account various characteristics. We prove that our analytical model offers remarkably good results and a satisfying performance.

6883924 | **Publication Date: 2014-06-01** |

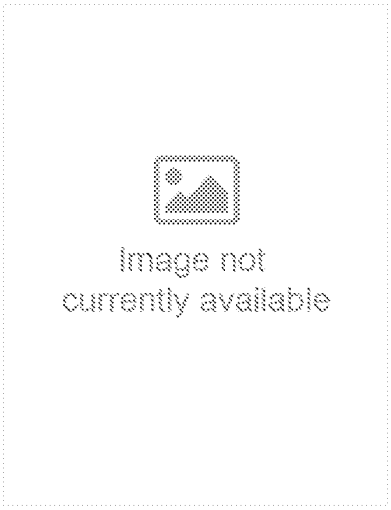
## Multi-user Parallel Channel Access for high efficiency carrier grade wireless LANs




**Abstract:**
The IEEE 802.11 specification for Wireless Local Area Networks (WLANs) supports 20 MHz channels utilizing bandwidths up to 160 MHz. However, the support of devices simultaneously transmitting over different, non-overlapping channels, is not specifically addressed. Recently, there has been interest in developing a 802.11 specification for Carrier Grade Wi-Fi which has led to the requirement for solutions with efficient frequency resource utilization that are not currently supported. In this paper we propose a Medium Access Control (MAC) method, called Multi-User Parallel Channel Access (MU/PCA) that enables simultaneous transmission to multiple devices of various bandwidths, while maintaining backward compatibility with 802.11. We present analytical and simulation results demonstrating the throughput gains that can be achieved using the proposed MU/PCA scheme as compared to the current Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) scheme that is used in 802.11.

230604164 | **Publication Date: 2023-06-07** |

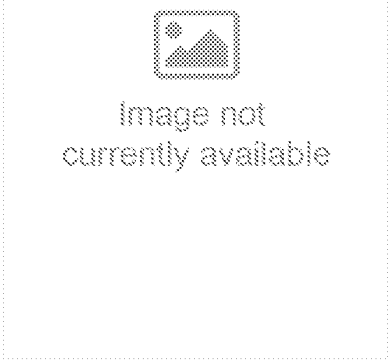
## A Survey on Multi-AP Coordination Approaches over Emerging WLANs: Future Directions and Open Challenges




**Abstract:**
Recent advancements in wireless local area network (WLAN) technology include IEEE 802.11be and 802.11ay, often known as Wi-Fi 7 and WiGig, respectively. The goal of these developments is to provide Extremely High Throughput (EHT) and low latency to meet the demands of future applications like as 8K videos, augmented and virtual reality, the Internet of Things, telesurgery, and other developing technologies. IEEE 802.11be includes new features such as 320 MHz bandwidth, multi-link operation, Multi-user Multi-Input Multi-Output, orthogonal frequency-division multiple access, and Multiple-Access Point (multi-AP) coordination (MAP-Co) to achieve EHT. With the increase in the number of overlapping APs and inter-AP interference, researchers have focused on studying MAP-Co approaches for coordinated transmission in IEEE 802.11be, making MAP-Co a key feature of future WLANs. Moreover, similar issues may arise in EHF bands WLAN, particularly for standards beyond IEEE 802.11ay. This has prompted...

5154121 | **Publication Date: 2009-01-01** |

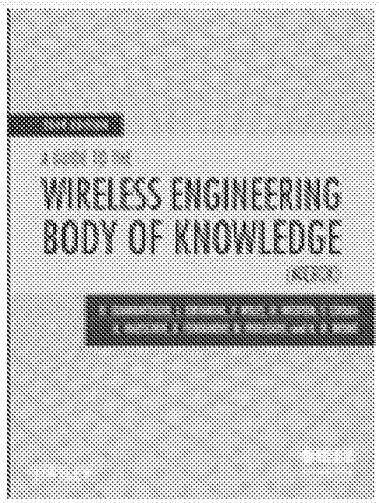
## IEEE Draft STANDARD for Information technology-Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 8: Wireless Network Management




**Abstract:**
This amendment provides Wireless Network Management enhancements to the IEEE 802.11 MAC, and PHY, extending radio measurements to effect a complete and coherent upper layer interface for managing IEEE 802.11 devices in wireless networks.

5396929 | **Publication Date: 2009-01-01** |

## Wireless Access Technologies




**Abstract:**
This chapter contains sections titled: Introduction Contents Design Fundamentals Mobility Management Wireless Access Technology Standardization Digital Mobile Cellular Technology Evolution-2G to 3G Local, Personal and Near-Field Communications Beyond 3G and Future Trends

1282211 | **Publication Date: 2003-01-01** |

## On the way to 3G networks: the GPRS/EDGE concept

Image not currently available

**Abstract:**
This work describes the principles and use of GPRS. The main problems of transition towards the UMTS are also stated.

10381585 | **Publication Date: 2024-01-03** |

IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Enhancements for Extremely High Throughput (EHT)



Image not currently available

Abstract:

6522432 | **Publication Date: 2007-06-12** |

IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Redline



Image not currently available

Abstract:
This revision specifies technical corrections and clarifications to IEEE Std 802.11 for wireless local area networks (WLANS) as well as enhancements to the existing medium access control (MAC) and physical layer (PHY) functions. It also incorporates Amendments 1 through 8 including a corrigendum.

8340144 | **Publication Date: 2018-01-01** |

## Enhanced Dual Carrier Sensing With Transmission Time Control for Fair Spatial Reuse in Heterogeneous and Dense WLANs

Image not currently available

**Abstract:**
In this paper, we focus on fairness and spatial reuse in heterogeneous and dense wireless local area networks (WLANs) where stations (STAs) have different capabilities of carrier sensing and basic service sets (BSSs) are densely deployed. First, we show a serious problem of unfairness arising when STAs with different carrier sensing threshold (CSTH) coexist and compete for channel access. To cope with this problem, a dual carrier sensing mechanism has been proposed in the on-going IEEE 802.11ax standardization. This mechanism uses two differentiated CSTHs: a conservative CSTH for fairness among intra-BSS STAs and an aggressive CSTH for spatial reuse by inter-BSS STAs. This dual carrier sensing mechanism may be effective in improving fairness. However, we show that its gain is marginal in terms of spatial reuse because an acknowledgment (ACK) frame is liable to be corrupted due to interference from a data frame transmitted by an inter-BSS STA. In order to avoid ACK corruption, we...

1249077 | **Publication Date: 2003-01-01** |

## STRIKE: spectrally efficient fixed wireless network based on dual standards

Image not currently available

**Abstract:**
One of the major challenges of the telecommunication community for the coming years will be to make multimedia services available to everyone, even to those who are in remote places. Broadband fixed wireless access (BFWA) is one of the best positioned radio access technologies to provide broadband access with performances that surpass current 3G mobile data rates and are similar to wired xDSL systems. The paper addresses the solutions which are proposed and demonstrated in the frame of the IST-STRIKE project to enhance spectral efficiency for BFWA and to guarantee end-to-end quality of service (QoS) through a dual mode HiperMAN/HiperLAN system. The first aspect is covered by the use of multi-transmit multi-receive (MTMR) techniques. Indeed, as it is foreseen that the data rates available with the studied standards will be sufficient for the majority of single user needs, the best way to increase the capacity and lower the deployment cost is to multiply the number of simultaneous...

1351780 | **Publication Date: 2004-10-29** |

## IEEE Standard for Information technology--Telecommunications and information exchange between systems-Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications--Amendment 7:4.9 GHz-5 GHz Operation in Japan



Image not currently available

**Abstract:**
This amendment specifies the extensions to IEEE Std 802.11® for Wireless Local Area Networks providing mechanisms for operation in the 4.9 GHz and 5 GHz bands in Japan. This amendment is based on IEEE Std 802.11™, 1999 Edition (Reaff 2003), as amended by IEEE Stds 802.11a™-1999, 802.11b™-1999, 802.11b-1999/Cor 1-2001, 802.11d™-2001, 802.11g™-2003, 802.11h™-2003, and 802.11i™-2004.

1543695 | **Publication Date: 2005-01-01** |

## Load balancing for QoS optimisation in wireless LANs utilising advanced cell breathing techniques



Image not currently available

**Abstract:**
Wireless local area networks (WLANs) have become increasingly popular over the last number of years. During this time, user requirements have evolved, resulting in a more diverse mix of services being carried over the wireless medium. In particular, delay sensitive real-time applications such as streaming multimedia and voice over IP are growing in importance. The widely accepted IEEE 802.11b standard, however, was not designed with sufficient quality of service (QoS) constraints for such applications. This paper attempts to optimise the received quality in 802.11b WLAN by balancing the load between various access points while changing the coverage area of each access point, a technique commonly known as cell breathing.

5174186 | **Publication Date: 2009-01-01** |

## IEEE Draft STANDARD for Information technology-Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 8: Wireless Network Management



Image not currently available

**Abstract:**
This amendment provides Wireless Network Management enhancements to the IEEE 802.11 MAC, and PHY, extending radio measurements to effect a complete and coherent upper layer interface for managing IEEE 802.11 devices in wireless networks.

7042282 | **Publication Date: 2015-02-13** |

## WiFi Network Virtualization to Control the Connectivity of a Target Service



Image not currently available

**Abstract:**
This paper proposes a WiFi network virtualization technique to control the connectivity of a target service. The packet-level delay violation ratio can be reduced even in a congested situation by provisioning dedicated base station (BS) resources (a set of dedicated BSs) to the target service and allowing only the corresponding terminals to associate with the BSs. The proposed technique is novel in that BSs are specially configured to use the same MAC address, and thus all the decisions on BS selection and handover are separated from those BSs and terminals and are put together into a centralized controller, while consistent layer-2 data paths in a backhaul network are also cooperatively configured. Simulation results show that the proposed technique can control the delay violation ratio of a target VoIP service and keep the ratio extremely low and comparable to that under IEEE 802.11e. A proof-of-concept prototype including two multi-channel virtualization-capable WiFi BSs and a BS...

4810969 | **Publication Date: 2009-01-01** |

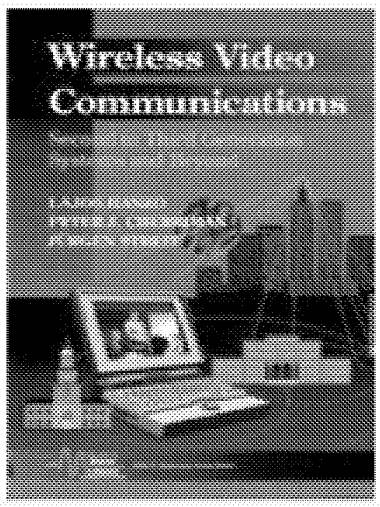
IEEE Draft STANDARD for Information technology-Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements-Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 8: Wireless Network Management

Image not currently available

**Abstract:**
This amendment is based on IEEE Std 802.11™-2007, as amended by IEEE 802.11k-2008, IEEE 802.11r-2008, IEEE P802.11y-2008, IEEE P802.11n D7.0, IEEE P802.11w D6.0, IEEE P802.11p D4.0 and IEEE P802.11z D2.0

5273184 | **Publication Date: 2001-01-01** |

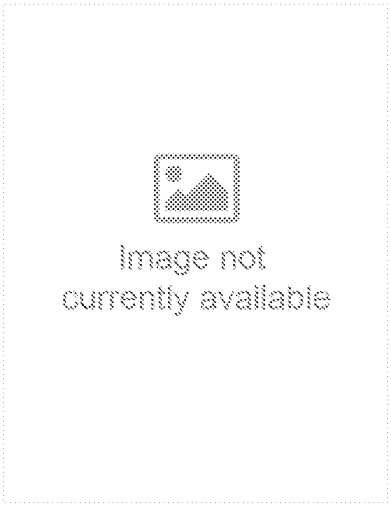
SecondGeneration Mobile Systems




**Abstract:**
This chapter contains sections titled: The Wireless Communications Scene Global System for Mobile Communications - GSM

10265800 | **Publication Date: 2023-09-25** |

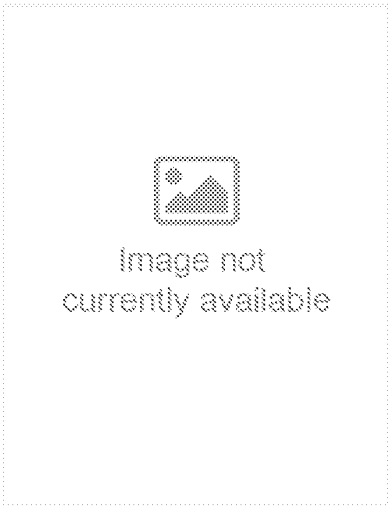
IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 8: Enhancements for Extremely High Throughput (EHT)




**Abstract:**

6328224 | **Publication Date: 2012-10-10** |

IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems Amendment 1: Enhancements to Support Machine-to-Machine Applications




**Abstract:**
Enhancements to the WirelessMAN-Advanced Air Interface, an air interface designated as "IMT-Advanced" by the International Telecommunication Union-Radiocommunication Sector (ITU-R), are specified in this standard. Improved support for machine-to-machine applications are provided by these enhancements.

1204832 | **Publication Date: 2003-06-01** |

## An efficient multipolling mechanism for IEEE 802.11 wireless LANs




**Abstract:**
To expand support for applications with QoS requirements in wireless local area networks (WLANs), the 802.11 E Task Group was formed to enhance the current IEEE 802.11 Medium Access Control (MAC) protocol. The multipolling mechanism was discussed in the task group, but some problems remain unsolved. In this paper, we show a design of the multipolling mechanism with the advantages of high channel utilization and low implementation overhead. In our proposed mechanism, wireless stations use a priority-based contention scheme to coordinate in themselves the transmission order on the channel. Moreover, we propose a polling schedule mechanism for our proposed multipoll to serve real-time traffic with constant and variable bit rates. The bounded delay requirement of the real-time traffic can be satisfied in our scheduling model. We establish an admission test to estimate the system capacity and to determine whether a new connection can be accepted. We study the performance of our proposed...

634783 | **Publication Date: 1997-11-01** |

## The UK LINK-PCP approach to the wireless ATM system




**Abstract:**
This article presents the conclusions of research undertaken in the Mobile Communications Group, University of Surrey, during the last three years in the area of wireless/mobile ATM. This research was funded by the United Kingdom DTI-EPSRC project, "Personal Communications LINK Project" (PCP) under the title "Wireless ATM LAN", and carried out in collaboration with Symbionics Developments Ltd. of the United Kingdom. The article outlines the basic characteristics of ATM technology and sets the design objectives for the ATM WLAN. It proposes system architectures and protocol reference models (PRMs) for the establishment of ATM WLAN using IEEE 802.11 and HIPERLAN. The system architecture and PRM of an optimum design for ATM WLAN are presented along with the mechanism for mobility management and handover execution. Finally, it discusses the multiple access scheme adopted in the proposed ATM WLAN.

4769134 | **Publication Date: 2008-09-01** |

## Saturation throughput analysis of Multiband-OFDM ultra wideband networks



Image not currently available

**Abstract:**
The saturation throughput analysis of the prioritized contention access (PCA) of the WiMedia Ultra Wideband (UWB) standard is presented in this paper. In the WiMedia standard, the Multiband Orthogonal Frequency Division Multiplexing (MB-OFDM) is used as the basic physical scheme. An in-depth Bit Error Rate (BER) performance analysis of the MB-OFDM UWB system using IEEE 802.15.3a channel models is conducted to aid the throughput analysis. The PCA throughput performance analysis is carried out by extending an original Enhanced Distributed Contention Access (EDCA) model for 802.11e into the MB-OFDM UWB protocol. The extended model considers the effects of the bit error rate, the transmission opportunity limits, and the uniqueness of WiMedia MAC timing structure. The results illustrate that the station saturation throughput of the PCA scheme is sensitive to the frame payload length, and there exists an optimal frame payload length that maximizes the saturation throughput. The results also...

9899401 | **Publication Date: 2022-09-21** |

## IEEE Approved Draft Standard for Information technology - Telecommunications and information exchange between systems Local and metropolitan area networks - Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 4: Enhancements for positioning



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 medium access control layer (MAC) and physical layers (PHY). Compared to IEEE Std 802.11-2020 it enables absolute and relative position estimation with higher accuracy, and reduces wireless medium utilization and power consumption, is scalable to dense deployments, and includes security features.

9745143 | **Publication Date: 2022-03-29** |

An Energy-Efficient Channel Access With Target Wake Time Scheduling for Overlapping 802.11ax Basic Service Sets

Image not currently available

**Abstract:**
Higher requirements in wireless Internet access have led to a dense deployment of Wi-Fi networks, which results in severe collisions and deteriorated throughput. In this article, we propose a grouping-based medium access control protocol with target wake time (TWT) scheduling for IEEE 802.11ax overlapping basic service sets (OBSSs), i.e., GTSO. It aims to improve the reutilization of the resource units (RUs) by increasing the number of parallel transmissions with sleep/wake-up period scheduling which is adaptive to the traffic loads. First, we divide the stations into different groups by mapping the OBSS architecture into an undirected graph. Based on the graph, we use the Welch Powell algorithm to find the minimum number of colors in the graph coloring problem to make as many parallel transmissions as possible. Finally, an optimization problem is proposed to realize a contention-free channel access with simultaneously active stations no more than the number of RUs under the constraint...

4041017 | **Publication Date: 2005-01-01** |

Standard for Corrigendum to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems

Image not currently available

**Abstract:**
This corrigendum contains substantive corrections to IEEE Std 802.16-2004. It corrects errors, inconsistencies, and ambiguities in that standard. It does not contain new material.

1284165 | **Publication Date: 2003-01-01** |

## An analytical model for IEEE 802.11e EDCF differential services




**Abstract:**
Having been originally developed as an extension of the wired LANs, IEEE 802.11 lacks support for QoS and differential services. Since its introduction various extensions and modifications have been studied to address this current need and the IEEE 802.11 Task Group E is responsible for developing a QoS-aware MAC protocol that considers several service differentiation mechanisms. In this paper, we first consider the enhanced DCF access method of IEEE 802.11e. We then introduce an analytical model, which can be used to calculate the traffic priority and throughput corresponding to the configuration of multiple DCF contention parameters under saturation condition. A detailed simulation is provided to validate the proposed model.

PMC10221319 | **Publication Date: 2023-05-22** |

## An Analysis of the Mixed IEEE 802.11ax Wireless Networks in the 5 GHz Band




**Abstract:**
This paper presents an analysis of the IEEE 802.11ax networks' coexistence with legacy stations, namely IEEE 802.11ac, IEEE 802.11n, and IEEE 802.11a. The IEEE 802.11ax standard introduces several new features that can enhance network performance and capacity. The legacy devices that do not support these features will continue to coexist with newer devices, creating a mixed network environment. This usually leads to a deterioration in the overall performance of such networks; therefore, in the paper, we want to show how we can reduce the negative impact of legacy devices. In this study, we investigate the performance of mixed networks by applying various parameters to both the MAC and PHY layers. We focus on evaluating the impact of the BSS coloring mechanism introduced to the IEEE 802.11ax standard on network performance. We also examine the impact of A-MPDU and A-MSDU aggregations on network efficiency. Through simulations, we analyze the typical performance metrics such as...

221103575 | **Publication Date: 2022-11-07** |

## Seamless Link-level Redundancy to Improve Reliability of Industrial Wi-Fi Networks




**Abstract:**
The adoption of wireless communications and, in particular, Wi-Fi, at the lowest level of the factory automation hierarchy has not increased as fast as expected so far, mainly because of serious issues concerning determinism. Actually, besides the random access scheme, disturbance and interference prevent reliable communication over the air and, as a matter of fact, make wireless networks unable to support distributed real-time control applications properly. Several papers recently appeared in the literature suggest that diversity could be leveraged to overcome this limitation effectively. In this paper a reference architecture is introduced, which describes how seamless link-level redundancy can be applied to Wi-Fi. The framework is general enough to serve as a basis for future protocol enhancements, and also includes two optimizations aimed at improving the quality of wireless communication by avoiding unnecessary replicated transmissions. Some relevant solutions have been analyzed...

9869788 | **Publication Date: 2022-08-26** |

## IEEE Draft Standard for Information technology - Telecommunications and information exchange between systems Local and metropolitan area networks - Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 4: Enhancements for positioning




**Abstract:**
This amendment defines modifications to both the IEEE 802.11 medium access control layer (MAC) and physical layers (PHY). Compared to IEEE Std 802.11-2020 it enables absolute and relative position estimation with higher accuracy, and reduces wireless medium utilization and power consumption, is scalable to dense deployments, and includes security features.

PMC6210506 | **Publication Date: 2018-10-09** |

## Interference-Aware Adaptive Beam Alignment for Hyper-Dense IEEE 802.11ax Internet-of-Things Networks

Image not currently available

**Abstract:**
The increasing use of Internet of Things (IoT) devices in specific areas results in an interference among them and the quality of communications can be severely degraded. To deal with this interference issue, the IEEE 802.11ax standard has been established in hyper-dense wireless networking systems. The 802.11ax adopts a new candidate technology that is called multiple network allocation vector in order to mitigate the interference problem. In this paper, we point out a potential problem in multiple network allocation vector which can cause delays to communication among IoT devices in hyper-dense wireless networks. Furthermore, this paper introduces an adaptive beam alignment algorithm for interference resolution, and analyzes the potential delays of communications among IoT devices under interference conditions. Finally, we simulate our proposed algorithm in densely deployed environments and show that the interference can be mitigated and the IEEE 802.11ax-based IoT devices can...

562638 | **Publication Date: 1996-01-01** |

## A proposal for multi-slot MAC layer operation for packet data channel in GSM

Image not currently available

**Abstract:**
Within the ETSI SMG, a General Packet Radio Service (GPRS) is being specified as part of GSM Phase 2+. The GPRS will be based on a new type of logical radio channel optimized for packet data. The requirement for higher data rate, flexibility and efficient utilization of the scarce bandwidth across the air interface triggered the development of a multi-slot packet data channel concept, which is presented. Such a concept can be implemented on any TDMA system and even extended to a multi-carrier solution. The article describes the principles for dynamic bandwidth allocation based on multi-slot operation at the MAC layer in a master-slave channel concept. Further, an evaluation, through simulations, is done in order to compare the performance of multi-slot and earlier assumed single-slot MAC layer operation.

9439344 | **Publication Date: 2021-05-19** |

IEEE Draft Standard for Information technology - Telecommunications and information exchange between systems Local and metropolitan area networks - Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications - Amendment 3: Enhancements for positioning



Image not currently available

**Abstract:**
This amendment defines modifications to both the IEEE 802.11 medium access control layer (MAC) and physical layers (PHY). Compared to IEEE Std 802.11-2020 it enables absolute and relative position estimation with higher accuracy, and reduces wireless medium utilization and power consumption, is scalable to dense deployments, and includes security features.

6359961 | **Publication Date: 2012-11-21** |

IEEE Draft Standard for IT - Telecommunications and Information Exchange Between Systems - LAN/MAN - Specific Requirements - Part 11: Wireless LAN Medium Access Control and Physical Layer Specifications - Amd 4: Enhancements for Very High Throughput for operation in bands below 6GHz



Image not currently available

**Abstract:**
The purpose of the amendment is to improve the 802.11 wireless local area network(LAN) user experience by providing significantly higher basic service set (BSS) throughput forexisting WLAN application areas and to enable new market segments for operation below 6 GHzincluding distribution of multiple multimedia/data streams.

9181687 | **Publication Date: 2020-08-21** |

## Telecommunications and exchange between information technology systems--Requirements for local and metropolitan area networks--Part 11:Wireless LAN medium access control (MAC) and physical layer (PHY) specifications - AMENDMENT 3: Enhancements for very high throughput to support Chinese millimeter wave frequency bands (60 GHz and 45 GHz)

Image not currently available

**Abstract:**
The IEEE 802.11 directional multi-gigabit (DMG) physical layer (PHY) and the medium access control (MAC) layer are modified by this amendment to IEEE Std 802.11-2016 to enable operation in the Chinese millimeter wave frequency band around 60 GHz. This amendment also defines modifications to the IEEE 802.11 PHY and MAC layer to enable operation in the Chinese millimeter wave frequency band around 45 GHz.

5282490 | **Publication Date: 2009-06-01** |

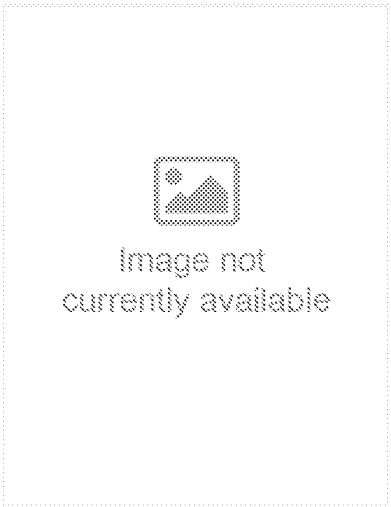
## A framework for interference mitigation in multi-BSS 802.11 wireless LANs

Image not currently available

**Abstract:**
This paper proposes a framework for interference mitigation in multi-BSS infrastructure 802.11 WLANs. Our interference mitigation approach is based on Access Point (AP) Coordination. With this approach, interfering BSSs negotiate and switch from the 802.11 CSMA/CA to a time slotted mechanism if users' QoS is observed to be degraded, diagnoses conclude that the cause is high interference, and the switch to the time slotted modus is expected to be useful and feasible. The proposed algorithms within the framework are driven by measurements. We utilize the wireless bandwidth and improve the fairness among WLAN users. We present results of detailed simulation experiments as well as real implementation.

5174653 | **Publication Date: 2009-07-01** |

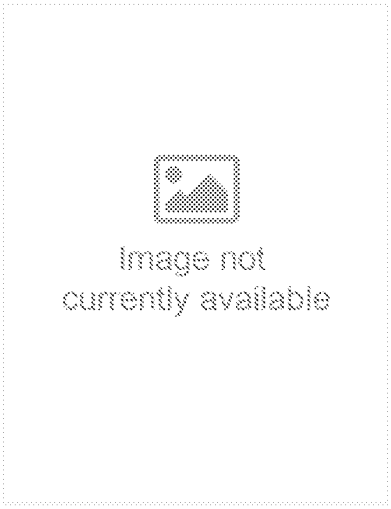
## Overlapping Impacts and Resource Coordination for High-density Wireless Communication




Abstract:

8387015 | **Publication Date: 2018-06-15** |

## IEEE Standard for Information technology-Telecommunications and information exchange between systems Local and metropolitan area networks-Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 4: Enhancements for Transit Links Within Bridged Networks




Abstract:
Protocols, procedures, and managed objects to enhance the ability of IEEE 802.11™ media to provide transit links internal to IEEE 802.1Q™ bridged networks are specified in this amendment to IEEE Std 802.11™-2016.

9417353 | **Publication Date: 2021-03-29** |

LSR: Link-aware Spatial Reuse in IEEE 802.11ax WLANs




**Abstract:**
The upsurge of mobile traffic volume has led to dense deployment of IEEE 802.11 wireless local area networks (WLANs). To enhance spectral efficiency in dense WLAN deployments, a new 802.11 amendment, namely 802.11ax, introduces overlapping basic service set packet detection-based spatial reuse (OBSS PD-based SR) operation. Although the OBSS PD-based SR operation enables more simultaneous transmissions among OBSSs, whether it improves network performance is highly uncertain and depends on the mutual interference among the simultaneous transmission links. In this paper, we propose a link-aware SR scheme, named LSR, that facilitates simultaneous transmissions among OBSSs considering the mutual interference. LSR efficiently exploits SR transmission opportunities by selecting the appropriate link for the SR transmission while sufficiently protecting the ongoing transmission. Moreover, the proposed method allows BSSs to coordinate with each other in a distributed manner without incurring...

9512279 | **Publication Date: 2021-08-11** |

MAC Protocols for IEEE 802.11ah-Based Internet of Things: A Survey




**Abstract:**
The IEEE 802.11ah, also known as WiFi HaLow, is a scalable solution for medium-range communication in Internet of Things (IoT). While provisioning support for the IoT and machine-to-machine (M2M) communication, IEEE 802.11ah leverages various innovative medium access control (MAC) layer concepts, such as restricted access window (RAW), hierarchical association identification (AID), traffic indication map (TIM) segmentation, etc. This article presents a survey on various MAC protocols for IEEE 802.11ah. While discussing the essential features of IEEE 802.11ah, this survey points out various issues and limitations of such MAC protocols. Although there are some surveys available for MAC protocols of IEEE 802.11ah, they do not include a large number of schemes that have been recently proposed to solve different standardization and implementation-based issues. This article individually surveys issues and challenges in the different problem domains of the IEEE 802.11ah MAC protocol and...

1177321 | **Publication Date: 2002-11-01** |

## Performance simulation of wireless multimedia systems using NC-PRMA/DA and SNC-PRMA/DA protocols

Image not currently available

**Abstract:**
A noncollision packet reservation multiple access with dynamic allocation (NC-PRMA/DA) scheme is proposed and investigated as a suitable candidate protocol for wireless multimedia communications. Access requests of the existing users in NC-PRMA/DA are conveyed to the base station in a noncollision manner by using a time-frequency signaling scheme. In addition, the scheduling NC-PRMA/DA (SNC-PRMA/DA) scheme, which is NC-PRMA/DA with packet scheduling, is also presented. Mixed voice, variable-rate video, and data traffic is used to demonstrate the efficiency of the proposed schemes for a single-cell environment. Simulation results show that our proposed NC-PRMA/DA and SNC-PRMA/DA protocols outperform the existing PRMA/DA protocol.

1682769 | **Publication Date: 2006-01-01** |

## Coexistence and Interworking of IEEE 802.16 and IEEE 802.11(e)

Image not currently available

**Abstract:**
The coexistence and interworking of IEEE 802.16 and IEEE 802.11 is an acute problem. The frame-based medium access of 802.16 requires rigorous protection against interference from wireless local area networks in order to operate properly. The 802.11e enhancements of the medium access control of 802.11 introduce the capability to support QoS. These enhancements define a central entity as main element: the hybrid coordinator. It realizes a contention free, centrally controlled medium access and introduces QoS limitations to the contention based access of 802.11e. In this paper, a central coordinating device combines the central base station of 802.16 with the hybrid coordinator of 802.11e and is thus referred to as base station hybrid coordinator. The base station hybrid coordinator is capable to operate in an 802.16 and an 802.11(e) protocol mode in the same frequency band. The realization of the interworking between these two standards is discussed and evaluated in this paper

5483491 | **Publication Date: 2010-04-01** |

## Analysis of IEEE 802.16e contention-based handover in erroneous channel




**Abstract:**
The IEEE 802.16 standard for fixed and mobile broadband wireless access systems specifies a group of Medium Access Control (MAC) procedures among which the handover (HO) is one of the crucial contributions, especially significant for the mobility requirement. The HO procedure defines numerous parameters which need a fine tuning in order to achieve satisfactory communication performance. This paper presents the impact of handover parameters value and an error-prone radio channel over the IEEE 802.16e CDMA-based handover procedure performance. We analytically analyzed the handover latency and connection dropping probability. The results were compared with the experimental measurements conducted on a protocol prototype specially developed for this purpose by using Specification and Description Language. The following parameters were investigated: value of the contention window minimal and maximal size, number of transmission allocations per frame, number of available CDMA ranging codes,...

4348971 | **Publication Date: 2007-06-01** |

## A Study of Radio-information Services for Networks of Cognitive Radios




**Abstract:**
The next generation of wireless networks, as envisioned by recent advances in cognitive radio (CR) technologies, will be autonomic and able to adjust their configurations to changes in the communications environment. There are three types of CRs, such as IEEE802.22 radio, multiple-radio with CR functions, and so-called fully configurable radios. Reconrigurable networks use these CRs and spectra efficiently. This paper discusses various cognitive radios from the viewpoint of re-configurable radio-information management for CR networks. We then propose a flexible and scalable network architecture for CR networks that enables management of re-configurable radio information. We classify radio information and propose the summarization of re-configuration information to enable efficient data exchanges between mobile terminals and the network. We intend to evaluate the efficiency of information services in the near future focusing on network traffic on wireless links.

7249269 | **Publication Date: 2015-06-01** |

## Analysis of an energy-efficient MAC protocol based on polling for IEEE 802.11 WLANs




**Abstract:**
This paper analyzes the performance of a duty-cycled polling-based access mechanism that exploits the Transmission Opportunity Power Save Mode (TXOP PSM) defined in the IEEE 802.11ac to improve the energy efficiency of Wireless Local Area Networks (WLANs) based on the IEEE 802.11. The basic idea behind the proposed approach, named GreenPoll, is to enable contention free periods, based on polling with beacons, during which wireless stations can save energy by turning off their radio transceivers after exchanging data with the access point. The closed expression of energy efficiency of GreenPoll is formulated in this paper and is used to evaluate the performance of GreenPoll considering important parameters like the traffic load, packet length, data rate, and number of stations in the network. Both analytical and simulation results show the high energy efficiency of GreenPoll with gains of up to 330% and 110% when compared to the legacy Distributed Coordination Function (DCF) and the...

5670408 | **Publication Date: 2010-09-01** |

## Field trials using coordinated multi-point transmission in the downlink




**Abstract:**
We report on field trials using CoMP transmission in the downlink of a mobile radio network. Two new features enable over-the-air CoMP transmission from physically separated base stations and terminals. These are distributed synchronization and a fast virtual local area network. Using VLAN tags, terminals feed back the multi-cell channel state information to their serving bases where it is multiplexed with shared data. Both are multicast to other cooperative base stations over the backhaul. In our trials, two terminals are served in two overlapping cells and placed in specific indoor, outdoor-to-indoor and outdoor scenarios. We have realized both intra-site as well as inter-site CoMP. While outage is indeed a big problem at the cell edge with full frequency reuse, with CoMP it is not observed anymore. Average throughput gains by factors 4 to 22 are observed when using CoMP compared to interference-limited transmission while between 27 and 78% of the isolated cell throughput is measured...

8011557 | **Publication Date: 2017-01-01** |

IEEE Draft Standard for Information Technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 5: Enhancements for Very High Throughput to Support Chinese Millimeter Wave Frequency Bands(60 GHz and 45 GHz).



Image not currently available

**Abstract:**
This amendment defines modifications to the IEEE P802.11ad Physical (PHY) layer and the Medium Access Control (MAC) layer to enable operation in the Chinese millimeter wave frequency band at around 60 GHz. This amendment also defines modifications to the IEEE Std 802.11 Physical (PHY) layer and the Medium Access Control (MAC) layer to enable operation in the Chinese millimeter wave frequency band at around 45 GHz.

1404569 | **Publication Date: 2005-02-01** |

Bluetooth and Wi-Fi wireless protocols: a survey and a comparison



Image not currently available

**Abstract:**
Bluetooth and IEEE 802.11 (Wi-Fi) are two communication protocol standards that define a physical layer and a MAC layer for wireless communications within a short range (from a few meters up to 100 m) with low power consumption (from less than 1 mW up to 100 mW). Bluetooth is oriented to connecting close devices, serving as a substitute for cables, while Wi-Fi is oriented toward computer-to-computer connections, as an extension of or substitution for cabled LANs. In this article we offer an overview of these popular wireless communication standards, comparing their main features and behaviors in terms of various metrics, including capacity, network topology, security, quality of service support, and power consumption.

5491728 | **Publication Date: 2010-06-15** |

## IEEE Draft Standard for Information Technology-Telecommunications and information exchange between systems-Local and Metropolitan networks-Specific requirements-Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 8: IEEE 802.11 Wireless Network Management



Image not currently available

**Abstract:**
This amendment provides Wireless Network Management enhancements to the IEEE 802.11MAC, and PHY, extending radio measurements to effect a complete and coherent upper layer interface formanaging IEEE 802.11 devices in wireless networks.

4601598 | **Publication Date: 2008-01-01** |

## IEEE Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems Multihop Relay Specification



Image not currently available

**Abstract:**
This document specifies OFDMA physical layer and medium access control layer enhancements to IEEE Std. 802.16 for licensed bands to enable the operation of relay stations.

881415 | **Publication Date: 2000-01-01** |

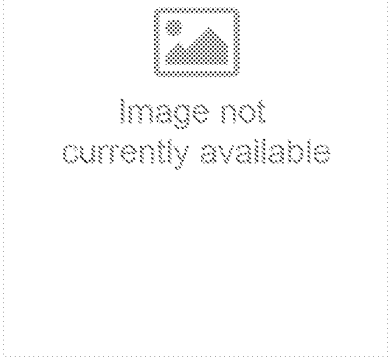
## A distributed multiple access technique for radio resource allocation in unlicensed wireless ATM LANs




**Abstract:**
A distributed multiple access technique for radio resource management is presented. The proposed distributed dynamic channel reservation (DDCR) method applies to multicarrier wireless ATM LANs, where base stations act as hubs to offer wireless ATM access to mobile units. The method is suitable for unlicensed wireless systems, where base stations are installed in a common coverage area. According to the proposed approach, base stations compete to access and reserve time on separate frequencies, using a dynamic TDMA/TDD technique, combined with listening and competing periods. Etiquette rules, contention disciplines and medium access control mechanisms are proposed. Procedures for terminal association and registration, and solutions for the hidden terminal problem are introduced. Finally, the performance of the presented contention disciplines is evaluated and compared through simulations.

5568824 | **Publication Date: 2010-06-01** |

## Probability-time characteristics of WiMAX systems




**Abstract:**
In this article we consider probability-time characteristics of broadband wireless system called WiMAX, which have been derived by numerical analytic method of the load intensity balance and could be used for its building and design. Need for frame format adaptation of the MAC protocol is showed by delay characteristics. The obtained results allow efficiency characteristics estimating of this perspective wireless network.

5542293 | **Publication Date: 2010-08-04** |

IEEE Draft Amendment Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems - Advanced Air Interface

Image not currently available

**Abstract:**
This standard amends the IEEE 802.16 WirelessMAN-OFDMA specification to provide an advanced air interface for operation in licensed bands. It meets the cellular layer requirements of IMT-Advanced next generation mobile networks. This amendment provides continuing support for legacy WirelessMAN-OFDMA equipment.

5302304 | **Publication Date: 2009-09-01** |

An Enhanced Method for the Quiet Period Synchronization of IEEE 802.22-Based Networks

Image not currently available

**Abstract:**

4669928 | **Publication Date: 2008-11-03** |

IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 3: 3650-3700 MHz Operation in USA

Image not currently available

**Abstract:**
This amendment defines enhancements to the IEEE 802.11 physical layer (PHY) and medium access control (MAC) to support operation in the 3650¿3700 MHz band in the United States.

5154151 | **Publication Date: 2009-01-01** |

IEEE Draft Standard for Information Technology- Telecommunications and information exchange between systems- Local and metropolitan area networks- Specific requirements- Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Amendment 6: Direct Link Setup

Image not currently available

**Abstract:**
This amendment provides Direct Link Setup enhancements to the IEEE 802.11 MAC, and PHY, extending direct link setup to be independent of the access point (AP), and adding power save capabilities. The direct link setup is made independent of the AP by tunneling the protocol messages inside data frames.

# Fast handoff for mobile wireless process control



Image not currently available

**Abstract:**
Handoff is defined as the phase during which a mobile node has a temporary connection loss during the transfer from one wireless communication cell to another one. As in industrial applications wireless networks are often used to connect mobile devices such as, robot, trolleys, conveyors, to a control station, handoff introduces a temporary interruption of monitoring and control of the mobile device that can be disruptive. This paper proposes the Mobile Association Handoff Protocol (MAHP), which, if compared with the standard protocol, provides a notable reduction of the handoff latency.

# Bibliographic Data

Application No: 17/670,419

Foreign Priority claimed: ◉ Yes ○ No

35 USC 119 (a-d) conditions met: ☑ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /MOHAMMED S CHOWDHURY/ Examiner's Signature | Initials

Title: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

| FILING or 371(c) DATE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|
| 02/11/2022 | 370 | 2467 | B-10124CON1 633517-8 |
| RULE | | | |

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**CONTINUING DATA**

This application is a CON of 16590302 10/01/2019 PAT 11284475

16590302 is a CON of PCT/KR2018/004397 04/16/2018

**FOREIGN APPLICATIONS**

KOREA, REPUBLIC OF KR10-2017-0048762 04/14/2017

KOREA, REPUBLIC OF KR10-2017-0146356 11/04/2017

KOREA, REPUBLIC OF KR10-2017-0146358 11/04/2017

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02/15/2022

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October 25, 2023

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|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 1. | Notice of Hearing dated August 21, 2023 for Indian Patent Application No. 201927042859. |
| | 2. | Office Action dated September 8, 2023 for U.S. Patent Application No. 17/670,424. |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| /MOHAMMED S CHOWDHURY/ (01/29/2024) | 01/29/2024 |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.C./

## PE2E SEARCH - Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| L1 | 1 | "16590302" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:24 PM |
| L2 | 5 | ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) and MinTrigProcTime$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:41 PM |
| L3 | 2 | L2 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:43 PM |
| L4 | 3 | ("20170202015" "20150139200" "20180014325").pn. | (US-PGPUB; USPAT) | OR | ON | ON | 2021/06/10 04:59 PM |
| L5 | 3 | L4 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:59 PM |
| L6 | 160 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:05 PM |
| L7 | 166 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 or introduc$4 or put$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:06 PM |
| L8 | 138 | L7 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:08 PM |
| L10 | 119 | L8 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:12 PM |
| L11 | 17 | ((insert$5) near25 (trigger frame$1) near25 ((physical layer | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:31 PM |

| | | | | | | | |
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| | | protocol data unit) or PPDU)) | | | | | |
| L12 | 10 | L11 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:32 PM |
| L13 | 10 | L12 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:33 PM |
| L14 | 776 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (USPAT) | ADJ | ON | ON | 2021/06/10 05:34 PM |
| L15 | 552 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT) | ADJ | ON | ON | 2021/06/10 05:35 PM |
| L27 | 1108 | ((transmit$4 or send$3 or forward$3 or transmission$1 or communicat$4 or relay$3 or transfer$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:56 PM |
| L28 | 932 | L27 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:57 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | H04W74/002 or Y02D30/70).cpc. | | | | | |
| L29 | 771 | L28 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:58 PM |
| L30 | 1004 | ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:16 AM |
| L31 | 840 | L30 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L32 | 701 | L31 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L33 | 699 | ((BSS color) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:46 AM |
| L34 | 642 | L33 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:47 AM |
| L35 | 12653 | ((BSS or (Basic Service Set)) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L36 | 1292 | ((BSS or (Basic Service Set)) near25 identif$7) and (Trigger$5 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L37 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:50 AM |
| L38 | 477 | L37 and (H04W80/08 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | 10:51 AM |
| L39 | 381 | L38 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:52 AM |
| L40 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L41 | 477 | L40 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L42 | 381 | L41 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L43 | 96 | L42 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L44 | 58 | L43 and ((BSS or (Basic Service Set)) near25 color$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:06 PM |
| L45 | 11 | L44 and ((BSS or (Basic Service Set)) near25 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:13 PM |
| L46 | 11 | L44 and ((BSS or (Basic Service Set)) near15 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:14 PM |
| L50 | 6 | L46 and ((generat$5 or produc$4) near15 (Trigger frame$1) near25 (uplink transmission)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:25 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| L51 | 6 | L46 and (((generat$5 or produc$4) near15 (Trigger frame$1) near25 (uplink transmission)) same (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:26 PM |
| L52 | 6 | L51 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:29 PM |
| L53 | 6 | L52 and ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:31 PM |
| L54 | 0 | L53 and ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:32 PM |
| L55 | 6 | L53 and (((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:33 PM |
| L56 | 0 | L53 and (((insert$5 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:34 PM |
| L57 | 6 | L53 and (OFDMA backoff) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:35 PM |
| L59 | 6 | L53 and OBO | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:36 PM |
| L60 | 6 | L59 and ((Overlapp$5 Basic Service Set) or OBSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:06 PM |
| L64 | 6 | L60 and ((Association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:08 PM |
| L65 | 491 | ((trigger$3 frame$1) near15 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:19 PM |
| L66 | 436 | L65 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:20 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L67 | 411 | L66 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:22 PM |
| L68 | 86 | L67 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:24 PM |
| L69 | 86 | L67 and ((trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:28 PM |
| L70 | 49 | L69 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:29 PM |
| L71 | 44 | L70 and ((Trigger frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L72 | 92 | L67 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L73 | 49 | L72 and ((Trigger$3 frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L74 | 44 | L73 and ((Trigger$3 frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L75 | 0 | L74 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:29 PM |
| L76 | 0 | L74 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L77 | 16 | L65 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L78 | 15 | L77 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L79 | 15 | L78 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:31 PM |

| | | | | | | | |
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| | | H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L80 | 1 | L65 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L81 | 6 | ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L82 | 2 | L81 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L83 | 16 | L74 and (receiver address) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:34 PM |
| L84 | 108 | ((Target Wake Time) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:44 AM |
| L85 | 117 | (((Target Wake Time) or (target wait time)) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:46 AM |
| L86 | 1 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:48 AM |
| L87 | 0 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L88 | 2 | (((Target Wake Time) or (target wait time) or TWT) same (receiver address) same (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L89 | 104 | L85 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L90 | 78 | L89 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L91 | 32 | ((receiver address) and | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 |

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|---|---|---|---|---|---|---|---|
| | | (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | | | | | 08:53 AM |
| L92 | 30 | L91 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |
| L93 | 29 | L92 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:54 AM |
| L94 | 6 | ((receiver address) near25 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:58 AM |
| L95 | 6 | ((receiver address) near35 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L96 | 109 | ((receiver address) near35 (Trigger$3 frame$1)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L97 | 47 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:33 AM |
| L98 | 41 | L97 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L99 | 20 | L98 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L100 | 1 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:38 AM |
| L101 | 16 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L102 | 15 | L101 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L103 | 12 | L102 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:40 AM |
| L104 | 0 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 ((user info) or (user information$1))) and (power near2 (sav$3 or consumption$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:06 AM |
| L106 | 59 | (((pre?determined or predetermined) near25 reserved) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L107 | 54 | L106 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L108 | 20 | L107 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L109 | 16 | (((pre?determined or predetermined) near25 (reserved value$1)) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:01 PM |
| L110 | 15 | L109 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L111 | 10 | L110 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L112 | 131 | ((pre?determined or predetermined) near15 "2044") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:03 PM |
| L113 | 6 | L112 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L114 | 4 | L113 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L115 | 18 | ((pre?determined or predetermined) near15 "2044") and ((association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L116 | 13 | L115 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L117 | 0 | L116 and (H04W80/08 or H04W76/11 or H04W72/0446 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L118 | 38 | (TID Aggregation limit$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:47 PM |
| L119 | 37 | L118 and (A?MPDU or (Aggregate MAC protocol data unit) or (A MPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:52 PM |
| L120 | 32 | L119 and (user info$8) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:53 PM |
| L121 | 11 | L120 and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:54 PM |
| L122 | 7 | L121 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:38 PM |
| L123 | 7 | L122 and (Trigger$3 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:41 PM |
| L124 | 14 | (without near10 indicat$5 near25 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:53 PM |
| L125 | 9 | L124 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L126 | 0 | (without near10 indicat$5 near25 (BSS color)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L127 | 0 | (trigger frame$1) near25 ("no" or "not") near25 indicat$5 near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L128 | 3 | (trigger frame$1) near25 ("no" or "not") near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L129 | 0 | (trigger frame$1) near25 (does) near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:59 PM |
| L130 | 0 | (trigger frame$1) near45 (does) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L131 | 67 | (trigger frame) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L132 | 39 | (trigger frame) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:01 PM |

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|---|---|---|---|---|---|---|---|
| L133 | 0 | (trigger frame) near45 (no) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:02 PM |
| L134 | 0 | (trigger frame) near45 ("not") near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:02 PM |
| L135 | 0 | (trigger frame) near45 (does) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L136 | 0 | (trigger frame) near45 does near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L137 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L138 | 84 | (trigger frame) near45 color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L139 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L140 | 0 | (trigger frame) near45 "does" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L141 | 240 | (trigger frame) near45 do$2 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L142 | 35 | L132 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:05 PM |
| L143 | 3 | active BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:41 AM |
| L144 | 0 | active BSS color | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/13 06:42 AM |
| L145 | 3 | L143 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L146 | 0 | L145 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L147 | 43 | partial BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L148 | 38 | L147 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L150 | 34 | L148 and (H04W80/08 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 |

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|---|---|---|---|---|---|---|---|
| | | or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | 07:14 AM |
| L151 | 25 | L150 and (trigger$4 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:29 AM |
| L152 | 68 | ((partial BSS color) or (partial Basic Service Set)) and ((partial AID) or (partial association)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:53 AM |
| L153 | 29 | L152 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:55 AM |
| L154 | 17 | ((((partial BSS color) or (partial Basic Service Set)) near10 PPDU) and (((partial AID) or (partial association)) near10 PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:00 AM |
| L155 | 15 | L154 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:01 AM |
| L156 | 697 | ((BSS color) near25 indicat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:22 PM |
| L157 | 270 | ((BSS color) near25 indicat$5)same (PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:27 PM |
| L158 | 155 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L159 | 118 | L158 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L160 | 95 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:31 PM |
| L161 | 92 | L160 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L162 | 72 | L161 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |
| L163 | 16 | L162 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:41 PM |
| L164 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) same (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L165 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and(Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L166 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L167 | 0 | L166 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L168 | 4 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L169 | 0 | L168 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L170 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L177 | 94 | ((BSS color) near25 indicat$5)same (PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |

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|---|---|---|---|---|---|---|---|
| | | and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | | | | | |
| L178 | 91 | L177 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L179 | 71 | L178 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L180 | 16 | L179 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L181 | 8 | L180 and (BSS color change$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L183 | 2 | L181 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:43 PM |
| L184 | 0 | L181 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:50 PM |
| L185 | 1 | L177 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L186 | 11 | ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L187 | 10 | L186 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L188 | 15 | ((partial Basic service set) near5 color) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:52 PM |
| L189 | 15 | L188 and (@ad or @rlad or @prad or @ptad)<"20170414" | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| L190 | 13 | L177 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L191 | 9 | L190 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L192 | 9 | L191 and (H04W80/08 or H04W76/11 or H04W72/0446 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:19 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L195 | 1 | ("20160212246").PN. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:34 PM |
| L196 | 0 | L195 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:35 PM |
| L197 | 1 | L195 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:36 PM |
| L198 | 0 | L197 and (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:37 PM |
| L199 | 11 | ("20160212246" OR "20160330742" OR "20160353275" OR "20170325178" OR "20180146426" OR "20180184285" OR "20180227950" OR "20180242355" OR "20190182864" OR "20200037395" OR "20210127427").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:45 PM |
| L200 | 2 | ("20160174254" OR "20170070962").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:48 PM |
| L203 | 1 | ("17/670,419").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L204 | 2 | ("16/590,302").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L205 | 170 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:54 PM |
| L206 | 156 | L205 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:55 PM |

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| | | H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L207 | 245 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L208 | 220 | L207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L209 | 124 | L206 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L210 | 121 | L208 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L212 | 65 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND (((trigger$ frame$1) near25 ((resource unit$1) OR RU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L213 | 47 | L212 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L214 | 36 | L213 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:16 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L215 | 36 | ((trigger$ frame$1) near25 ((resource unit$1) OR RU)) AND L209 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:22 PM |
| L216 | 2 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L217 | 1 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L218 | 1689 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:26 PM |
| L219 | 369 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) AND (transmitter address) AND (receiver address ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L220 | 294 | L219 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L222 | 209 | L220 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:29 PM |
| L223 | 161 | L222 AND (( physical layer protocol data unit) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:35 PM |

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|---|---|---|---|---|---|---|---|
| | | OR PPDU) | | | | | |
| L224 | 25 | L223 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:42 PM |
| L225 | 185 | (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:50 PM |
| L226 | 140 | L225 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L227 | 38 | L226 AND ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L228 | 102 | L226 NOT L227 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:52 PM |
| L229 | 67 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:03 PM |
| L230 | 51 | L229 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:04 PM |
| L231 | 48 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:09 PM |
| L232 | 46 | L231 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W74/002).cpc. | | | | | |
| L233 | 25 | L232 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L234 | 0 | WO02016024770 | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:56 PM |
| L235 | 0 | WO2016024770 | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:56 PM |
| L236 | 1 | "10440751".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:58 PM |
| L237 | 1 | "10448333".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:01 PM |
| L238 | 0 | "2017070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L239 | 1 | "20170070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L240 | 1 | "20180270038".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:05 PM |
| L241 | 185 | (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L242 | 0 | L241 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L243 | 271 | (((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L244 | 0 | L243 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L245 | 68 | (((trigger$ frame$ ) near25 ((resource unit) OR RU)) ) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L246 | 48 | L245 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L247 | 37 | L246 AND (H04W80/08 OR H04W72/0446 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:35 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L248 | 37 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:25 AM |
| L249 | 1 | L217 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L250 | 2676 | ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L251 | 10 | L250 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L252 | 5 | L251 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L253 | 17 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:14 PM |
| L254 | 17 | L253 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:16 PM |
| L255 | 0 | L254 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 03:09 PM |
| L256 | 18 | ((Partial Association ID) near45 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L257 | 12 | L256 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L258 | 38 | ((Partial Association ID) near45 (BSS color)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |
| L259 | 34 | L258 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |

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|---|---|---|---|---|---|---|---|
| L260 | 3650 | (trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:35 PM |
| L261 | 2727 | L260 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:35 PM |
| L262 | 874 | ((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:36 PM |
| L263 | 780 | L262 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:36 PM |
| L265 | 416 | L263 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:37 PM |
| L266 | 1353 | ((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:42 PM |
| L267 | 1205 | L266 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| L268 | 361 | L267 AND (@ad OR @rlad OR @prad OR | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, | ADJ | ON | ON | 2023/05/05 08:43 PM |

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|---|---|---|---|---|---|---|---|
| | | @ptad)<"20170414" | KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | |
| L269 | 166 | (((trigger$ frame$1) OR (trigger$?frame$1) ) SAME (PPDU OR (physical layer protocol data unit)) SAME (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:01 PM |
| L270 | 160 | L269 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:02 PM |
| L271 | 73 | L270 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:03 PM |
| L272 | 883 | (((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) AND ((bit OR bits OR bitmap$ OR bit?map$) SAME ("0" OR zero)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:09 PM |
| L273 | 782 | L272 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:09 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L274 | 362 | L273 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:09 PM |
| L275 | 20 | L274 AND (((target beacon transmission time) OR TBTT) AND (target beacon transmission time)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:14 PM |
| L276 | 1222 | (((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) AND ((bit OR bits OR bitmap$ OR bit?map$) SAME ("0" OR zero)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:16 PM |
| L277 | 1094 | L276 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:16 PM |
| L278 | 146 | L277 AND (((target beacon transmission time) OR TBTT) AND (target beacon transmission time)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:17 PM |
| L279 | 10 | L278 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:17 PM |
| L280 | 10 | L275 AND ((((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour)) near45 (adjut$ OR modif$ OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:24 AM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | chang$)) | | | | | |
| L281 | 288 | (user info) SAME (trigger$ frame$1) SAME (resource$1 near5 (unit$1 OR allocat$)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:54 AM |
| L282 | 330 | ((user info) OR (per user information) OR (per?user information) OR (per?user?information)) SAME (trigger$ frame$1) SAME (resource$1 near5 (unit$1 OR allocat$)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:56 AM |
| L283 | 302 | L282 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:57 AM |
| L284 | 192 | L283 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:00 AM |
| L285 | 15 | L284 AND ((((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour)) near45 (adjut$ OR modif$ OR chang$)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:03 AM |
| L286 | 3 | L280 AND (((intra?BSS) OR (intra BSS)) SAME ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour))) AND (((inter?BSS) OR (inter BSS)) SAME ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:09 AM |
| L287 | 3 | L286 AND (((HE?SIG?A) OR (HE SIG A)) SAME ((BSS?color) OR (BSS color) OR (BSS?colour) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:13 AM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | OR (BSS colour))) | | | | | |
| L288 | 594 | ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour)) SAME (HE?SIG?A OR (HESIG?A)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2024/01/29 08:44 PM |
| L289 | 343 | L288 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2024/01/29 08:45 PM |
| L290 | 312 | L289 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2024/01/29 08:45 PM |
| L291 | 9 | ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour)) near5 (active) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2024/01/29 08:47 PM |

## PE2E SEARCH - Search History (Interference)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| N16 | 1716 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:35 PM |
| N17 | 537 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:36 PM |
| N18 | 370 | (((trigger$3 frame$1) and ((physical layer protocol data unit) or PPDU))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N19 | 303 | N18 and (H04W80/08 or H04W76/11 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| N20 | 29 | N16 and N19 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:38 PM |
| N21 | 4 | N19 and (insert$5 near25 (trigger frame$1)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:39 PM |
| N22 | 2 | N16 and N21 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:40 PM |
| N23 | 80 | N19 and ((Basic Service Set$1) or BSS).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N24 | 15 | N16 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N25 | 15 | N17 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N26 | 67 | N23 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:43 PM |
| N171 | 1 | ((((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N172 | 1805 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N173 | 1 | N172 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N174 | 595 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | (("KWAK") near3 ("Jinsam"))).INV. | | | | | |
| N175 | 1 | N174 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N176 | 1 | N171 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N193 | 6 | ((partial Basic service set) near5 color).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| N194 | 5 | N193 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:54 PM |
| N195 | 13 | ((( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N196 | 4 | N195 AND N174 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N197 | 4 | N172 AND N195 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N201 | 0 | (((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" )).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| N202 | 28 | ((((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1)))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:08 PM |
| N203 | 5 | N202 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:09 PM |
| N204 | 11 | (((Partial Association ID) SAME (BSS color))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N205 | 5 | N204 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N206 | 1 | "11284475".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:55 PM |
| N207 | 34 | (((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| N208 | 34 | N207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:44 PM |
| N209 | 8 | N208 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:44 PM |
| N210 | 2 | ((((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) AND ((bit OR bits OR bitmap$ OR bit?map$) SAME ("0" OR zero))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:17 PM |
| N211 | 0 | N210 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:18 PM |
| N212 | 58 | ((((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour)))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:18 PM |
| N213 | 16 | N212 AND N174 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:19 PM |
| N214 | 55 | N212 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:21 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| N215 | 36 | N214 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:21 PM |

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# ELECTRONIC PAYMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **17/670,419** | **02/01/2024 02:12:11 PM Z ET** | **B-10124CON1 633517-8** |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Young Seok Koo |
| PATENT CENTER # | 64174745 | AUTHORIZED BY | - |
| CUSTOMER # | 158747 | FILING DATE | 02/11/2022 |
| CORRESPONDENCE ADDRESS | - | FIRST NAMED INVENTOR | Geonjung KO |

## Payment Information

| PAYMENT METHOD | PAYMENT TRANSACTION ID | PAYMENT AUTHORIZED BY |
|---|---|---|
| **CARD / 1025** | **E202421E12396006** | **Young Seok Koo** |

| FEE CODE | DESCRIPTION | ITEM PRICE($) | QUANTITY | ITEM TOTAL($) |
|---|---|---|---|---|
| 1814 | STATUTORY DISCLAIMER, INCLUDING TERMINAL DISCLAIMER | 170.00 | 1 | 170.00 |
| | | | **TOTAL AMOUNT:** | **$170.00** |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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United States Patent and Trademark Office
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# APPROVAL LETTER

| APPLICATION # | FILING DATE | APPLICANT/PATENT UNDER REEXAMINATION |
|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

**Electronic terminal disclaimer filed on 02/01/2024**

☑ Approved

**This patent is subject to a Terminal Disclaimer**

**Approved / Disapproved by: Electronic Terminal Disclaimer automatically approved**

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# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **17/670,419** | **02/01/2024 02:12:11 PM Z ET** | **B-10124CON1 633517-8** |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Young Seok Koo |
| PATENT CENTER # | 64174745 | FILING DATE | 02/11/2022 |
| CUSTOMER # | 158747 | FIRST NAMED INVENTOR | Geonjung KO |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | - |

## Documents

**TOTAL DOCUMENTS: 2**

| DOCUMENT | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|
| petition-request.pdf | 3 | Terminal Disclaimer-Filed (Electronic) | 45 KB |
| grantLetter.pdf | 1 | Terminal Disclaimer-Electronic-Approved | 18 KB |

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| petition-request.pdf | 85420992EB5D462718ECE8DFD94C64690E770B818E62CA5D4748AFDCEF77D4FE7A00FBCF6BD39E377078B19FC36A599F17C15B81296C13D3FA18F9F9FF05CAC4 |

grantLetter.pdf

9BEC747ECAAC43EDB2CC26291D075A0004B0A28192C03DB
B381BA731BFCDC49C358EF82E25A9B81B2D0628A414846C2
E2B69F103D875378F03AD99B1D92DBD8E

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**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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# TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT

| APPLICATION # | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET # |
|---|---|---|---|
| 17670419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

| | |
|---|---|
| ✓ | Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action |
| ✓ | This electronic Terminal Disclaimer is not being used for a Joint Research Agreement. |

| Owner | Percent interest |
|---|---|
| WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | 100% |
| SK TELECOM CO., LTD. | 100% |
| **Total** | **200%** |

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

| Application # | Filing Date |
|---|---|
| 17670424 | 02/12/2022 |

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

---

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

| Patent # |
|---|
| 11284475 |

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
• expires for failure to pay a maintenance fee;
• is held unenforceable;
• is found invalid by a court of competent jurisdiction;
• is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
• has all claims canceled by a reexamination certificate;
• is reissued; or
• is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal

disclaimer.

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 Terminal disclaimer fee under 37 CFR 1.20(d) included with Electronic Terminal Disclaimer request.

**Applicant claims the following entity status:**
Regular Undiscounted

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I hereby declare that all statements made herein of my own knowledge are true and that all statemnts made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

---

I certify, in accordance with 37 CFR 1.4(d)(4) that I am: An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

| Signature | Name | Registration # |
|---|---|---|
| /Young Seok Koo/ | Young Seok Koo | L0792 |

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* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP 324.

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# ELECTRONIC ACKNOWLEDGEMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| **17/670,419** | **12/11/2023 10:18:55 PM Z ET** | **B-10124CON1 633517-8** |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Azatuhi Chinaryan |
| PATENT CENTER # | 63572147 | FILING DATE | 02/11/2022 |
| CUSTOMER # | 158747 | FIRST NAMED INVENTOR | Geonjung KO |
| CORRESPONDENCE ADDRESS | - | AUTHORIZED BY | Young Seok Koo |

## Documents

**TOTAL DOCUMENTS: 3**

| DOCUMENT | | PAGES | DESCRIPTION | SIZE (KB) |
|---|---|---|---|---|
| 2023-12-11_633517_Response_to_OA_of_9-8-23.pdf | | 11 | - | 243 KB |
| 2023-12-11_633517_Response_to_OA_of_9-8-23-A...pdf | (1-1) | 1 | Amendment/Request for Reconsideration-After Non-Final Rejection | 91 KB |
| 2023-12-11_633517_Response_to_OA_of_9-8-23-CLM.pdf | (2-4) | 3 | Claims | 98 KB |
| 2023-12-11_633517_Response_to_ | (5-11) | 7 | Applicant Arguments/Remarks Made in an Amendment | 211 KB |

OA_of_9-8-23-REM.pdf

## Digest

| DOCUMENT | MESSAGE DIGEST(SHA-512) |
|---|---|
| 2023-12-11_633517_Response_to_OA_of_9-8-23.pdf | 05B3886F80B72E26FB93FF5AF6273713FF2D32E9E7D4C2BFC2D09B6322ACFE15BC9223D2E251CEEC951C6E29C053186A3AD2F167B9471F4EB3788829D1A4150C |
| 2023-12-11_633517_Response_to_OA_of_9-8-23-A....pdf | E7703967C3E7DF008FD53D14C58704F395A5FE6D2B76430A5E415D32CD4839C1986B9C61349B38E8EDB803EC6F4DACF186C36E771C9A0F1506C5FB679ABC6337 |
| 2023-12-11_633517_Response_to_OA_of_9-8-23-CLM.pdf | E72B1AC6B9DCE4F47681449FEE7952A53EC6B126025B9421C57E8443373743B3728B88D1CD586F41F46E8946BEA498C34FB25CD582F189941A517B3B2F9F04EC |
| 2023-12-11_633517_Response_to_OA_of_9-8-23-REM.pdf | 0421C7170D07C2FADCCAEEFCE4B3B805D8E981EA2F4B3562D9E815E107DFB3D74C8FF784064DA59DBFEF0DB50141043B9D2878D7744CF514BFEA481FC085A3C2 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | | |
|---|---|---|---|
| First Named Inventor: | Geonjung KO | ) Examiner Name: | Chowdhury, Mohammed Shamsul |
| Application No.: | 17/670,419 | ) Confirmation No.: | 6110 |
| Filing Date: | February 11, 2022 | ) Group Art Unit: | 2467 |
| Title: | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | ) Attorney Docket: | B-10124CON1 633517-8 |
| | | ) Date: | December 11, 2023 |
| | | ) Re: | **Response to Non-Final Office Action of September 8, 2023** |

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

**RESPONSE TO OFFICE ACTION**

Sir:

This paper is submitted in response to the Final Office Action mailed on September 8, 2023 for the subject application. The Applicant hereby petitions under the provisions of 37 C.F.R. §1.136(a) for an extension of time in which to respond to the outstanding Office Action and includes a fee as set forth in 37 C.F.R. §1.17(a) with this response for such extension of time. Please amend the application as follows and consider the Remarks/Arguments set forth below.

**Amendments to the Claims** begin on page 2 of this paper.

**Remarks/Arguments** begin on page 5 of this paper.

All Amendments and Remarks/Arguments are made without prejudice or disclaimer.

## AMENDMENTS TO THE CLAIMS

Please amend the claims to read as indicated in the following list of claims:

**Listing of claims**

1-20. (Canceled).

21. (Currently Amended) A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmit the trigger-based PPDU based on the trigger frame,

wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element,

wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, and

wherein the BSS color is one of identifiers identifying a BSS.

22. (Previously Presented) The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

23. (Previously Presented) The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero,

wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

24. (Currently Amended) A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmitting the trigger-based PPDU based on the trigger frame,

wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element,

wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, and

wherein the BSS color is one of identifiers identifying a BSS.

## REMARKS/ARGUMENTS

The following Remarks/Arguments are in response to the non-Final Office Action mailed on September 8, 2023 (hereinafter "Office Action") for the subject application. Pending in the application are claims 21-24.

In the Office Action, claims 21-23 stand rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-4 of U.S. Patent No. 11,284,475. Claim 24 stands rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-2 of U.S. Patent No. 11,284,475. Claims 21-23 stand provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 21-23 of co-pending Application No. 17/670,424. Claim 24 stands provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claim 24 of co-pending Application No. 17/670,424. Claims 21-22 and 24 stand rejected under 35 U.S.C. §103 as allegedly being obvious over U.S. Patent Application Publication No. 2017/0325202 (hereinafter "Verma") in view of U.S. Patent Application Publication No. 2017/0367129 (hereinafter "Yang"). Claim 23 stands rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Yang and U.S. Patent Application Publication No. 2018/0146426 (hereinafter "Park").

In this response, claims 21 and 24 are amended. No new matter is presented as a result of these amendments. No claim is added or canceled. Claims 1-20 were previously canceled. Accordingly, the claims pending in this application after entry of this response are claims 21-24.

For at least the following reasons, this application should be considered in condition for allowance and passed to issuance.

### *Double Patenting*

In the Office Action, claims 21-23 stand rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-4 of U.S. Patent No. 11,284,475. Claim 24 stands rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-2 of U.S. Patent No. 11,284,475. Claims 21-23 stand provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 21-23 of co-pending Application No. 17/670,424. Claim 24 stands provisionally rejected

on the ground of nonstatutory double patenting as allegedly being unpatentable over claim 24 of co-pending Application No. 17/670,424. Although the Applicant respectfully questions the position taken by the Examiner, solely to expedite the prosecution of the present application and allowance of the claims, claims 21 and 24 are amended to add "*wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element*". Accordingly, the Applicant respectfully requests reconsideration and withdrawal of the double patenting rejections of claims 21-24.

***Claim Rejections – 35 U.S.C. §103***

In the Office Action, claims 21-22 and 24 stand rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Yang. Claim 23 stands rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Yang and Park. These rejections are hereby traversed, and reconsideration and withdrawal are respectfully requested.

**Claim 21**

Claim 21 recites:

*A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:*
*a transceiver configured to transmit and receive wireless signals; and*
*a processor configured to process the wireless signals,*
*wherein the processor is configured to:*
*receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,*
*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,*
*when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and*
*transmit the trigger-based PPDU based on the trigger frame,*
*wherein the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element,*

*wherein when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, and*

*wherein the BSS color is one of identifiers identifying a BSS.*

Verma and Yang do not disclose, teach or suggest each and every limitation recited in claim 21. For example, Verma and Yang fail to disclose, teach or suggest "*when the format of the PPDU including the trigger frame is a PPDU format in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

In the Office Action, the Examiner acknowledges that "**Verma** does **not expressly teach** when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal" (Office Action: page 18; emphasis added).

The Office Action instead contends that:

> Yang explicitly discloses when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal (Fig. 1-11 & ¶0051 - the BSS Color Change procedure comprises multiple stages. An example two stage BSS Color Change procedure is as follows: Fig. 1-11 & ¶0052 - During a first stage, which is also referred to as a transitory period, the AP uses a pre-specified Transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP as soon as the AP determines to change the BSS Color value, e.g., after the detection of a collision with the current BSS Color value. The pre-specified Transitory BSS Color value may also be referred to as the Temporary BSS Color value or the Transient BSS Color value. An example of the pre-specified Transitory BSS Color value (e.g., through standardization or by an operator of the communications system) may be binary value "111111" (or decimal value 63) when the BSS Color is 6 bits. Another example of the pre-specified Transitory BSS Color value may be binary value "000000" (or value 0, i.e., zero). Fig. 1-11 & ¶0053 - A non-transitory BSS Color value is a BSS Color value that is not the pre-specified Transitory BSS Color. For example, if the pre-specified Transitory BSS Color value is binary value

> "111111", a non-transitory BSS Color values may be a binary value from "000000" to "111110". For another example, if the pre-specified Transitory BSS Color value is binary value "000000", a non-transitory BSS Color values may be a binary value from "000001" to "111111". The non-transitory BSS Color value may be randomly selected by the AP. ….the AP may select a non-transitory BSS Color value that hasn't been used in another BSS., Fig. 1-11 & ¶0057 - AP detects a collision with its BSS Color value of "Color 1" at time To 490 and thereafter enters a transitory period 424 (shown as "Transitory Period" on trace 420) by immediately starting to use the pre-specified Transitory BSS Color value (such as binary value "111111", for example) to set the BSS Color subfield in the HE-SIG-A field of all DL HE PPDUs transmitted by the AP (shown as "DL HE PPDU: Transitory Color" on trace 430). Fig. 1-11 & ¶0058 - AP determines a new non-transitory BSS Color value (shown as "Color 2" in FIG. 4) that its BSS will use. ..the AP may select the new non-transitory BSS Color value by itself, with or without information (such as historical information or usage information) to assist in the selection of the new non-transitory BSS Color value. Fig. 1-11 & ¶0059 - A transitory period is defined as a period spanning the time between when the AP starts to use the pre-specified Transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP until the time when the AP starts to use a new non-transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP. The aforesaid disclosures by Yang is similar to instant application, at least in ¶0167, ¶0180 & ¶0184 along with Fig. 12)

(Office Action: pages 17-19). However, in Yang, the Applicant cannot find any specific disclosure, teaching or suggestion that the operations described in paragraphs [0051]-[0053], [0057]-[0059], [0167], [0180] and [0184] of Yang cited above in the Office Action are performed "*when the format of the PPDU including the trigger frame is a PPDU format in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included***" (emphasis added). Otherwise, the Applicant respectfully asks the Examiner to quote exact language of Yang specifically teaching or suggesting that the operations described in paragraphs [0051]-[0053], [0057]-[0059], [0167], [0180] and [0184] of Yang cited above in the Office Action are performed "*when the format of the PPDU including the trigger frame is a PPDU format in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included***" so that the Applicant can properly understand the ground of the rejection and formulate a response (emphasis added).

At most, Yang states that "[d]uring a first stage, which is also referred to as a transitory period, the AP uses a pre-specified Transitory BSS Color value to set the **BSS Color subfield** in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP as soon as the AP determines to change the BSS Color value, e.g., after the detection of a collision with the current BSS Color value" (Yang: paragraph [0052]; emphasis added) and "[a] non-transitory BSS Color value is a

BSS Color value that is not the pre-specified Transitory BSS Color" (Yang: paragraph [0053]). However, nothing in Yang teaches that the "BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs" of Yang is "*a PPDU format in which* ***a physical layer signaling field including the field for indicating the BSS color is not included***" (emphasis added). By way of contrast, claim 21 requires "*when the format of the PPDU including the trigger frame is a PPDU format in which a* ***physical layer signaling field including the field for indicating the BSS color is not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added).

Therefore, Yang does not make up Verma's failure of teaching "*when the format of the PPDU including the trigger frame is a PPDU format in which a* ***physical layer signaling field including the field for indicating the BSS color is not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added).

Further, although the Applicant respectfully disagrees with the Examiner, solely to expedite the prosecution of the present application and allowance of the claims, claim 21 is amended to add the limitation that "*the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element*". Neither Verma nor Yang discloses, teaches or suggests that "*the active BSS color is a BSS color actually used by the wireless communication terminal and set by an Operation element*" as recited in claim 21.

For at least the foregoing reasons, the Applicant respectfully submits that claim 21 is not obvious over Verma in view of Yang, and requests reconsideration and withdrawal of the §103 rejection of claim 21.

**Claims 22-23**

"If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). As discussed above, claim 21 is not obvious over Verma in view of Yang. Park does not cure the deficiency of Verma and Yang with respect to the limitation of claim 21 discussed above. Claims 22-23 depend from claim 21. Therefore, the Applicant respectfully submits that claims

22-23 are not obvious over Verma in view of Yang or over Verma in view of Yang and Park at least by way of their dependencies from claim 21, and requests reconsideration and withdrawal of the §103 rejections of claims 22-23.

**Claim 24**

The Applicant respectfully submits that arguments similar to the arguments set forth for claim 21 can be used, *mutatis mutandis*, to show that claim 24 is not obvious over Verma in view of Yang, and requests reconsideration and withdrawal of the §103 rejection of claim 24.

## CONCLUSION

It is believed that all of the grounds of rejection have been properly traversed, accommodated, or rendered moot. The Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (323) 934-2300.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, then the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136 (a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

I hereby certify that this document is being transmitted electronically to the United States Patent and Trademark Office via electronic filing.

December 11, 2023
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

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# ELECTRONIC PAYMENT RECEIPT

| APPLICATION # | RECEIPT DATE / TIME | ATTORNEY DOCKET # |
|---|---|---|
| 17/670,419 | 12/11/2023 10:18:55 PM Z ET | B-10124CON1 633517-8 |

## Title of Invention

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

## Application Information

| | | | |
|---|---|---|---|
| APPLICATION TYPE | Utility - Nonprovisional Application under 35 USC 111(a) | PATENT # | - |
| CONFIRMATION # | 6110 | FILED BY | Azatuhi Chinaryan |
| PATENT CENTER # | 63572147 | AUTHORIZED BY | Young Seok Koo |
| CUSTOMER # | 158747 | FILING DATE | 02/11/2022 |
| CORRESPONDENCE ADDRESS | - | FIRST NAMED INVENTOR | Geonjung KO |

## Payment Information

| PAYMENT METHOD | PAYMENT TRANSACTION ID | PAYMENT AUTHORIZED BY |
|---|---|---|
| CARD / 1025 | E2023BAM19419602 | Azatuhi Chinaryan |

| FEE CODE | DESCRIPTION | ITEM PRICE($) | QUANTITY | ITEM TOTAL($) |
|---|---|---|---|---|
| 1251 | EXTENSION FOR RESPONSE WITHIN FIRST MONTH | 220.00 | 1 | 220.00 |
| | | | TOTAL AMOUNT: | $220.00 |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
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| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>17/670,419 | Filing Date<br>02/11/2022 | ☐ To be Mailed |
|---|---|---|---|

**ENTITY:** ☑ LARGE ☐ SMALL ☐ MICRO

## APPLICATION AS FILED - PART I

| FOR | (Column 1)<br>NUMBER FILED | (Column 2)<br>NUMBER EXTRA | | RATE ($) | FEE ($) |
|---|---|---|---|---|---|
| ☐ BASIC FEE<br>(37 CFR 1.16(a), (b), or (c)) | N/A | N/A | | N/A | |
| ☐ SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m)) | N/A | N/A | | N/A | |
| ☐ EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q)) | N/A | N/A | | N/A | |
| TOTAL CLAIMS<br>(37 CFR 1.16(i)) | minus 20 = | * | | x $100 = | |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h)) | minus 3 = | * | | x $480 = | |
| ☐ APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | | TOTAL | |

## APPLICATION AS AMENDED - PART II

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | 12/11/2023 | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * 4 | Minus | ** 20 | = 0 | | x $100 = | 0 |
| | Independent<br>(37 CFR 1.16(h)) | * 2 | Minus | *** 3 | = 0 | | x $480 = | 0 |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | 0 |

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * | Minus | ** | = | | x $0 = | |
| | Independent<br>(37 CFR 1.16(h)) | * | Minus | *** | = | | x $0 = | |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | |

| | |
|---|---|
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. | SLIE |
| ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". | /ADRIENE D. SELLMAN/ |
| *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". | |
| The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. | |

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 1. | Notice of Hearing dated August 21, 2023 for Indian Patent Application No. 201927042859. |
| | 2. | Office Action dated September 8, 2023 for U.S. Patent Application No. 17/670,424. |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| | |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

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**संदर्भ सं. / Ref. No:**
POD/Application No /201927042859

**प्रेषण दिनांक / Date of Dispatch:**
21/09/2023

सेवा मे, / To

**आवेदक /Applicant:**
WILLIS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.

Registerd Address For Service :CHETAN CHADHA, CHADHA & CHADHA, Advocates, Regus Business Center, Level 2, Connaught Place, Bund Garden Road, Pune 411001, Maharashtra, India.. Email: info@ipattorneys.com

**विपक्षी /Opponent:**
NA

**ई-मेल प्रेषित /Email Sent to:**
info@ipattorneys.com

**विषय:** आवेदन सख्या 201927042859 के संदर्भ मे सुनवाई नोटिस
**Sub:** Hearing Notice in Reference of Application No. 201927042859

**सुनवाई स्थल / Hearing Location:** Through Video Conferencing
**सुनवाई दिनांक व समय / Hearing Date & Time:** 12/09/2023 / 09:00 HRS.(IST) for (30 Mins.)
**नियंत्रक ईमेल /Controller's EmailId:** dkmeena93.ipo@gov.in

आपके द्वारा प्रथम परीक्षण रिपोर्ट/ अनुवर्ती परीक्षण रिपोर्ट के उत्तर के संदर्भ मे, दिनांक 12/09/2023 को 09:00 HRS.(IST) for (30 Mins.) पर विडियो कॉन्फ्रेंसिंग माध्यम से Hearing U/S (14) सुनवाई तय की गयी है; अत:, आपको उपरोक्त दिनांक व समय पर नियंत्रक के समक्ष सुनवाई हेतु उपस्थित होना है;

With reference to your reply to the First examination Report/Subsequent Examination Report, a Hearing U/S (14) hearing has been scheduled in the matter through Video Conferencing on 12/09/2023 at 09:00 HRS.(IST) for (30 Mins.) . You are therefore, required to appear before the Controller for the hearing on said date and time.

इस आवेदन पर पेटेंट अनुदान हेतु कृपा से नीचे दी गयीं आपत्ति को पूर्व / अंतिम दिनांक के बाद, विद्यमानतः आपत्तियां अभी भी शेष हैं;
The following objection(s) are still outstanding before / after the expiry of last date for putting this application in order for grant of patent.

Deepak Kumar Meena
Assistant Controller of Patents & Designs

*Examination, Fees, Date(s) & Hearing(s) के बारे में अब नियंत्रक का निर्णय, कृपया निम्नलिखित यूआरएल देखें http://ipindiaservices.gov.in/PatentCauseList.
Please refer to the following URL for Date/Time, Venue, Status and other details about the Hearing
http://ipindiaservices.gov.in/PatentCauseList

टिप्पणी:- विडियो कॉन्फ्रेंसिंग के माध्यम से सुनवाई के समय के संबंध में अलग मेल भेजी जाएगी;
Note:- Separate mail will be sent regarding the time of the Hearing through Video Conference.

* Hearing Objections are attached.

# THE PATENT OFFICE

Date-21-08-2023

**Objections**

**Formal Requirement(s)**

1. 1. FORM-6 in favour of the Deed of assignment between applicant WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC and SK TELECOM CO. LTD as submitted on 23/10/2019(as per e-module) is required to be filed by the applicant.

**Other Requirement(s)**

1. 1. The applicant shall, as soon as possible (at least three days before the scheduled hearing), notifying the Controller whether he will attend the hearing as per rule 28(4). Otherwise, it may be considered, the applicant is not interested.

   2. In the scheduled hearing, those people who have a valid PA/GPA will attend the hearing under section 127 & 132 of the Indian Patent Act, 1970 (as amended).

| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 48764159 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 25-OCT-2023 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 22:56:25 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| Submitted with Payment | no |
|---|---|

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2023-10-25_633517_IDS.pdf | 239922<br>24943a5e004fed3cf18b589216cc710206ae120a | yes | 4 |

| | Multipart Description/PDF files in .zip description | | | | |
|---|---|---|---|---|---|
| | **Document Description** | | **Start** | **End** | |
| | Transmittal Letter | | 1 | 3 | |
| | Information Disclosure Statement (IDS) Form (SB08) | | 4 | 4 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Other reference-Patent/Application/ Search Documents | Ref1_IN201927042859_Hearing_Notice_8-21-23.pdf | 102208<br>7ce93a59edd317ccc9ba7d1737f99d1cd0769d28 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Other reference-Patent/Application/ Search Documents | Ref2_US17670424_3rdOA_9-8-23.pdf | 1722068<br>83cd54f95d4bfc3e316c2b9f0340ddb31d9f9fdd | no | 29 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 2064198 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | Examiner: Chowdhury, Mohammad Shamsul |
| Serial No.: 17/670,419 | Art Unit: 2467 |
| Filing Date: February 11, 2022 | Conf. No.: 6110 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Our Ref: B-10124CON1 633517-8 |
| Date: October 25, 2023 | Re: ***Information Disclosure Statement*** |

**INFORMATION DISCLOSURE STATEMENT**

**Mail Stop Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97 and 1.98 to disclose information that may be relevant to the above-identified patent application. The Applicant requests the Examiner consider the documents listed on the enclosed form PTO-1449 (modified) in the examination of this application.

The filing of this Information Disclosure Statement (IDS) shall not be construed as a representation that a search has been made (37 C.F.R. 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability, or that no other material information exists.

The filing of this Information Disclosure Statement shall not be construed as an admission against interest in any manner (37 C.F.R § 1.97(h)).

If any additional fee is required for this filing, the Applicant requests the Examiner contact a practitioner associated with the Customer Number listed below for authorization.

This information disclosure statement also includes the statements marked below. Failure to mark a statement should not be construed as a negative assertion.

*Timing and Fees*

This IDS is being filed:

[ ] Concurrently with the application, and no fee is due.

[ ] Within three months of the filing of the national application, other than a continued prosecution application under § 1.53(d), and no fee is due.

[ ] Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, and no fee is due.

[ ] Before the mailing of a first Office Action on the merits, and no fee is due.

[ ] Before the mailing of a first Office Action after the filing of a request for continued examination under§ 1.114, and no fee is due.

---

[x] After the periods described above, and before a final Office Action under § 1.113, a Notice of Allowance under § 1.311, or an action that otherwise closes prosecution in the application, and is

- [ ] accompanied by the fee set forth in § 1.17(p), or
- [x] filed with the statement set forth in 37 C.F.R. 1.97(e)(1): That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2): That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

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[ ] After the periods described above, and is accompanied by the fee set forth in § 1.17(p), and is

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

[ ] Concurrently with a Request for Continued Examination, and no additional fee is due for this IDS.

*Items Disclosed*

At least one item listed on the enclosed form PTO-1449 (modified) was

[x] Cited in an Office Action for a related application, the application number of the related application and the issue date of the Office Action are provided below and the Office Action is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

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[ ] Cited in an International Search Report (ISR) or an International Preliminary Report on Patentability (IPRP) or a Written Opinion (WO) of the International Searching Authority (ISA) for the related PCT Application, the PCT application number and the issue date of the ISR/IPRP/WO are provided below and the ISR/IPRP/WO is enclosed.

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*Additional Information*

[ ] Translations of the foreign-language documents are also enclosed as machine-translations, human-translations, or counterpart applications as noted. Machine translations were provided by the Japanese Patent Office, ESPACENET, Google Documents, Patent Fetcher® /ESPACENET, Google Translate or Google Translator Toolkit as noted and with OCR by Adobe Acrobat 9 or ABBYY PDF Transformer 3 if needed.

[ ] English-language abstracts of foreign-language documents are provided.

[x] Documents listed on the enclosed ISR/IPRP/WO or the Office Action have relevance at least as described therein.

[ ] The documents with the following reference numbers were described in the specification of the present application; omission of a reference from this list does not indicate that it was not discussed in the specification of the present application.

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[x] At least one of the references cited in the Office Action listed on the attached PTO-1449 (modified) were previously submitted in an IDS or cited by the Examiner for the present application on September 8, 2023 and therefore are not submitted in this IDS.

[ ] Other:

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

October 25, 2023
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

/ Young Seok Koo 76255 /

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

158747 7590 09/08/2023

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SUITE 240
LOS ANGELES, CA 90010

| EXAMINER | |
|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2467 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 09/08/2023 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

LA_MAIL@la.ladas.com
achinaryan@la.ladas.com
ykoo@la.ladas.com

| *Office Action Summary* | Application No. 17/670,419 | Applicant(s) KO et al. | |
|---|---|---|---|
| | Examiner MOHAMMED S CHOWDHURY | Art Unit 2467 | AIA (FITF) Status Yes |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☑ Responsive to communication(s) filed on 17 August 2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims***

5) ☑ Claim(s) 21-24 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 21-24 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

**Application Papers**

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

**TAILED ACTION**

1. The following is a **non-final office** action in response to applicant's amendment filed on **08/17/2023** for response of the office action mailed on **05/18/2023**. Independent claims **21** and **24** are amended. No claims are added or cancelled. Therefore, claims **21-24** are pending and addressed below.

***Notice of Pre-AIA or AIA Status***

2. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

***Information Disclosure Statement***

3. The information disclosure statement (IDS) submitted on **08/18/2023** is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

***Continued Examination Under 37 CFR 1.114***

4. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on **08/17/2023** has been entered.

***Double Patenting***

*5.* The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting

claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

6. Claims **21-23** are rejected on the ground of nonstatutory double patenting as being unpatentable over claims **1-4** of U.S. Patent No. **US 11,284,475 B2.** Although the claims at issue are not identical, they

are not patentably distinct from each other because claims **21-23** are "anticipated by" claims **1-4** of U.S. Patent No. **US 11,284,475 B2**

| **Application No. 17/670,419 (Instant)** | **US 11,284,475 B2** |
|---|---|
| 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger | 1. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the |

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| frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>22. The wireless communication terminal of | trigger-based PPDU based on the trigger frame, wherein the BSS color is one of identifiers identifying a BSS, wherein the active BSS color indicates a BSS color actually used by the wireless communication terminal.<br>2. The wireless communication terminal of claim 1, wherein the processor is configured to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change.<br>3. The wireless communication terminal of claim 2, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>4. The wireless communication terminal of claim 1, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS |

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| claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. | PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate part of an AID value, wherein the Intra-BSS PPDU is a PPDU transmitted from the BSS including the wireless communication terminal, and the Inter-BSS PPDU is a PPDU transmitted from the BSS not including the wireless communication terminal. |

7. Claim **24** is rejected on the ground of nonstatutory double patenting as being unpatentable over claims **1-2** of U.S. Patent No. **US 11,284,475 B2.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **24** is "anticipated by" claims **1-2** of U.S. Patent No. **US 11,284,475 B2**

| **Application No. 17/670,419 (Instant)** | **US 11,284,475 B2** |
|---|---|
| 24. A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising: receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger | 1. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical |

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| frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmitting the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active | layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, wherein the BSS color is one of identifiers identifying a BSS, wherein the active BSS color indicates a BSS color actually used by the wireless communication terminal.<br>2. The wireless communication terminal of claim 1, wherein the processor is configured to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS |

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| BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS. | color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change. |

8. Claims **21-23** are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims **21-23** of co-pending **Application No. 17/670,424.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **21-23** are "anticipated by" claims **21-23** of co-pending **Application No. 17/670,424**.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

| **Application No. 17/670,419 (Instant)** | **Application No. 17/670,424 (co-pending)** |
|---|---|
| 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, | 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, |

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|---|---|
| wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active | wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color |

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| BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>22. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. | change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>23. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. |

9. Claim **24** is provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim **24** of co-pending **Application No. 17/670,424.** Although the claims at issue

are not identical, they are not patentably distinct from each other because claim **24** is "anticipated by" claim **24** of co-pending **Application No. 17/670,424**.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

| **Application No. 17/670,419 (Instant)** | **Application No. 17/670,424 (co-pending)** |
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| 24. A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising: receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when | 24. A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising: receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes an identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for |

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| the format of the PPDU including the trigger frame is a PPDU format in which physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmitting the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS. | indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, transmitting the trigger-based PPDU based on the trigger frame, and when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS. |

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***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

In event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or

nonobviousness.

12. **Claims 21-22** and **24** are rejected under 35 U.S.C. 103 as being unpatentable over Verma et al. (2017/0325202), Verma hereinafter, in view of Yang et al. (2017/0367129), Yang hereinafter.

**Re. Claims 21** and **24,** Verma teaches a method (¶0008/¶0011) of operating a wireless communication terminal (Fig. 12,STA, 115 / Fig. 2, STA1-2) wirelessly (Fig. 2) communicating with a base wireless communication terminal (Fig. 7, AP, 105 / Fig. 2, AP 105) and a wireless communication terminal (Fig. 12,STA, 115 / Fig. 2, STA1-2) wirelessly (Fig. 2) communicating with a base wireless communication terminal (Fig. 7, AP, 105 / Fig. 2, AP 105), the wireless communication terminal comprising: a transceiver (Fig. 12, 1202) configured to transmit and receive wireless signals (Fig. 2 / Fig.12 & ¶0120 - ***transceiver 1202 for receiving and transmitting radio transmissions****, for example, wireless communications transmitted by at least one AP 105 or wireless transmissions transmitted by another STA 115*); and a processor (Fig. 12, 1212) configured to process the wireless signals (Fig. 2 / Fig. 12 & ¶0115 - ¶0118), wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes an identifier which identifies a wireless communication terminal which is triggered by the trigger frame, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal (Fig. 2-12 & ¶0011 - ***receiving, at a STA, a trigger frame*** *from an AP. The* ***trigger frame*** *may include a* ***per-user information field****. The method may further include decoding the* ***trigger frame to identify whether one or more resources allocated to the STA are a single user resource unit allocation*** *or a* ***multi-user resource unit allocation****. The method may further include*

*communicating with* ***the AP on the one or more resources allocated to the STA by the AP based on the decoding***. Fig. 2-12 & ¶0035 - ***BSS color is a field in the HE trigger-based PPDU,*** *aspects of the present disclosure ensure that it is set correctly in order to be identical value by* ***all non-AP STAs transmitted the HE trigger-based PPDU***. Fig. 2-12 & ¶0054 - ***trigger frame 302*** *may include a* ***common information field 305*** *that may include information shared by a plurality of the STAs 115 on the network. The* ***trigger frame 302*** *may also include* ***a per-user information field 310 that may include information specific to each STA***. Fig. 2-12 & ¶0058 - ***table 400*** *that identifies one example of* ***bit value****s that may be assigned to a* ***resource unit allocation subfield*** *of the per-user information field of* ***the trigger frame*** *to identify whether the one or more* ***resources allocated to the at least one STA are the single user resource unit allocation*** *or the Vigermulti-user resource unit allocation.* Fig. 2-12 & ¶0059 - *in table* ***400, the seven (7) bit*** *indices of the resource unit allocation subfield* ***(see FIG. 3B, RU Allocation 320****) may utilize the* ***identified bit values to convey the identified message to the STA*** *based on t****he determination whether at least one or more allocated resource units are SU or MU***. Fig. 2-12 & ¶0065 - *At* ***block 520****, the method may include t****ransmitting the trigger frame to the at least one STA****……the* ***trigger fram****e may also include* ***resource allocation information*** *for the STAs to utilize for uplink transmission.)*, when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame(Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to th****e common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****….when AID12=0, type dependent per user information field of the* ***trigger frame*** *may be repurposed to i****ndicate the BSS color information****….when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to*

*AID=0. Thus,* ***all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0051 - *the* ***BSS color information*** *may be added to the* ***common information field*** *(see FIG. 3A) of* ***the trigger frame 210.*** *Such implementation includes an advantage that* ***color for HE_Trig PPDU*** *is present in the* ***trigger frame 210*****……** ***BSS color information signaling*** *may be type depended* ***per user information field for basic trigger.*** Fig. 2-12 & ¶0055 - *AP may receive from the* ***at least one STA (e.g., associated and/or unassociated STAs) a high efficiency (HE) trigger physical layer convergence procedure protocol data unit (RE Trig PPDU)*** *with a* ***fixed basic service set (BSS) color information*** *in response to the transmission of the* ***trigger frame****.),*transmit the trigger-based PPDU based on the trigger frame (Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to the* ***common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****….when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus,* ***all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0040 - *AP1 105-a and/or AP2 105-b may* ***transmit a trigger frame*** *(see FIG. 3A and 3B) to initiate* ***uplink transmission from one or more STAs in the networ****k. … the request to initiate the* ***uplink transmission (by the AP via trigger frame)*** *may be based on receiving a buffer status report from one or more STAs 115 that may identify the amount of data that each STA may be queued for uplink transmission. … The AP 105 may achieve this goal by utilizing a* ***trigger frame that identifies the STAs 115 that AP 105 requests to initiate uplink transmission and assigns resources for the STA 115 to use when communicating with the AP 105***), wherein the **BSS** color is one of identifiers identifying a **BSS** (Fig. 2-12 & ¶0036 - Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to the* ***common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU*****……*****all the associated and unassociated STAs may transmit***

***HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0049 - *the AP 105 first* ***identifies a BSS color information*** *and inserts the* ***BSS color information in all the packets sent by the HE AP 105 to the STAs 115****, including the trigger frame 210. In response, the STAs 115 may add the* ***BSS color information identified*** *by the* ***AP 105 in the trigger frame into the packets it sends out****).*

Yet, Verma does not **expressl**y teach when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

However, in the analogous art, Yang **explicitly** discloses when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal (Fig. 1-11 & ¶0051 - *the* ***BSS Color Change procedure*** *comprises multiple stages. An example t****wo stage BSS Color Change*** *procedure is as follows:* Fig. 1-11 & ¶0052 - *During a first stage, which is also referred to as a transitory period, the AP uses a* ***pre-specified Transitory BSS Color*** *value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP as soon as the AP determines to change the BSS Color value, e.g.,* ***after the detection of a collision with the current BSS Color value****.* ***The pre-specified Transitory BSS Color value may also be referred to as the Temporary BSS Color value or the Transient BSS Color value.*** *An example of the pre-specified Transitory BSS*

*Color value (e.g., through standardization or by an operator of the communications system) may be binary value* ***"111111" (or decimal value 63) when the BSS Color is 6 bits.*** *Another example* ***of the pre-specified Transitory BSS Color value may be binary value "000000" (or value 0, i.e., zero).*** Fig. 1-11 & ¶0053 - *A* ***non-transitory BSS Color*** *value is a BSS Color value that* ***is not the pre-specified Transitory BSS Color****. For example, if the pre-specified Transitory BSS Color value is binary value "111111",* ***a non-transitory BSS Color values may be a binary value from "000000" to "111110".*** *For another example, if the pre-specified Transitory BSS Color value is binary value "000000", a non-transitory BSS Color values may be a binary value from "000001" to "111111".* ***The non-transitory BSS Color value may be randomly selected by the AP****. ….****the AP may select a non-transitory BSS Color value that hasn't been used in another BSS.,*** Fig. 1-11 & ¶0057 - *AP detects a collision with its BSS Color value of "Color 1" at time To 490 and thereafter enters a transitory period 424 (shown as "Transitory Period" on trace 420) by immediately* ***starting to use the pre-specified Transitory BSS Color value*** *(such as binary value* ***"111111****", for example) to set the* ***BSS Color subfield in the HE-SIG-A field of all DL HE PPDUs*** *transmitted by the AP (shown as "DL HE PPDU: Transitory Color" on trace 430).* Fig. 1-11 & ¶0058 - *AP determines a* ***new non-transitory BSS Color value (shown as "Color 2" in FIG. 4)*** *that its BSS will use. ..the AP may select the n****ew non-transitory BSS Color value by itself****, with or without information (such as historical information or usage information) to assist in* ***the selection of the new non-transitory BSS Color value.*** Fig. 1-11 & ¶0059 - *A* ***transitory period*** *is defined as a period spanning the time between* ***when the AP starts to use the pre-specified Transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP*** *until the time when t****he AP starts to use a new non-transitory BSS Color value to set the BSS Color subfield in the HE-SIG-A field of the DL HE PPDUs transmitted by the AP.*** *The aforesaid disclosures by Yang is similar to instant*

*application, at least in ¶0167, ¶0180 & ¶0184 along with Fig. 12)*and when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active **BSS** color is a value of a BSS color indicated by the information on the BSS color change (Fig. 1-11 & ¶0085 - *FIG. 8 illustrates an example format of an Action field 800 in a* ***BSS Color Request action frame****. As shown in FIG. 8, Action field 800 comprises a* ***Category field 810 containing a value indication the action frame*** *is an HE action frame, and an HE Action field 820 containing a value indication the HE action frame is a* ***BSS Color Request action frame requesting the latest non-transitory BSS Color of the BSS****.* Fig. 1-11 & ¶0086 - *An AP receiving a* ***BSS Color Request action frame*** *from a station may respond with a* ***CCN (Color Change Notification)*** *action frame. The AP may unicast the* ***CCN action frame*** *(see Fig. 4) to the requesting station. Alternatively, the AP may broadcast the CCN action frame to all stations. Yet alternatively, if a* ***target Beacon transmission time is near*** *(i.e., with a time threshold) when the AP receives the* ***BSS Color Request action frame,*** *the AP may respond to the requesting station by broadcasting a Beacon frame (BCN frame, see Fig. 4) with an HE Operation element (such as HE Operation element 700) including the* ***latest non-transitory BSS Color of the BSS****.).*

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames at an access point in a wireless local network to include Yang's invention of a system and a method for changing an identifier of a basic service set (BSS) of a wireless telecommunications network, because it provides an efficient mechanism in changing an identifier of a basic service set

(BSS) without causing the stations to pre-maturely enter a power save mode or deny themselves legitimate opportunities for spatially reusing a shared channel for transmissions, in turn, improves, system efficiency and area throughput, and improves real world performance in indoor and outdoor deployments in the presence of high density of APs and stations in a wireless local area network (WLAN) .(¶0002 - ¶0004, Yang)

**Re. Claim 22,** Verma and Yang teach claim 21.

Yet, Verma does not **expressl**y teach wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

However, in the analogous art, Yang **explicitly** discloses wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal. ((Fig. 1-11 & ¶0085 - *FIG. 8 illustrates an example format of an Action field 800 in a* ***BSS Color Request action frame****. As shown in FIG. 8, Action field 800 comprises a* ***Category field 810 containing a value indication the action frame*** *is an HE action frame, and an HE Action field 820 containing a value indication the HE action frame is a* ***BSS Color Request action frame requesting the latest non-transitory BSS Color of the BSS****.* Fig. 1-11 & ¶0086 - *An AP receiving a* ***BSS Color Request action frame*** *from a station may respond with a* ***CCN (Color Change Notification)*** *action frame. The AP may unicast the* ***CCN action frame*** *(see Fig. 4) to the requesting station. Alternatively, the AP may broadcast the CCN action frame to all stations. Yet alternatively, if a* ***target Beacon transmission time is near*** *(i.e., with a time threshold) when the AP receives the* ***BSS Color Request action frame,*** *the AP may respond to the requesting station by broadcasting a Beacon*

*frame (BCN frame, see Fig. 4) with an HE Operation element (such as HE Operation element 700) including the* ***latest non-transitory BSS Color of the BSS****.)*

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames at an access point in a wireless local network to include Yang's invention of a system and a method for changing an identifier of a basic service set (BSS) of a wireless telecommunications network, because it provides an efficient mechanism in changing an identifier of a basic service set (BSS) without causing the stations to pre-maturely enter a power save mode or deny themselves legitimate opportunities for spatially reusing a shared channel for transmissions, in turn, improves, system efficiency and area throughput, and improves real world performance in indoor and outdoor deployments in the presence of high density of APs and stations in a wireless local area network (WLAN) .(¶0002 - ¶0004, Yang)

13. **Claim 23** is rejected under 35 U.S.C. 103 as being unpatentable over Verma, in view of Yang, further in view of Park et al. (2018/0146426), Park hereinafter.

**Re. Claim 23,** Verma and Yang teach claim 21.

Yet, Verma and Yang do not **expressly** teach wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

However, in the analogous art, Park **explicitly** discloses wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor (Fig. 14, 21) determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. (Fig. 8- 13 & ¶0217 - F*or the two NAVs maintained by an HE STA,* ***one is identified as intra-BSS NAV,*** *and the second one is identified as basic NAV.* ***Intra-BSS NAV is used to store NAV value, if needed, from a PPDU identified as intra-BSS.*** *Basic NAV is used to store NAV value, if needed, from a* ***PPDU identified as inter-BSS.*** Fig. 8- 13 & ¶0222 - *The RXVECTOR parameter* ***PARTIAL_AID in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 0*** *is the same as the BSSID[39:47] of the AP to* ***which the STA is associated.*** Fig. 8- 13 & ¶0223 - ***The value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associate****d when the Partial BSS Color field in the most recently received HE Operation element is 1*.).

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames

at an access point and Yang's invention of a system and a method for changing an identifier of a basic service set (BSS) of a wireless telecommunications network to include Park's invention of transmitting a physical layer protocol data unit (PPDU) in a wireless local area network, because it provides an improved protection mechanism to prevent collisions due to simultaneous transmissions of STAs by using high efficiency WLAN system (e.g., IEEE 802.11ax) in the wireless local area network. (¶0004-¶0006, Park)

***Response to Arguments***

14. Applicant's arguments in regards to double patenting issue as mentioned in pages **5-6** of remarks as submitted on **08/17/2023,** is NOT persuasive. Applicant is required to submit a **terminal disclaimer (TD)** in overcoming nonstatutory double patenting rejection as outlined in the office action. See MPEP **804.02.**

15. Applicant's arguments filed on **08/17/2023** have been fully considered but they are not persuasive.

Regarding remarks in pages 7-10 for i**ndependent claim 21** , applicant argues that Verma fails to teach, *" when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame"*. Examiner respectfully disagrees with the applicant. As mentioned in the §103 rejection, Verma discloses that **BSS color information** may be added to th**e common information field (see FIG. 3A, common info field 305)** of the **trigger frame** that may be **transmitted in the HE PPDU**....when AID12=0, type dependent per user information field of the **trigger frame** may be repurposed to i**ndicate the BSS color information**....when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus, **all the associated and unassociated STAs may transmit HE_Trig PPDU (physical layer convergence procedure protocol data unit) with a fixed BSS color (e.g., value 0 or 63).** See ¶0036 along with Fig. 2-12. Verma also discloses that the **BSS color information** may be added to the **common information field** (see FIG. 3A) of **the trigger frame 210.** Such implementation includes an advantage that **color for HE_Trig PPDU** is present in the **trigger frame 210**..... **BSS color information signaling** may be type

depended **per user information field for basic trigger. S**ee ¶0051 along with Fig. 2-12. Verma further discloses that AP may receive from the **at least one STA (e.g., associated and/or unassociated STAs) a high efficiency (HE) trigger physical layer convergence procedure protocol data unit (RE Trig PPDU)** with a **fixed basic service set (BSS) color information** in response to the transmission of the **trigger frame**. See ¶0055 along with Fig. 2-12.

Applicant's allegation towards the limitation, "when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal" is moot, as because, a **new** reference (2017/0367129 ⇔ **Yang** et al ) is used in §**103** rejection.

- For these reasons, it is maintained that independent claim **21** is unpatentable over **Verma**, in view of Yang (2017/0367129 ⇔ **new** reference).
- For similar reasons, it is maintained that independent claim **24** is also, unpatentable over **Verma**, in view of Yang (2017/0367129 ⇔ **new** reference).
- As all other dependent claims depend either directly or indirectly from the independent claim **21,** similar rationale also applies to all respective dependent claims.

***Conclusion***

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- IEEE 802.11-16/1415r2; IEEE P802.11 - Wireless LANs; Author(s): **Abhishek** et al.; Affiliation: **Qualcomm;** November **2016**. See § 9.3.3.1; 9.3.3.6; 9.6.28.3; 9.4.2.22x; 25.1a.1.
- IEEE P802.11 Wireless LANs; Proposed resolution for comments related to Section 27.11.4 (BSS Color; Author(s): **Abhishek** et al.; Affiliation: **Qualcomm;** March **2017.** See pages 2-8.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MOHAMMED SHAMSUL CHOWDHURY whose telephone number is (571)272-0485. The examiner can normally be reached on Monday-Thursday 9 AM- 6 PM EST (Friday Var.).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Phillips can be reached on 571-272-3940. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or

access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MOHAMMED S CHOWDHURY/
Primary Examiner, Art Unit 2467

| Notice of References Cited | Application/Control No. 17/670,419 | Applicant(s)/Patent Under Reexamination KO et al. | |
|---|---|---|---|
| | Examiner MOHAMMED S CHOWDHURY | Art Unit 2467 | Page 1 of 1 |

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| | B | | | | | |
| | C | | | | | |
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**FOREIGN PATENT DOCUMENTS**

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**NON-PATENT DOCUMENTS**

| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|---|
| | U | IEEE 802.11-16/1415r2; IEEE P802.11 - Wireless LANs; Author(s): Abhishek et al.; Affiliation: Qualcomm; November 2016. (Year: 2016) |
| | V | IEEE P802.11 Wireless LANs; Proposed resolution for comments related to Section 27.11.4 (BSS Color; Author(s): Abhishek et al.; Affiliation: Qualcomm; March 2017. (Year: 2017) |
| | W | |
| | X | |

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| CPC - Searched* | | |
|---|---|---|
| **Symbol** | **Date** | **Examiner** |
| H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

| CPC Combination Sets - Searched* | | |
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| **Symbol** | **Date** | **Examiner** |
| | | |

| US Classification - Searched* | | | |
|---|---|---|---|
| **Class** | **Subclass** | **Date** | **Examiner** |
| | | | |

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

| | |
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| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| Search Notes | | |
|---|---|---|
| **Search Notes** | **Date** | **Examiner** |
| East Text Search (See search history printout) | 06/10/2021 | MC |
| Inventor search (PALM and EAST) | 06/10/2021 | MC |
| Assignee Search (PALM and EAST) | 06/10/2021 | MC |
| No 101 or double patenting or 112 (b) issues are found. | 06/10/2021 | MC |
| IEEE Technical Specification Search (Relevant documents attached) . See PTO-892 | 06/10/2021 | MC |
| IP.COM (Patent & NPL Search), Google Patent Search (attached) | 06/13/2021 | MC |
| No 101 or 112 (b) issues are found but double patenting issues are found, addressed accordingly. It's a continuation of 16/590,302 (US Pat. No. 11,284,475) as prosecuted by the same examiner. | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 01/11/2023 | MC |
| Updated search from IP.COM (Patent & NPL Search), Google Patent Search (attached) | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 05/05/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 08/28/2023 | MC |
| IEEE Technical Specification updated Search (Relevant documents attached). See PTO-892 | 08/28/2023 | |

| Interference Search | | | |
|---|---|---|---|
| **US Class/CPC Symbol** | **US Subclass/CPC Group** | **Date** | **Examiner** |
| H04W,Y02D | H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W | H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/ 0833 OR H04W84/12 OR H04W74/06 OR H04W52 /02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

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| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | **Examiner** | **Art Unit** |
| | MOHAMMED S CHOWDHURY | 2467 |

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|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

**CLAIMS**

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/18/2023 | 05/14/2023 | 09/02/2023 | | | | | | |
| | 1 | - | - | - | | | | | | |
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| | 5 | - | - | - | | | | | | |
| | 6 | - | - | - | | | | | | |
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| | 8 | - | - | - | | | | | | |
| | 9 | - | - | - | | | | | | |
| | 10 | - | - | - | | | | | | |
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| | 19 | - | - | - | | | | | | |
| | 20 | - | - | - | | | | | | |
| | 21 | ✓ | ✓ | ✓ | | | | | | |
| | 22 | ✓ | ✓ | ✓ | | | | | | |
| | 23 | ✓ | ✓ | ✓ | | | | | | |
| | 24 | ✓ | ✓ | ✓ | | | | | | |
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## PE2E SEARCH - Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| L1 | 1 | "16590302" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:24 PM |
| L2 | 5 | ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) and MinTrigProcTime$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:41 PM |
| L3 | 2 | L2 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:43 PM |
| L4 | 3 | ("20170202015" "20150139200" "20180014325").pn. | (US-PGPUB; USPAT) | OR | ON | ON | 2021/06/10 04:59 PM |
| L5 | 3 | L4 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:59 PM |
| L6 | 160 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:05 PM |
| L7 | 166 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 or introduc$4 or put$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:06 PM |
| L8 | 138 | L7 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:08 PM |
| L10 | 119 | L8 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:12 PM |
| L11 | 17 | ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:31 PM |

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|---|---|---|---|---|---|---|---|
| | | PPDU)) | | | | | |
| L12 | 10 | L11 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:32 PM |
| L13 | 10 | L12 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:33 PM |
| L14 | 776 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (USPAT) | ADJ | ON | ON | 2021/06/10 05:34 PM |
| L15 | 552 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT) | ADJ | ON | ON | 2021/06/10 05:35 PM |
| L27 | 1108 | ((transmit$4 or send$3 or forward$3 or transmission$1 or communicat$4 or relay$3 or transfer$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:56 PM |
| L28 | 932 | L27 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:57 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L29 | 771 | L28 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:58 PM |
| L30 | 1004 | ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:16 AM |
| L31 | 840 | L30 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L32 | 701 | L31 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L33 | 699 | ((BSS color) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:46 AM |
| L34 | 642 | L33 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:47 AM |
| L35 | 12653 | ((BSS or (Basic Service Set)) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L36 | 1292 | ((BSS or (Basic Service Set)) near25 identif$7) and (Trigger$5 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L37 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:50 AM |
| L38 | 477 | L37 and (H04W80/08 or H04W76/11 or H04W72/0446 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:51 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L39 | 381 | L38 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:52 AM |
| L40 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L41 | 477 | L40 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L42 | 381 | L41 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L43 | 96 | L42 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L44 | 58 | L43 and ((BSS or (Basic Service Set)) near25 color$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:06 PM |
| L45 | 11 | L44 and ((BSS or (Basic Service Set)) near25 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:13 PM |
| L46 | 11 | L44 and ((BSS or (Basic Service Set)) near15 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:14 PM |
| L50 | 6 | L46 and ((generat$5 or produc$4) near15 (Trigger frame$1) near25 (uplink transmission)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:25 PM |
| L51 | 6 | L46 and (((generat$5 or produc$4) near15 (Trigger frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:26 PM |

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|---|---|---|---|---|---|---|---|
| | | near25 (uplink transmission)) same (random access)) | | | | | |
| L52 | 6 | L51 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:29 PM |
| L53 | 6 | L52 and ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:31 PM |
| L54 | 0 | L53 and ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:32 PM |
| L55 | 6 | L53 and (((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:33 PM |
| L56 | 0 | L53 and (((insert$5 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:34 PM |
| L57 | 6 | L53 and (OFDMA backoff) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:35 PM |
| L59 | 6 | L53 and OBO | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:36 PM |
| L60 | 6 | L59 and ((Overlapp$5 Basic Service Set) or OBSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:06 PM |
| L64 | 6 | L60 and ((Association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:08 PM |
| L65 | 491 | ((trigger$3 frame$1) near15 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:19 PM |
| L66 | 436 | L65 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:20 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L67 | 411 | L66 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:22 PM |
| L68 | 86 | L67 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:24 PM |
| L69 | 86 | L67 and ((trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:28 PM |
| L70 | 49 | L69 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:29 PM |
| L71 | 44 | L70 and ((Trigger frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L72 | 92 | L67 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L73 | 49 | L72 and ((Trigger$3 frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L74 | 44 | L73 and ((Trigger$3 frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L75 | 0 | L74 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:29 PM |
| L76 | 0 | L74 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L77 | 16 | L65 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L78 | 15 | L77 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L79 | 15 | L78 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:31 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L80 | 1 | L65 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L81 | 6 | ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L82 | 2 | L81 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L83 | 16 | L74 and (receiver address) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:34 PM |
| L84 | 108 | ((Target Wake Time) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:44 AM |
| L85 | 117 | (((Target Wake Time) or (target wait time)) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:46 AM |
| L86 | 1 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:48 AM |
| L87 | 0 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L88 | 2 | (((Target Wake Time) or (target wait time) or TWT) same (receiver address) same (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L89 | 104 | L85 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L90 | 78 | L89 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L91 | 32 | ((receiver address) and (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |

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|---|---|---|---|---|---|---|---|
| L92 | 30 | L91 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |
| L93 | 29 | L92 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:54 AM |
| L94 | 6 | ((receiver address) near25 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:58 AM |
| L95 | 6 | ((receiver address) near35 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L96 | 109 | ((receiver address) near35 (Trigger$3 frame$1)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L97 | 47 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:33 AM |
| L98 | 41 | L97 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L99 | 20 | L98 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L100 | 1 | (((association ID) or AID) near25 (frequenc$4 or band$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:38 AM |

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|---|---|---|---|---|---|---|---|
| | | or channel$1) near25 (user info$9)) same (power near2 (sav$3 or consumption$1)) | | | | | |
| L101 | 16 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L102 | 15 | L101 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L103 | 12 | L102 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:40 AM |
| L104 | 0 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 ((user info) or (user information$1))) and (power near2 (sav$3 or consumption$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:06 AM |
| L106 | 59 | (((pre?determined or predetermined) near25 reserved) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L107 | 54 | L106 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L108 | 20 | L107 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |

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| L109 | 16 | (((pre?determined or predetermined) near25 (reserved value$1)) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:01 PM |
| L110 | 15 | L109 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L111 | 10 | L110 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L112 | 131 | ((pre?determined or predetermined) near15 "2044") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:03 PM |
| L113 | 6 | L112 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L114 | 4 | L113 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L115 | 18 | ((pre?determined or predetermined) near15 "2044") and ((association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L116 | 13 | L115 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L117 | 0 | L116 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L118 | 38 | (TID Aggregation limit$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:47 PM |
| L119 | 37 | L118 and (A?MPDU or (Aggregate MAC protocol data unit) or (A MPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:52 PM |
| L120 | 32 | L119 and (user info$8) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:53 PM |
| L121 | 11 | L120 and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:54 PM |
| L122 | 7 | L121 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:38 PM |
| L123 | 7 | L122 and (Trigger$3 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:41 PM |
| L124 | 14 | (without near10 indicat$5 near25 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:53 PM |
| L125 | 9 | L124 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L126 | 0 | (without near10 indicat$5 near25 (BSS color)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L127 | 0 | (trigger frame$1) near25 ("no" or "not") near25 indicat$5 near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L128 | 3 | (trigger frame$1) near25 ("no" or "not") near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L129 | 0 | (trigger frame$1) near25 (does) near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:59 PM |
| L130 | 0 | (trigger frame$1) near45 (does) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L131 | 67 | (trigger frame) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L132 | 39 | (trigger frame) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:01 PM |
| L133 | 0 | (trigger frame) near45 (no) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:02 PM |
| L134 | 0 | (trigger frame) near45 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 |

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|---|---|---|---|---|---|---|---|
| | | ("not") near45 indicat$6 near45 (BSS color) | | | | | 11:02 PM |
| L135 | 0 | (trigger frame) near45 (does) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L136 | 0 | (trigger frame) near45 does near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L137 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L138 | 84 | (trigger frame) near45 color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L139 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L140 | 0 | (trigger frame) near45 "does" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L141 | 240 | (trigger frame) near45 do$2 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L142 | 35 | L132 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:05 PM |
| L143 | 3 | active BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:41 AM |
| L144 | 0 | active BSS color | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/13 06:42 AM |
| L145 | 3 | L143 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L146 | 0 | L145 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L147 | 43 | partial BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L148 | 38 | L147 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L150 | 34 | L148 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:14 AM |

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| | | H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L151 | 25 | L150 and (trigger$4 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:29 AM |
| L152 | 68 | ((partial BSS color) or (partial Basic Service Set)) and ((partial AID) or (partial association)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:53 AM |
| L153 | 29 | L152 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:55 AM |
| L154 | 17 | (((((partial BSS color) or (partial Basic Service Set)) near10 PPDU) and (((partial AID) or (partial association)) near10 PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:00 AM |
| L155 | 15 | L154 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:01 AM |
| L156 | 697 | ((BSS color) near25 indicat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:22 PM |
| L157 | 270 | ((BSS color) near25 indicat$5)same (PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:27 PM |
| L158 | 155 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L159 | 118 | L158 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L160 | 95 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:31 PM |
| L161 | 92 | L160 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |

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| | | Y02D30/70).cpc. | | | | | |
| L162 | 72 | L161 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |
| L163 | 16 | L162 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:41 PM |
| L164 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) same (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L165 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and(Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L166 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L167 | 0 | L166 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L168 | 4 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L169 | 0 | L168 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L170 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L177 | 94 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L178 | 91 | L177 and (H04W80/08 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 |

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|---|---|---|---|---|---|---|---|
| | | or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | 09:39 PM |
| L179 | 71 | L178 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L180 | 16 | L179 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L181 | 8 | L180 and (BSS color change$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L183 | 2 | L181 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:43 PM |
| L184 | 0 | L181 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:50 PM |
| L185 | 1 | L177 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L186 | 11 | ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L187 | 10 | L186 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L188 | 15 | ((partial Basic service set) near5 color) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:52 PM |
| L189 | 15 | L188 and (@ad or @rlad or @prad or @ptad)<"20170414" | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| L190 | 13 | L177 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L191 | 9 | L190 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L192 | 9 | L191 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:19 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L195 | 1 | ("20160212246").PN. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:34 PM |
| L196 | 0 | L195 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:35 PM |
| L197 | 1 | L195 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:36 PM |
| L198 | 0 | L197 and (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:37 PM |
| L199 | 11 | ("20160212246" OR "20160330742" OR "20160353275" OR "20170325178" OR "20180146426" OR "20180184285" OR "20180227950" OR "20180242355" OR "20190182864" OR "20200037395" OR "20210127427").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:45 PM |
| L200 | 2 | ("20160174254" OR "20170070962").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:48 PM |
| L203 | 1 | ("17/670,419").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L204 | 2 | ("16/590,302").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L205 | 170 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:54 PM |
| L206 | 156 | L205 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L207 | 245 | (( physical layer | (USOCR; FIT (CA, CN, | ADJ | ON | ON | 2022/11/27 |

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|---|---|---|---|---|---|---|---|
| | | protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | 02:55 PM |
| L208 | 220 | L207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L209 | 124 | L206 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L210 | 121 | L208 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L212 | 65 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND (((trigger$ frame$1) near25 ((resource unit$1) OR RU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L213 | 47 | L212 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L214 | 36 | L213 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:16 PM |
| L215 | 36 | ((trigger$ frame$1) near25 ((resource unit$1) OR RU)) AND | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:22 PM |

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|---|---|---|---|---|---|---|---|
| | | L209 | | | | | |
| L216 | 2 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L217 | 1 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L218 | 1689 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:26 PM |
| L219 | 369 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) AND (transmitter address) AND (receiver address ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L220 | 294 | L219 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L222 | 209 | L220 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:29 PM |
| L223 | 161 | L222 AND (( physical layer protocol data unit) OR PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:35 PM |
| L224 | 25 | L223 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:42 PM |
| L225 | 185 | (((BSS color) OR (( | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 |

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|---|---|---|---|---|---|---|---|
| | | Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | | | | | 02:50 PM |
| L226 | 140 | L225 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L227 | 38 | L226 AND ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L228 | 102 | L226 NOT L227 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:52 PM |
| L229 | 67 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:03 PM |
| L230 | 51 | L229 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:04 PM |
| L231 | 48 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:09 PM |
| L232 | 46 | L231 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L233 | 25 | L232 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L234 | 0 | WO02016024770 | (USOCR; FIT (CA, CN, | ADJ | ON | ON | 2023/01/10 |

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|---|---|---|---|---|---|---|---|
| | | | DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | 03:56 PM |
| L235 | 0 | WO2016024770 | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:56 PM |
| L236 | 1 | "10440751".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:58 PM |
| L237 | 1 | "10448333".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:01 PM |
| L238 | 0 | "2017070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L239 | 1 | "20170070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L240 | 1 | "20180270038".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:05 PM |
| L241 | 185 | (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L242 | 0 | L241 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L243 | 271 | (((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L244 | 0 | L243 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L245 | 68 | (((trigger$ frame$ ) near25 ((resource unit) OR RU)) ) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L246 | 48 | L245 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L247 | 37 | L246 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:35 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L248 | 37 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:25 AM |
| L249 | 1 | L217 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L250 | 2676 | ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L251 | 10 | L250 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L252 | 5 | L251 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L253 | 17 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:14 PM |
| L254 | 17 | L253 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:16 PM |
| L255 | 0 | L254 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 03:09 PM |
| L256 | 18 | ((Partial Association ID) near45 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L257 | 12 | L256 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L258 | 38 | ((Partial Association ID) near45 (BSS color)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |
| L259 | 34 | L258 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |
| L260 | 3650 | (trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:35 PM |
| L261 | 2727 | L260 AND (H04W80/08 OR H04W72/0446 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:35 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L262 | 874 | ((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:36 PM |
| L263 | 780 | L262 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:36 PM |
| L265 | 416 | L263 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:37 PM |
| L266 | 1353 | ((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:42 PM |
| L267 | 1205 | L266 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| L268 | 361 | L267 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| L269 | 166 | (((trigger$ frame$1) OR (trigger$?frame$1) ) SAME (PPDU OR (physical layer protocol | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:01 PM |

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|---|---|---|---|---|---|---|---|
| | | data unit)) SAME (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) | | | | | |
| L270 | 160 | L269 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:02 PM |
| L271 | 73 | L270 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:03 PM |
| L272 | 883 | (((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) AND ((bit OR bits OR bitmap$ OR bit?map$) SAME ("0" OR zero)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:09 PM |
| L273 | 782 | L272 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:09 PM |
| L274 | 362 | L273 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:09 PM |
| L275 | 20 | L274 AND (((target beacon transmission | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:14 PM |

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|---|---|---|---|---|---|---|---|
| | | time) OR TBTT) AND (target beacon transmission time)) | | | | | |
| L276 | 1222 | (((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) AND ((bit OR bits OR bitmap$ OR bit?map$) SAME ("0" OR zero)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:16 PM |
| L277 | 1094 | L276 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:16 PM |
| L278 | 146 | L277 AND (((target beacon transmission time) OR TBTT) AND (target beacon transmission time)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:17 PM |
| L279 | 10 | L278 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/08/27 10:17 PM |
| L280 | 10 | L275 AND ((((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour)) near45 (adjut$ OR modif$ OR chang$)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:24 AM |
| L281 | 288 | (user info) SAME (trigger$ frame$1) SAME (resource$1 near5 (unit$1 OR allocat$)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:54 AM |
| L282 | 330 | ((user info) OR (per user information) OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:56 AM |

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|---|---|---|---|---|---|---|---|
| | | (per?user information) OR (per?user?information)) SAME (trigger$ frame$1) SAME (resource$1 near5 (unit$1 OR allocat$)) | | | | | |
| L283 | 302 | L282 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 01:57 AM |
| L284 | 192 | L283 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:00 AM |
| L285 | 15 | L284 AND ((((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour)) near45 (adjut$ OR modif$ OR chang$)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:03 AM |
| L286 | 3 | L280 AND (((intra?BSS) OR (intra BSS)) SAME ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour))) AND (((inter?BSS) OR (inter BSS)) SAME ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:09 AM |
| L287 | 3 | L286 AND (((HE?SIG?A) OR (HE SIG A)) SAME ((BSS?color) OR (BSS color) OR (BSS?colour) OR (BSS colour))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/28 02:13 AM |

## PE2E SEARCH - Search History (Interference)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| N16 | 1716 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:35 PM |

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|---|---|---|---|---|---|---|---|
| | | ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | | | | | |
| N17 | 537 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:36 PM |
| N18 | 370 | (((trigger$3 frame$1) and ((physical layer protocol data unit) or PPDU))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N19 | 303 | N18 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N20 | 29 | N16 and N19 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:38 PM |
| N21 | 4 | N19 and (insert$5 near25 (trigger frame$1)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:39 PM |
| N22 | 2 | N16 and N21 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:40 PM |
| N23 | 80 | N19 and ((Basic Service Set$1) or BSS).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N24 | 15 | N16 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N25 | 15 | N17 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N26 | 67 | N23 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:43 PM |
| N171 | 1 | ((((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |

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|---|---|---|---|---|---|---|---|
| | | near25 PPDU)) and (Active near15 BSS)).clm. | | | | | |
| N172 | 1805 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N173 | 1 | N172 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N174 | 595 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N175 | 1 | N174 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N176 | 1 | N171 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N193 | 6 | ((partial Basic service set) near5 color).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| N194 | 5 | N193 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:54 PM |
| N195 | 13 | ((( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N196 | 4 | N195 AND N174 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N197 | 4 | N172 AND N195 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |

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|---|---|---|---|---|---|---|---|
| N201 | 0 | (((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" )).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| N202 | 28 | ((((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1))))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:08 PM |
| N203 | 5 | N202 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:09 PM |
| N204 | 11 | (((Partial Association ID) SAME (BSS color))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N205 | 5 | N204 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N206 | 1 | "11284475".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:55 PM |
| N207 | 34 | (((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| N208 | 34 | N207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:44 PM |
| N209 | 8 | N208 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:44 PM |
| N210 | 2 | ((((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour))) AND ((bit OR bits OR bitmap$ OR bit?map$) SAME ("0" OR zero))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:17 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N211 | 0 | N210 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:18 PM |
| N212 | 58 | ((((trigger$ frame$1) OR (trigger$?frame$1) ) AND (PPDU OR (physical layer protocol data unit)) AND (((Basic Service Set$1) OR (BasicService?Set$1) OR ( Basic?Service?Set$1) OR BSS) near5 (color OR colour)))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:18 PM |
| N213 | 16 | N212 AND N174 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:19 PM |
| N214 | 55 | N212 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR Y02D30/70 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:21 PM |
| N215 | 36 | N214 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/08/27 10:21 PM |

August 18, 2023

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 1. | Office Action dated May 24, 2023 for U.S. Patent Application No. 17/670,424. |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| /MOHAMMED S CHOWDHURY/ (08/28/2023) | 08/28/2023 |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.C./

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
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**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 1. | Office Action dated May 24, 2023 for U.S. Patent Application No. 17/670,424. |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| | |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 48462346 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 18-AUG-2023 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 19:27:32 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2023-08-18_633517_IDS.pdf | 239728<br>0c8e5027ab3d78993c3cf4d546e366fddf32dbae | yes | 4 |

| | Multipart Description/PDF files in .zip description | | | | |
|---|---|---|---|---|---|
| | **Document Description** | | **Start** | **End** | |
| | Transmittal Letter | | 1 | 3 | |
| | Information Disclosure Statement (IDS) Form (SB08) | | 4 | 4 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Other reference-Patent/Application/ Search Documents | Ref1_US17670424_2ndOA_5-24-23.pdf | 1602652<br>4e923576932be39e1bccf9b26745d87169b7d552 | no | 26 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1842380 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**
**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**
**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | Examiner: Chowdhury, Mohammad Shamsul |
| Serial No.: 17/670,419 | Art Unit: 2467 |
| Filing Date: February 11, 2022 | Conf. No.: 6110 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Our Ref: B-10124CON1 633517-8 |
| Date: August 18, 2023 | Re: ***Information Disclosure Statement*** |

**INFORMATION DISCLOSURE STATEMENT**

**Mail Stop Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97 and 1.98 to disclose information that may be relevant to the above-identified patent application. The Applicant requests the Examiner consider the documents listed on the enclosed form PTO-1449 (modified) in the examination of this application.

The filing of this Information Disclosure Statement (IDS) shall not be construed as a representation that a search has been made (37 C.F.R. 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability, or that no other material information exists.

The filing of this Information Disclosure Statement shall not be construed as an admission against interest in any manner (37 C.F.R § 1.97(h)).

If any additional fee is required for this filing, the Applicant requests the Examiner contact a practitioner associated with the Customer Number listed below for authorization.

This information disclosure statement also includes the statements marked below. Failure to mark a statement should not be construed as a negative assertion.

*Timing and Fees*

This IDS is being filed:

[ ] Concurrently with the application, and no fee is due.

[ ] Within three months of the filing of the national application, other than a continued prosecution application under § 1.53(d), and no fee is due.

[ ] Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, and no fee is due.

[ ] Before the mailing of a first Office Action on the merits, and no fee is due.

[x] Before the mailing of a first Office Action after the filing of a request for continued examination under§ 1.114, and no fee is due.

---

[ ] After the periods described above, and before a final Office Action under § 1.113, a Notice of Allowance under § 1.311, or an action that otherwise closes prosecution in the application, and is

- [ ] accompanied by the fee set forth in § 1.17(p), or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1): That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2): That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

---

[ ] After the periods described above, and is accompanied by the fee set forth in § 1.17(p), and is

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

[ ] Concurrently with a Request for Continued Examination, and no additional fee is due for this IDS.

*Items Disclosed*

At least one item listed on the enclosed form PTO-1449 (modified) was

[x] Cited in an Office Action for a related application, the application number of the related application and the issue date of the Office Action are provided below and the Office Action is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

---

[ ] Cited in an International Search Report (ISR) or an International Preliminary Report on Patentability (IPRP) or a Written Opinion (WO) of the International Searching Authority (ISA) for the related PCT Application, the PCT application number and the issue date of the ISR/IPRP/WO are provided below and the ISR/IPRP/WO is enclosed.

---

*Additional Information*

[ ] Translations of the foreign-language documents are also enclosed as machine-translations, human-translations, or counterpart applications as noted. Machine translations were provided by the Japanese Patent Office, ESPACENET, Google Documents, Patent Fetcher® /ESPACENET, Google Translate or Google Translator Toolkit as noted and with OCR by Adobe Acrobat 9 or ABBYY PDF Transformer 3 if needed.

[ ] English-language abstracts of foreign-language documents are provided.

[x] Documents listed on the enclosed ISR/IPRP/WO or the Office Action have relevance at least as described therein.

[ ] The documents with the following reference numbers were described in the specification of the present application; omission of a reference from this list does not indicate that it was not discussed in the specification of the present application.

---

[ ] At least one of the references cited in the Office Action listed on the attached PTO-1449 (modified) were previously submitted in an IDS or cited by the Examiner for the present application on _____ and therefore are not submitted in this IDS.

[ ] Other:

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

August 18, 2023
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

/ Young Seok Koo 76255 /

Young Seok Koo
Attorney for Applicant
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LADAS & PARRY LLP
4525 Wilshire Blvd., Suite 240
Los Angeles, CA 90010
(323) 934-2300 voice

PTO/SB/30 (11-17)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

# Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

| | |
|---|---|
| Application Number | 17/670,419 |
| Filing Date | February 11, 2022 |
| First Named Inventor | Geonjung KO |
| Art Unit | 2467 |
| Examiner Name | CHOWDHURY, MOHAMMED SHAMSUL |
| Attorney Docket Number | B-10124CON1 633517-8 |

**This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.**
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☑ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☑ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 12-0415.

      i. ☑ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

   d. ■ Payment by EFS-Web

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

***SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED***

| | | | |
|---|---|---|---|
| Signature | /Young Seok Koo 76255/ | Date | August 17, 2023 |
| Name (Print/Type) | Young Seok Koo | Registration No. | 76,255 |

***CERTIFICATE OF MAILING OR TRANSMISSION***

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office (USPTO), deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the USPTO on the date shown below.

| | | | |
|---|---|---|---|
| Signature | /Aza Chinaryan/ | | |
| Name (Print/Type) | Aza Chinaryan | Date | August 17, 2023 |

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0031. Public burden for this form is estimated to average 12 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **If filing this completed form by mail, send to:**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013). https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to: 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law; 2) a Federal, state, local, or international agency, in response to its request; 3) a contractor of the USPTO having need for the information in order to perform a contract; 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record; 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record; 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations; 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals; 8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)); 9) the Office of Personnel Management (OPM) for personnel research purposes; and 9) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

## Additional Uses

Additional USPTO uses of the information in this record may include disclosure to: 1) the International Bureau of the World Intellectual Property Organization, if the record is related to an international application filed under the Patent Cooperation Treaty; 2) the public i) after publication of the application pursuant to 35 U.S.C. 122(b), ii) after issuance of a patent pursuant to 35 U.S.C. 151, iii) if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections, or an issued patent, or iv) without publication of the application or patent under the specific circumstances provided for by 37 CFR 1.14(a)(1)(v)-(vii); and/or 3) the National Archives and Records Administration, for inspection of records.

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | | |
|---|---|---|---|
| First Named Inventor: | Geonjung KO | ) Examiner Name: | Chowdhury, Mohammed Shamsul |
| Application No.: | 17/670,419 | ) Confirmation No.: | 6110 |
| Filing Date: | February 11, 2022 | ) Group Art Unit: | 2467 |
| Title: | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | ) Attorney Docket: | B-10124CON1 633517-8 |
| | | ) Date: | August 17, 2023 |
| | | ) Re: | **Response to Final Office Action of May 18, 2023** |

---

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

**RESPONSE TO OFFICE ACTION**

Sir:

This paper is timely submitted in response to the Final Office Action mailed on May 18, 2023 for the subject application, and in conjunction with a Request for Continued Examination (hereinafter "RCE"). Please amend the application as follows and consider the Remarks/Arguments set forth below.

**Amendments to the Claims** begin on page 2 of this paper.

**Remarks/Arguments** begin on page 5 of this paper.

All Amendments and Remarks/Arguments are made without prejudice or disclaimer.

## AMENDMENTS TO THE CLAIMS

Please amend the claims to read as indicated in the following list of claims:

### Listing of claims

1-20. (Canceled).

21. (Currently Amended) A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including ~~of the PPDU including the trigger frame includes~~ a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the format of the PPDU including the trigger frame is a PPDU format in which ~~does not include~~ a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmit the trigger-based PPDU based on the trigger frame,

when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

wherein the BSS color is one of identifiers identifying a BSS.

22. (Previously Presented) The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

23. (Previously Presented) The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero,

wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

24. (Currently Amended) A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields ~~of the PPDU including the trigger frame includes~~ including a field for indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the format of the PPDU including the trigger frame is a PPDU format in which ~~the PPDU including the trigger frame does not include~~ a physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmitting the trigger-based PPDU based on the trigger frame,

when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

wherein the BSS color is one of identifiers identifying a BSS.

## REMARKS/ARGUMENTS

The following Remarks/Arguments are in response to the non-Final Office Action mailed on May 18, 2023 (hereinafter "Office Action") for the subject application. Pending in the application are claims 21-24.

In the Office Action, claims 21-23 stand rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-4 of U.S. Patent No. 11,284,475. Claim 24 stands rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-2 of U.S. Patent No. 11,284,475. Claims 21-23 stand provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 21-23 of co-pending Application No. 17/670,424. Claims 21-22 and 24 stand rejected under 35 U.S.C. §103 as allegedly being obvious over U.S. Patent Application Publication No. 2017/0325202 (hereinafter "Verma") in view of U.S. Patent Application Publication No. 2018/0110046 (hereinafter "Patil"). Claim 23 stands rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Patil and U.S. Patent Application Publication No. 2018/0146426 (hereinafter "Park").

In this response, claims 21 and 24 are amended. No new matter is presented as a result of these amendments. No claim is added or canceled. Claims 1-20 were previously canceled. Accordingly, the claims pending in this application after entry of this response are claims 21-24.

For at least the following reasons, this application should be considered in condition for allowance and passed to issuance.

### *Double Patenting*

In the Office Action, claims 21-23 stand rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-4 of U.S. Patent No. 11,284,475 (See Office Action: item 5 at page 3). Claim 24 stands rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-2 of U.S. Patent No. 11,284,475 (See Office Action: item 6 at page 6). Claims 21-23 stand provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 21-23 of co-pending Application No. 17/670,424 (See Office Action: item 7 at page 8). Although the Applicant respectfully questions the position taken by the Examiner, solely to expedite the prosecution of

the present application and allowance of the claims, claim 21 is amended to recite "*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" and claim 24 is amended to recite "*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added). Accordingly, the Applicant respectfully requests reconsideration and withdrawal of the double patenting rejections of claims 21-24.

***Claim Rejections – 35 U.S.C. §103***

In the Office Action, claims 21-22 and 24 stand rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Patil (See Office Action: item 10 at page 12). Claim 23 stands rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Patil and Park (See Office Action: item 11 at page 19). These rejections are hereby traversed, and reconsideration and withdrawal are respectfully requested.

**Claim 21**

Claim 21 recites:

> *A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:*
> *a transceiver configured to transmit and receive wireless signals; and*

*a processor configured to process the wireless signals,*
*wherein the processor is configured to:*
*receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,*
*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,*
*when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and*
*transmit the trigger-based PPDU based on the trigger frame,*
*when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,*
*wherein the BSS color is one of identifiers identifying a BSS.*

Although the Applicant respectfully disagrees with the Examiner, solely to expedite the prosecution of the present application and allowance of the claims, claim 21 is amended to recite "*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added).

Neither Verma nor Patil discloses, teaches or suggests "*when **a format of the PPDU including the trigger frame is a PPDU format** in which at least one of **physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color** is **included**, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and] when **the format of the PPDU including the***

***trigger frame is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

In the Office Action, the Examiner acknowledges that "**Verma** does **not expressly teach** when the **PPDU** including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based **PPDU** according to an active **BSS** color of the wireless communication terminal" (Office Action: page 15). Further, as stated above, claim 21 is amended to recite "*when a format of the PPDU including the trigger frame is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the format of the PPDU including the trigger frame is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added). Accordingly, Verma does not disclose, teach or suggest "***when a format of the PPDU including the trigger frame is a PPDU format*** *in which at least one of* ***physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color*** *is* ***included****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and] when* ***the format of the PPDU including the trigger frame is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

Patil does not cure Verma's failure of teaching or suggesting "***when a format of the PPDU including the trigger frame is a PPDU format*** *in which at least one of* ***physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color*** *is* ***included****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color*

*indicated by the PPDU including the trigger frame, [and] when* ***the format of the PPDU including the trigger frame is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

The Office Action indicates that:

> Patil discloses that one or more operating parameters of the first BSS may further cause the wireless device to disable one or more features related to the BSS color of the first BSS upon detecting that the first BSS and the second BSS have the same BSS color, and re-enable the one or more features when the conflict is no longer detected in the BSS color of the first BSS. See ¶0015 along with Fig. 1-7. Patil further discloses that step of disabling one or more features related to the BSS color, when communicating with the first BSS, based on the response from the AP… the one or more features may include at least one of spatial reuse, multi-NAV operation, or intra-PPDU (physical layer convergence procedure protocol data unit) power save. See ¶0047 along with Fig. 1-7.

(Office Action: page 23; emphasis added). However, the Applicant notes that "one or more features related to the BSS color" of Patil are not a specific disclosure, teaching or suggestion of "***the format of the PPDU including the trigger frame [which] is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included***" in claim 21. Otherwise, the Applicant respectfully asks the Examiner to explain how "one or more features related to the BSS color" of Patil can be interpreted as "***the format of the PPDU including the trigger frame [which] is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included***" in claim 21 so that the Applicant can properly understand the ground of the rejection and formulate a response.

Further, while paragraph [0046] of Patil states that "[t]he BSS color indicator may be included in a physical layer (PHY) header (such as a high efficiency signaling A (HE SIG A) field) of communication frames exchanged between wireless devices (such as an AP and a STA)" and paragraph [0047] of Patil teaches that "an AP may temporarily disable one or more color-related features of its associated STAs (such as intra-PPDU power save, multi-NAV operation, spatial reuse, and the like) upon first detecting a color collision", Patil is **silent of a relationship between the "BSS color indicator" and "disabl[ing] one or more color-related features"**.

In addition, although the Office Action states that "Patil also discloses that CCD(color collision detection) message may be embedded in management frames, control frames, action

frames, data frames, or other communication frames. In some implementations, the CCD message may correspond to a bit in the HE Operation element of frames communicated by the AP to the stations STA1 and STA2. The CCD (color collision detection) message, as transmitted at time t0 , may indicate that the STAs should disable one or more color-related functions (interpreted as BSS color is NOT indicated)….the AP may indicate that the STAs should disable their color-related functions by activating the corresponding bit in the HE Operation field of frames communicated to the stations STA1 and STA2; and after receiving the CCD message, at time t1, each of the associated stations STA1 and STA2 may disable their respective color-related functions. In some implementations, the color-related features may be disabled for at least a threshold duration (i.e., BSS color is NOT indicated for the duration), from times t1 to t2. See ¶0062-¶0063 along with Fig. 1-7. In fact, the aforesaid disclosures are similar to instant application, at least in ¶0220, quite contrary to applicant's remark at least in pages 9-10 as submitted on 04/24/2023" (Office Action: pages 23-24), the "color collision detection (CCD) message" of Patil is **not** a **BSS color** as described in paragraph [0062] of Patil. Further, the management frames, control frames, action frames, data frames, or other communication frames of Patil, in which the CCD message is embedded, are **MAC frames**, and therefore are **not** a disclosure, teaching or suggestion of "*a **physical layer signaling field** including the field for indicating the BSS color is not included*" of claim 21. In addition, the "HE operation element" of Patil is included in the **MAC frame**, **not** in "*a **physical layer signaling field***" (emphasis added).

Additionally, nothing in Patil teaches or suggests "*the **format** of the **PPDU***" of claim 21. Patil teaches that "[t]he BSS color indicator may be included in a physical layer (PHY) header (such as a high efficiency signaling A (HE SIG A) field) of communication frame" (Patil: paragraph [0046]). However, Patil's disclosure that "[t]he BSS color indicator may be included in a physical layer (PHY) header (such as a high efficiency signaling A (HE SIG A) field) of communication frame" is not a specific teaching or suggestion of "*a format of the PPDU including the trigger frame [which] is a PPDU format in which at least one of physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color is included*" or "*the format of the PPDU including the trigger frame [which] is a PPDU format in which a physical layer signaling field including the field for indicating the BSS color is not included*" as recited in claim 21.

Accordingly, Patil fails to cure the deficiency of Verma with respect to the limitation of claim 21 of "*when* ***a format of the PPDU including the trigger frame is a PPDU format*** *in which at least one of* ***physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color*** *is* ***included****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and] when* ***the format of the PPDU including the trigger frame is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added).

Hence, Verma and Patil, individually or in combination, do not disclose, teach or suggest "*when* ***a format of the PPDU including the trigger frame is a PPDU format*** *in which at least one of* ***physical layer signaling fields including a field for indicating a Basic Service Set (BSS) color*** *is* ***included****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and] when* ***the format of the PPDU including the trigger frame is a PPDU format*** *in which a* ***physical layer signaling field including the field for indicating the BSS color*** *is* ***not included****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

For at least the foregoing reasons, the Applicant respectfully submits that claim 21 is not obvious over Verma in view of Patil, and requests reconsideration and withdrawal of the §103 rejection of claim 21.

**Claims 22-23**

"If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). As discussed above, claim 21 is not obvious over Verma in view of Patil. Park does not cure the deficiency of Verma and Patil with respect to the limitation of claim 21 discussed above. Claims 22-23 depend from claim 21. Therefore, the Applicant respectfully submits that claims 22-23 are not obvious over Verma in view of Patil or over Verma in view of Patil and Park at least by way

of their dependencies from claim 21, and requests reconsideration and withdrawal of the §103 rejections of claims 22-23.

**Claim 24**

The Applicant respectfully submits that arguments similar to the arguments set forth for claim 21 can be used, *mutatis mutandis*, to show that claim 24 is not obvious over Verma in view of Patil, and requests reconsideration and withdrawal of the §103 rejection of claim 24.

## CONCLUSION

It is believed that all of the grounds of rejection have been properly traversed, accommodated, or rendered moot. The Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (323) 934-2300.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, then the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136 (a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

I hereby certify that this document is being transmitted electronically to the United States Patent and Trademark Office via electronic filing.

August 17, 2023
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

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# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 17670419 |
| **Filing Date:** | 11-Feb-2022 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Filer:** | Young Seok Koo/Azatuhi Chinaryan |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| RCE- 1ST REQUEST | 1801 | 1 | 1360 | 1360 |
| | | **Total in USD ($)** | | **1360** |

| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 48457985 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo/Azatuhi Chinaryan |
| **Filer Authorized By:** | Young Seok Koo |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 17-AUG-2023 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 23:37:31 |
| **Application Type:** | Utility under 35 USC 111(a) |

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| Submitted with Payment | yes |
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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Request for Continued Examination (RCE) | 2023-08-17_633517_RCE.pdf | 320831<br>15270b02cff8e84ef39ac415cf1e1fb9e16b9a73 | no | 2 |
| **Warnings:** | | | | | |
| This is not a USPTO supplied RCE SB30 form. | | | | | |
| **Information:** | | | | | |
| 2 | | 2023-08-17_633517_RCE_Response_to_Final_OA_5-18-2023.pdf | 269825<br>b212ac5629d60ee643ad89a29e07f8ed886610ba | yes | 13 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE) | 1 | 1 |
| | Claims | 2 | 4 |
| | Applicant Arguments/Remarks Made in an Amendment | 5 | 13 |

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|---|---|---|---|---|---|
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Fee Worksheet (SB06) | fee-info.pdf | 38304<br>6474435252O9b3f58c5d19e7ab4e4df4ed53ff32 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 628960 | | |

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>17/670,419 | Filing Date<br>02/11/2022 | ☐ To be Mailed |
|---|---|---|---|

**ENTITY:** ☑ LARGE ☐ SMALL ☐ MICRO

## APPLICATION AS FILED - PART I

| FOR | (Column 1)<br>NUMBER FILED | (Column 2)<br>NUMBER EXTRA | | RATE ($) | FEE ($) |
|---|---|---|---|---|---|
| ☐ BASIC FEE<br>(37 CFR 1.16(a), (b), or (c)) | N/A | N/A | | N/A | |
| ☐ SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m)) | N/A | N/A | | N/A | |
| ☐ EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q)) | N/A | N/A | | N/A | |
| TOTAL CLAIMS<br>(37 CFR 1.16(i)) | minus 20 = | * | | x $100 = | |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h)) | minus 3 = | * | | x $480 = | |
| ☐ APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | | TOTAL | |

## APPLICATION AS AMENDED - PART II

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | 08/17/2023 | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * 4 | Minus | ** 20 | = 0 | | x $100 = | 0 |
| | Independent<br>(37 CFR 1.16(h)) | * 2 | Minus | *** 3 | = 0 | | x $480 = | 0 |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | 0 |

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * | Minus | ** | = | | x $0 = | |
| | Independent<br>(37 CFR 1.16(h)) | * | Minus | *** | = | | x $0 = | |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | |

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|---|---|
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. | LIE |
| ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". | /SHERRY A DAVIS/ |
| *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". | |
| The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. | |

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

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| 2467 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 05/18/2023 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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| Office Action Summary | Application No. 17/670,419 | Applicant(s) KO et al. | |
|---|---|---|---|
| | Examiner MOHAMMED S CHOWDHURY | Art Unit 2467 | AIA (FITF) Status Yes |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☑ Responsive to communication(s) filed on 24 April 2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims***

5) ☑ Claim(s) 21-24 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 21-24 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

**Application Papers**

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

**DETAILED ACTION**

1. The following is a **final office** action in response to applicant's amendment filed on **04/24/2023** for response of the office action mailed on **01/23/2023**. Independent claims **21** and **24** are amended. No claims are added or cancelled. Therefore, claims **21-24** are pending and addressed below.

***Notice of Pre-AIA or AIA Status***

2. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

***Information Disclosure Statement***

3. The information disclosure statement (IDS) submitted on **05/04/2023** is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

***Double Patenting***

*4.* The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to

overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

5. Claims **21-23** are rejected on the ground of nonstatutory double patenting as being unpatentable over claims **1-4** of U.S. Patent No. **US 11,284,475 B2.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **21-23** are "anticipated by" claims **1-4** of U.S. Patent No. **US 11,284,475 B2**

| **Application No. 17/670,419 (Instant)** | **US 11,284,475 B2** |
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| 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a | 1. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a |

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| transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes a!!. identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating indicate the BSS color, set the value of the BSS color indicated by the trigger-based PPDU | transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, wherein the BSS color is one of identifiers identifying a BSS, wherein the active BSS color indicates a BSS color actually used by the wireless communication terminal.<br>2. The wireless communication terminal of claim 1, wherein the processor is configured |

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| according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on g BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>22. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial | to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change.<br>3. The wireless communication terminal of claim 2, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>4. The wireless communication terminal of claim 1, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate part of an AID value, wherein the Intra-BSS PPDU is a PPDU transmitted from the BSS including the wireless communication terminal, and the |

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| BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. | Inter-BSS PPDU is a PPDU transmitted from the BSS not including the wireless communication terminal. |

6. Claim **24** is rejected on the ground of nonstatutory double patenting as being unpatentable over claims **1-2** of U.S. Patent No. **US 11,284,475 B2.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **24** is "anticipated by" claims **1-2** of U.S. Patent No. **US 11,284,475 B2**

| **Application No. 17/670,419 (Instant)** | **US 11,284,475 B2** |
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| 24. A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising: receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes ag identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when at least one of physical layer | 1. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU |

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| signaling fields of the PPDU including the trigger frame includes a field for indicating indicates a Basic Service Set (BSS) color, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating indicate the BSS color, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, transmitting the trigger-based PPDU based on the trigger frame, and when the wireless communication terminal receives information on 1t.BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS. | based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, wherein the BSS color is one of identifiers identifying a BSS, wherein the active BSS color indicates a BSS color actually used by the wireless communication terminal.<br>2. The wireless communication terminal of claim 1, wherein the processor is configured to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change. |

7. Claims **21-23** are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims **21-23** of co-pending **Application No. 17/670,424.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **21-23** are "anticipated by" claims **21-23** of co-pending **Application No. 17/670,424**.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

| **Application No. 17/670,419 (Instant)** | **Application No. 17/670,424 (co-pending)** |
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| 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes a!!. identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated | 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes a identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the |

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| to the wireless communication terminal, when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating indicate the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on g BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a | trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active **BSS** color is a value of a BSS color indicated by the information on the BSS color change, |

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| BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>22. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. | wherein the BSS color is one of identifiers identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>23. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. |

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

In event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. **Claims 21-22** and **24** are rejected under 35 U.S.C. 103 as being unpatentable over Verma et al. (2017/0325202), Verma hereinafter, in view of Patil et al. (2018/0110046), Patil hereinafter.

**Re. Claims 21** and **24,** Verma teaches a method (¶0008/¶0011) of operating a wireless communication terminal (Fig. 12,STA, 115 / Fig. 2, STA1-2) wirelessly (Fig. 2) communicating with a base wireless communication terminal (Fig. 7, AP, 105 / Fig. 2, AP 105) and a wireless communication terminal (Fig. 12,STA, 115 / Fig. 2, STA1-2) wirelessly (Fig. 2) communicating with a base wireless communication terminal (Fig. 7, AP, 105 / Fig. 2, AP 105), the wireless communication terminal comprising: a transceiver (Fig. 12, 1202) configured to transmit and receive wireless signals (Fig. 2 / Fig.12 & ¶0120 - ***transceiver 1202 for receiving and transmitting radio transmissions****, for example, wireless communications transmitted by at least one AP 105 or wireless transmissions transmitted by another STA 115*); and a processor (Fig. 12, 1212) configured to process the wireless signals (Fig. 2 / Fig. 12 & ¶0115 - ¶0118), wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes an identifier which identifies a wireless communication terminal which is triggered by the trigger frame, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal (Fig. 2-12 & ¶0011 - ***receiving, at a STA, a trigger frame*** *from an AP. The* ***trigger frame*** *may include a* ***per-user information field****. The method may further include decoding the* ***trigger frame to identify whether one or more resources allocated to the STA are a single user resource unit allocation*** *or* ***a multi-user resource unit allocation****. The method may further include communicating with* ***the AP on the one or more resources allocated to the STA by the AP based on the decoding***. Fig. 2-12 & ¶0035 - ***BSS color is a field in the HE trigger-based PPDU,*** *aspects of the*

*present disclosure ensure that it is set correctly in order to be identical value by* ***all non-AP STAs transmitted the HE trigger-based PPDU****.* Fig. 2-12 & ¶0054 - ***trigger frame 302*** *may include a* ***common information field 305*** *that may include information shared by a plurality of the STAs 115 on the network. The* ***trigger frame 302*** *may also include* ***a per-user information field 310 that may include information specific to each STA****.* Fig. 2-12 & ¶0058 - ***table 400*** *that identifies one example of* ***bit value****s that may be assigned to a* ***resource unit allocation subfield*** *of the per-user information field of* ***the trigger frame*** *to identify whether the one or more* ***resources allocated to the at least one STA are the single user resource unit allocation*** *or the Vigermulti-user resource unit allocation.* Fig. 2-12 & ¶0059 - *in table* ***400, the seven (7) bit*** *indices of the resource unit allocation subfield* ***(see FIG. 3B, RU Allocation 320****) may utilize the* ***identified bit values to convey the identified message to the STA*** *based on t****he determination whether at least one or more allocated resource units are SU or MU****.* Fig. 2-12 & ¶0065 - *At* ***block 520****, the method may include t****ransmitting the trigger frame to the at least one STA****……the* ***trigger fram****e may also include* ***resource allocation information*** *for the STAs to utilize for uplink transmission.),*<u>when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame</u> (Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to th****e common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****….when AID12=0, type dependent per user information field of the* ***trigger frame*** *may be repurposed to i****ndicate the BSS color information****….when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus,* ***all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0055 - *AP 105 may generate a* ***trigger frame*** *that identifies* ***one or more punctured channels***

*by the AP in either the spatial reuse subfield 330 or the bandwidth subfield 335 of* ***the common information field****. ….generating the* ***trigger frame*** *may include determining that* ***one or more resources allocated*** *to the at least one STA are for OFDMA backoff (OBO), and allocating the one or more resources to association identifier (AID) a value of zero. Accordingly, the AP may receive from the* ***at least one STA (e.g., associated and/or unassociated STAs) a high efficiency (HE) trigger physical layer convergence procedure protocol data unit (RE Trig PPDU)*** *with a* ***fixed basic service set (BSS) color information*** *in response to the transmission of the* ***trigger frame****.),*transmit the trigger-based PPDU based on the trigger frame (Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to the* ***common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****….when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus,* ***all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0040 - *AP1 105-a and/or AP2 105-b may* ***transmit a trigger frame*** *(see FIG. 3A and 3B) to initiate* ***uplink transmission from one or more STAs in the networ****k. … the request to initiate the* ***uplink transmission (by the AP via trigger frame)*** *may be based on receiving a buffer status report from one or more STAs 115 that may identify the amount of data that each STA may be queued for uplink transmission. … The AP 105 may achieve this goal by utilizing a* ***trigger frame that identifies the STAs 115 that AP 105 requests to initiate uplink transmission and assigns resources for the STA 115 to use when communicating with the AP 105***), wherein the **BSS** color is one of identifiers identifying a **BSS** (Fig. 2-12 & ¶0036 - Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to the* ***common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****……****all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0049 - *the AP 105 first* ***identifies a BSS color information*** *and inserts the*

***BSS color information in all the packets sent by the HE AP 105 to the STAs 115****, including the trigger frame 210. In response, the STAs 115 may add the* ***BSS color information identified*** *by the* ***AP 105 in the trigger frame into the packets it sends out****).*

Yet, Verma does not **expressly** teach when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

However, in the analogous art, Patil **explicitly** discloses when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal (Fig. 1-7 & ¶0015 - *one or more operating parameters of the first BSS may further cause the wireless device to* ***disable one or more features related to the BSS color of the first BSS*** *upon detecting that the first BSS and the second BSS have the same BSS color, and re-enable the one or more features when the conflict is no longer detected in the BSS color of the first BSS.* Fig. 1-7 & ¶0020 - *a step of* ***disabling one or more features*** *related to the* ***BSS color****, when communicating with the first BSS, based on the response from the AP... the one or more features may include at least one of spatial reuse, multi-NAV operation, or* ***intra-PPDU*** *(physical layer convergence procedure*

*protocol data unit) power save.* Fig. 1-7 & ¶0047 - *Upon detecting a color collision, the AP may temporarily* ***disable color-related features*** *(such as* ***intra-PPDU*** *(physical layer convergence procedure protocol data unit))* ***power sav****e, multi-NAV operation, spatial reuse, and the like) of its associated STAs. If the AP no longer detects the color collision after a threshold duration, the AP may subsequently re-enable the color-related features of its associated STAs.* Fig. 1-7 & ¶0062 – ***CCD(color collision detection) message*** *may be embedded in* ***management frames, control frames, action frames****, data frames, or othe****r communication frames****. In some implementations, the* ***CCD message may correspond to a bit in the HE Operation element of frames*** *communicated by the AP to the stations STA1 and STA2. The* ***CCD (color collision detection) message****, as transmitted at* ***time*** $t_0$ *, may indicate that the STAs should* ***disable*** *one or* ***more color-related functions*** *(interpreted as BSS color is NOT indicated)….the AP may indicate that the STAs should* ***disable their color-related functions*** *by* ***activating*** *the* ***corresponding bit*** *in the* ***HE Operation field of frames communicated*** *to the stations STA1 and STA2.* Fig. 1-7 & ¶0063 - *After receiving the CCD message, at time* $t_1$*, each of the associated stations STA1 and STA2 may* ***disable*** *their* ***respective color-related functions.*** *In some implementations, the color-related features may be* ***disabled*** *for at least a threshold duration (i.e., BSS color is NOT indicated for the duration), from times* $t_1$ *to* $t_2$*. The aforesaid disclosures are similar to instant application, at least in ¶0220*), and when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active **BSS** color is a value of a BSS color indicated by the information on the BSS color change (Fig. 1-7 & ¶0060 - *if the*

*color collision persists after a threshold period of time has elapsed , the AP may then initiate a* ***dynamic color change operation to change the color of its BSS to a new BSS color****. For example, the* ***AP may coordinate with its associated STAs to ensure that each of the STAs is appropriately notified of the change in BSS colo*****r.** Fig. 1-7 & ¶0065 - *However, if the AP detects that the* ***color collision persists after the color monitoring period expires*** *(at time* $t_2$*), the AP may subsequently* ***trigger a BSS color change operation.*** *.., the* ***CS trigger message*** *may be embedded in* ***management frames, control frames, action*** *frames, data frames, or other communication frames. More specifically, the* ***CS trigger message may indicate a time*** *at which the color change operation is to occur (referred to hereinafter as a "****color-switching" time.*** Fig. 1-7 & ¶0066- *It may be desirable to perform the* ***color change operatio****n at a time when all (or at least most) of the STAs of a particular BSS are listening to the AP. .. the AP may perform th****e color change operation during a target beacon transmission time (TBTT),*** *when its associated STAs expect to receive a beacon frame from the AP. The CS trigger message may specify or otherwise* ***indicate a particular TBTT (*** $TBTT_{CS}$***)*** *at* ***which the BSS color change is to occur.*** Fig. 1-7 & ¶0067 - *the beacon frame broadcast during the c****olor-switching time (*** $TBTT_{CS}$***)*** *may include a* ***BSS color identifier with the new BSS color.*** Fig. 1-7 & ¶0070 - *the CS trigger message may indicate a* ***time (*** $TBTT_{CS}$***)*** *at which* ***a color change operation is scheduled to occu****r*),

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames at an access point in a wireless local network to include Patil's invention of a system and a method for dynamically changing parameters of a basic service set (BSS) of a wireless network, because it provides

an efficient mechanism in improving throughput of communications in dense deployment scenarios where one BSS (Basic Service Set) may hinder or otherwise interfere with communications in an overlapping BSS (OBSS) in a wireless local area network (WLAN) as served by one or more access points (APs) providing a shared wireless communication medium for use by a number of client devices or stations (STAs). (¶0002 - ¶0005, Patil)

**Re. Claim 22,** Verma and Patil teach claim 21.

Yet, Verma does not **expressl**y teach wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

However, in the analogous art, Patil **explicitly** discloses wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal. (Fig. 1-7 & ¶0066- *It may be desirable to perform the* ***color change operatio****n at a time when all (or at least most) of the STAs of a particular BSS are listening to the AP. .. the AP may perform th****e color change operation during a target beacon transmission time (TBTT),*** *when its associated STAs expect to receive a beacon frame from the AP. The CS trigger message may specify or otherwise* ***indicate a particular TBTT (TBTT$_{CS}$)*** *at* ***which the BSS color change is to occur.*** Fig. 1-7 & ¶0067 - *the beacon frame broadcast during the c****olor-switching time (TBTT$_{CS}$)*** *may include a* ***BSS color identifier with the new BSS color.*** Fig. 1-7 & ¶0070 - *the CS trigger message may indicate a* ***time (TBTT$_{CS}$)*** *at which* ***a color change operation is scheduled to occu****r*),

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames at an access point in a wireless local network to include Patil's invention of a system and a method for dynamically changing parameters of a basic service set (BSS) of a wireless network, because it provides an efficient mechanism in improving throughput of communications in dense deployment scenarios where one BSS (Basic Service Set) may hinder or otherwise interfere with communications in an overlapping BSS (OBSS) in a wireless local area network (WLAN) as served by one or more access points (APs) providing a shared wireless communication medium for use by a number of client devices or stations (STAs). (¶0002 - ¶0005, Patil)

11. **Claim 23** is rejected under 35 U.S.C. 103 as being unpatentable over Verma, in view of Patil, further in view of Park et al. (2018/0146426), Park hereinafter.

**Re. Claim 23,** Verma and Patil teach claim 21.

Yet, Verma and Patil do not **expressly** teach wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

However, in the analogous art, Park **explicitly** discloses wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor (Fig. 14, 21) determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. (Fig. 8- 13 & ¶0217 - F*or the two NAVs maintained by an HE STA,* ***one is identified as intra-BSS NAV,*** *and the second one is identified as basic NAV.* ***Intra-BSS NAV is used to store NAV value, if needed, from a PPDU identified as intra-BSS.*** *Basic NAV is used to store NAV value, if needed, from a* ***PPDU identified as inter-BSS.*** Fig. 8- 13 & ¶0222 - *The RXVECTOR parameter* ***PARTIAL_AID in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 0*** *is the same as the BSSID[39:47] of the AP to* ***which the STA is associated.*** Fig. 8- 13 & ¶0223 - ***The value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associate****d when the Partial BSS Color field in the most recently received HE Operation element is 1*.).

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames

at an access point and Patil's invention of a system and a method for dynamically changing parameters of a basic service set (BSS) of a wireless network to include Park's invention of transmitting a physical layer protocol data unit (PPDU) in a wireless local area network, because it provides an improved protection mechanism to prevent collisions due to simultaneous transmissions of STAs by using high efficiency WLAN system (e.g., IEEE 802.11ax) in the wireless local area network. (¶0004-¶0006, Park)

***Response to Arguments***

12. Earlier claim objections for claims **21** and **24** have been withdrawn following amended claim languages.

13. Applicant's arguments in regards to double patenting issue as mentioned in page **6** of remarks as submitted on **04/24/2023,** is NOT persuasive. Applicant is required to submit a **terminal disclaimer (TD)** in overcoming nonstatutory double patenting rejection as outlined in the office action. See MPEP **804.02.**

14. Applicant's arguments filed on **04/24/2023** have been fully considered but they are not persuasive.

Regarding remarks in pages 7-10 for i**ndependent claim 21** , applicant argues that Verma fails to teach, "*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame*". Examiner respectfully disagrees with the applicant. As mentioned in the §103 rejection, Verma discloses that **BSS color information** may be added to th**e common information field (see FIG. 3A, common info field 305)** of the **trigger frame** that may be **transmitted in the HE PPDU**....when AID12=0, type dependent per user information field of the **trigger frame** may be repurposed to i**ndicate the BSS color information**....when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus, **all the associated and unassociated STAs may transmit HE_Trig PPDU (physical layer convergence procedure protocol data unit) with a fixed BSS color (e.g., value 0 or 63).** See ¶0036 along with Fig. 2-12. Verma further discloses that AP 105 may generate a **trigger frame** that

identifies **one or more punctured channels** by the AP in either the spatial reuse subfield 330 or the bandwidth subfield 335 of **the common information field**. ….generating the **trigger fram**e may include determining that **one or more resources allocated** to the at least one STA are for OFDMA backoff (OBO), and allocating the one or more resources to association identifier (AID) a value of zero. Accordingly, the AP may receive from the **at least one STA (e.g., associated and/or unassociated STAs) a high efficiency (HE) trigger physical layer convergence procedure protocol data unit (RE Trig PPDU)** with a **fixed basic service set (BSS) color information** in response to the transmission of th**e trigger frame**. See ¶0055 along with Fig. 2-12.

Applicant further asserts that Patil fails to teach, "*when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*". Examiner respectfully disagrees with the applicant. As mentioned in the §103 rejection, Patil discloses that one or more operating parameters of the first BSS may further cause the wireless device to **disable one or more features related to the BSS color of the first BSS** upon detecting that the first BSS and the second BSS have the same BSS color, and re-enable the one or more features when the conflict is no longer detected in the BSS color of the first BSS. See ¶0015 along with Fig. 1-7. Patil further discloses that step of **disabling one or more features** related to the **BSS color**, when communicating with the first BSS, based on the response from the AP… the one or more features may include at least one of spatial reuse, multi-NAV operation, or **intra-PPDU** (physical layer convergence procedure protocol data unit) power save. See ¶0047 along with Fig. 1-7. Patil also discloses that **CCD(color collision detection) message** may be embedded in **management frames**, **control frames, action frames**, data frames, or othe**r communication frames**. In some implementations, the **CCD message may correspond to a bit in the HE Operation element**

**of frames** communicated by the AP to the stations STA1 and STA2. The **CCD (color collision detection) message**, as transmitted at **time $t_0$** , may indicate that the STAs should **disable** one or **more color-related functions** (interpreted as BSS color is NOT indicated)....the AP may indicate that the STAs should **disable their color-related functions** by **activating** the **corresponding bit** in the **HE Operation field of frames communicated** to the stations STA1 and STA2; and after receiving the CCD message, at time **$t_1$**, each of the associated stations STA1 and STA2 may **disable** their **respective color-related functions.** In some implementations, the color-related features may be **disabled** for at least a threshold duration (i.e., BSS color is NOT indicated for the duration), from times **$t_1$** to **$t_2$**. See ¶0062-¶0063 along with Fig. 1-7. In fact, the aforesaid disclosures are similar to instant application, at least in ¶0220, quite contrary to applicant's remark at least in pages 9-10 as submitted on 04/24/2023.

- For these reasons, it is maintained that independent claim **21** is unpatentable over **Verma**, in view of **Patil**.
- For similar reasons, it is maintained that independent claim **24** is also, unpatentable over **Verma**, in view of **Patil**.
- As all other dependent claims depend either directly or indirectly from the independent claim **21,** similar rationale also applies to all respective dependent claims.

***Conclusion***

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MOHAMMED SHAMSUL CHOWDHURY whose telephone number is (571)272-0485. The examiner can normally be reached on Monday-Thursday 9 AM- 6 PM EST (Friday Var.).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Phillips can be reached on 571-272-3940. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through

Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MOHAMMED S CHOWDHURY/
Primary Examiner, Art Unit 2467

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

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| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

**CLAIMS**

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
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| | 22 | ✓ | ✓ | | | | | | | |
| | 23 | ✓ | ✓ | | | | | | | |
| | 24 | ✓ | ✓ | | | | | | | |
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| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| CPC - Searched* | | |
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| **Symbol** | **Date** | **Examiner** |
| H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

| CPC Combination Sets - Searched* | | |
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| **Symbol** | **Date** | **Examiner** |
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| US Classification - Searched* | | | |
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| **Class** | **Subclass** | **Date** | **Examiner** |
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* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| Search Notes | | |
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| **Search Notes** | **Date** | **Examiner** |
| East Text Search (See search history printout) | 06/10/2021 | MC |
| Inventor search (PALM and EAST) | 06/10/2021 | MC |
| Assignee Search (PALM and EAST) | 06/10/2021 | MC |
| No 101 or double patenting or 112 (b) issues are found. | 06/10/2021 | MC |
| IEEE Technical Specification Search (Relevant documents attached) . See PTO-892 | 06/10/2021 | MC |
| IP.COM (Patent & NPL Search), Google Patent Search (attached) | 06/13/2021 | MC |
| No 101 or 112 (b) issues are found but double patenting issues are found, addressed accordingly. It's a continuation of 16/590,302 (US Pat. No. 11,284,475) as prosecuted by the same examiner. | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 01/11/2023 | MC |
| Updated search from IP.COM (Patent & NPL Search), Google Patent Search (attached) | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 05/05/2023 | MC |

| Interference Search | | | |
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| **US Class/CPC Symbol** | **US Subclass/CPC Group** | **Date** | **Examiner** |
| H04W,Y02D | H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W | H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/ 0833 OR H04W84/12 OR H04W74/06 OR H04W52 /02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

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| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

May 4, 2023

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 1. | 10-2426755 | Jul. 29, 2022 | KR | | | KIPRIS |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 2. | Office Action dated February 6, 2023 for U.S. Patent Application No. 17/670,424. |
| | 3. | Office Action dated April 27, 2023 for Korean Patent Application No. 10-2022-7025792 and its English translation provided by Applicant's foreign counsel |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| /MOHAMMED S CHOWDHURY/ (05/05/2023) | 05/05/2023 |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.C./

## PE2E SEARCH - Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| L1 | 1 | "16590302" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:24 PM |
| L2 | 5 | ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) and MinTrigProcTime$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:41 PM |
| L3 | 2 | L2 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:43 PM |
| L4 | 3 | ("20170202015" "20150139200" "20180014325").pn. | (US-PGPUB; USPAT) | OR | ON | ON | 2021/06/10 04:59 PM |
| L5 | 3 | L4 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:59 PM |
| L6 | 160 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:05 PM |
| L7 | 166 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 or introduc$4 or put$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:06 PM |
| L8 | 138 | L7 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:08 PM |
| L10 | 119 | L8 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:12 PM |
| L11 | 17 | ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:31 PM |

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| L12 | 10 | L11 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:32 PM |
| L13 | 10 | L12 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:33 PM |
| L14 | 776 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (USPAT) | ADJ | ON | ON | 2021/06/10 05:34 PM |
| L15 | 552 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT) | ADJ | ON | ON | 2021/06/10 05:35 PM |
| L27 | 1108 | ((transmit$4 or send$3 or forward$3 or transmission$1 or communicat$4 or relay$3 or transfer$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:56 PM |
| L28 | 932 | L27 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:57 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L29 | 771 | L28 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:58 PM |
| L30 | 1004 | ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:16 AM |
| L31 | 840 | L30 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L32 | 701 | L31 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L33 | 699 | ((BSS color) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:46 AM |
| L34 | 642 | L33 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:47 AM |
| L35 | 12653 | ((BSS or (Basic Service Set)) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L36 | 1292 | ((BSS or (Basic Service Set)) near25 identif$7) and (Trigger$5 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L37 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:50 AM |
| L38 | 477 | L37 and (H04W80/08 or H04W76/11 or H04W72/0446 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:51 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L39 | 381 | L38 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:52 AM |
| L40 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L41 | 477 | L40 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L42 | 381 | L41 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L43 | 96 | L42 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L44 | 58 | L43 and ((BSS or (Basic Service Set)) near25 color$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:06 PM |
| L45 | 11 | L44 and ((BSS or (Basic Service Set)) near25 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:13 PM |
| L46 | 11 | L44 and ((BSS or (Basic Service Set)) near15 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:14 PM |
| L50 | 6 | L46 and ((generat$5 or produc$4) near15 (Trigger frame$1) near25 (uplink transmission)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:25 PM |
| L51 | 6 | L46 and (((generat$5 or produc$4) near15 (Trigger frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:26 PM |

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|---|---|---|---|---|---|---|---|
| | | near25 (uplink transmission)) same (random access)) | | | | | |
| L52 | 6 | L51 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:29 PM |
| L53 | 6 | L52 and ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:31 PM |
| L54 | 0 | L53 and ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:32 PM |
| L55 | 6 | L53 and (((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:33 PM |
| L56 | 0 | L53 and (((insert$5 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:34 PM |
| L57 | 6 | L53 and (OFDMA backoff) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:35 PM |
| L59 | 6 | L53 and OBO | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:36 PM |
| L60 | 6 | L59 and ((Overlapp$5 Basic Service Set) or OBSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:06 PM |
| L64 | 6 | L60 and ((Association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:08 PM |
| L65 | 491 | ((trigger$3 frame$1) near15 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:19 PM |
| L66 | 436 | L65 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:20 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L67 | 411 | L66 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:22 PM |
| L68 | 86 | L67 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:24 PM |
| L69 | 86 | L67 and ((trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:28 PM |
| L70 | 49 | L69 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:29 PM |
| L71 | 44 | L70 and ((Trigger frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L72 | 92 | L67 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L73 | 49 | L72 and ((Trigger$3 frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L74 | 44 | L73 and ((Trigger$3 frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L75 | 0 | L74 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:29 PM |
| L76 | 0 | L74 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L77 | 16 | L65 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L78 | 15 | L77 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L79 | 15 | L78 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:31 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L80 | 1 | L65 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L81 | 6 | ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L82 | 2 | L81 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L83 | 16 | L74 and (receiver address) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:34 PM |
| L84 | 108 | ((Target Wake Time) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:44 AM |
| L85 | 117 | (((Target Wake Time) or (target wait time)) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:46 AM |
| L86 | 1 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:48 AM |
| L87 | 0 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L88 | 2 | (((Target Wake Time) or (target wait time) or TWT) same (receiver address) same (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L89 | 104 | L85 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L90 | 78 | L89 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L91 | 32 | ((receiver address) and (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |

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| L92 | 30 | L91 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |
| L93 | 29 | L92 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:54 AM |
| L94 | 6 | ((receiver address) near25 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:58 AM |
| L95 | 6 | ((receiver address) near35 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L96 | 109 | ((receiver address) near35 (Trigger$3 frame$1)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L97 | 47 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:33 AM |
| L98 | 41 | L97 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L99 | 20 | L98 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L100 | 1 | (((association ID) or AID) near25 (frequenc$4 or band$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:38 AM |

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|---|---|---|---|---|---|---|---|
| | | or channel$1) near25 (user info$9)) same (power near2 (sav$3 or consumption$1)) | | | | | |
| L101 | 16 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L102 | 15 | L101 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L103 | 12 | L102 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:40 AM |
| L104 | 0 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 ((user info) or (user information$1))) and (power near2 (sav$3 or consumption$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:06 AM |
| L106 | 59 | (((pre?determined or predetermined) near25 reserved) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L107 | 54 | L106 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L108 | 20 | L107 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |

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|---|---|---|---|---|---|---|---|
| L109 | 16 | (((pre?determined or predetermined) near25 (reserved value$1)) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:01 PM |
| L110 | 15 | L109 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L111 | 10 | L110 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L112 | 131 | ((pre?determined or predetermined) near15 "2044") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:03 PM |
| L113 | 6 | L112 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L114 | 4 | L113 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L115 | 18 | ((pre?determined or predetermined) near15 "2044") and ((association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L116 | 13 | L115 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L117 | 0 | L116 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L118 | 38 | (TID Aggregation limit$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:47 PM |
| L119 | 37 | L118 and (A?MPDU or (Aggregate MAC protocol data unit) or (A MPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:52 PM |
| L120 | 32 | L119 and (user info$8) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:53 PM |
| L121 | 11 | L120 and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:54 PM |
| L122 | 7 | L121 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:38 PM |
| L123 | 7 | L122 and (Trigger$3 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:41 PM |
| L124 | 14 | (without near10 indicat$5 near25 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:53 PM |
| L125 | 9 | L124 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L126 | 0 | (without near10 indicat$5 near25 (BSS color)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L127 | 0 | (trigger frame$1) near25 ("no" or "not") near25 indicat$5 near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L128 | 3 | (trigger frame$1) near25 ("no" or "not") near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L129 | 0 | (trigger frame$1) near25 (does) near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:59 PM |
| L130 | 0 | (trigger frame$1) near45 (does) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L131 | 67 | (trigger frame) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L132 | 39 | (trigger frame) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:01 PM |
| L133 | 0 | (trigger frame) near45 (no) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:02 PM |
| L134 | 0 | (trigger frame) near45 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 |

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|---|---|---|---|---|---|---|---|
| | | ("not") near45 indicat$6 near45 (BSS color) | | | | | 11:02 PM |
| L135 | 0 | (trigger frame) near45 (does) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L136 | 0 | (trigger frame) near45 does near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L137 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L138 | 84 | (trigger frame) near45 color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L139 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L140 | 0 | (trigger frame) near45 "does" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L141 | 240 | (trigger frame) near45 do$2 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L142 | 35 | L132 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:05 PM |
| L143 | 3 | active BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:41 AM |
| L144 | 0 | active BSS color | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/13 06:42 AM |
| L145 | 3 | L143 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L146 | 0 | L145 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L147 | 43 | partial BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L148 | 38 | L147 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L150 | 34 | L148 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:14 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L151 | 25 | L150 and (trigger$4 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:29 AM |
| L152 | 68 | ((partial BSS color) or (partial Basic Service Set)) and ((partial AID) or (partial association)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:53 AM |
| L153 | 29 | L152 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:55 AM |
| L154 | 17 | (((((partial BSS color) or (partial Basic Service Set)) near10 PPDU) and (((partial AID) or (partial association)) near10 PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:00 AM |
| L155 | 15 | L154 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:01 AM |
| L156 | 697 | ((BSS color) near25 indicat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:22 PM |
| L157 | 270 | ((BSS color) near25 indicat$5)same (PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:27 PM |
| L158 | 155 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L159 | 118 | L158 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L160 | 95 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:31 PM |
| L161 | 92 | L160 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L162 | 72 | L161 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |
| L163 | 16 | L162 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:41 PM |
| L164 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) same (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L165 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and(Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L166 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L167 | 0 | L166 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L168 | 4 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L169 | 0 | L168 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L170 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L177 | 94 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L178 | 91 | L177 and (H04W80/08 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 |

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|---|---|---|---|---|---|---|---|
| | | or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | 09:39 PM |
| L179 | 71 | L178 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L180 | 16 | L179 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L181 | 8 | L180 and (BSS color change$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L183 | 2 | L181 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:43 PM |
| L184 | 0 | L181 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:50 PM |
| L185 | 1 | L177 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L186 | 11 | ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L187 | 10 | L186 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L188 | 15 | ((partial Basic service set) near5 color) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:52 PM |
| L189 | 15 | L188 and (@ad or @rlad or @prad or @ptad)<"20170414" | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| L190 | 13 | L177 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L191 | 9 | L190 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L192 | 9 | L191 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:19 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L195 | 1 | ("20160212246").PN. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:34 PM |
| L196 | 0 | L195 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:35 PM |
| L197 | 1 | L195 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:36 PM |
| L198 | 0 | L197 and (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:37 PM |
| L199 | 11 | ("20160212246" OR "20160330742" OR "20160353275" OR "20170325178" OR "20180146426" OR "20180184285" OR "20180227950" OR "20180242355" OR "20190182864" OR "20200037395" OR "20210127427").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:45 PM |
| L200 | 2 | ("20160174254" OR "20170070962").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:48 PM |
| L203 | 1 | ("17/670,419").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L204 | 2 | ("16/590,302").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L205 | 170 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:54 PM |
| L206 | 156 | L205 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L207 | 245 | (( physical layer | (USOCR; FIT (CA, CN, | ADJ | ON | ON | 2022/11/27 |

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|---|---|---|---|---|---|---|---|
| | | protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | 02:55 PM |
| L208 | 220 | L207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L209 | 124 | L206 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L210 | 121 | L208 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L212 | 65 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND (((trigger$ frame$1) near25 ((resource unit$1) OR RU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L213 | 47 | L212 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L214 | 36 | L213 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:16 PM |
| L215 | 36 | ((trigger$ frame$1) near25 ((resource unit$1) OR RU)) AND | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:22 PM |

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|---|---|---|---|---|---|---|---|
| | | L209 | | | | | |
| L216 | 2 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L217 | 1 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L218 | 1689 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:26 PM |
| L219 | 369 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) AND (transmitter address) AND (receiver address ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L220 | 294 | L219 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L222 | 209 | L220 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:29 PM |
| L223 | 161 | L222 AND (( physical layer protocol data unit) OR PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:35 PM |
| L224 | 25 | L223 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:42 PM |
| L225 | 185 | (((BSS color) OR (( | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 |

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|---|---|---|---|---|---|---|---|
| | | Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | | | | | 02:50 PM |
| L226 | 140 | L225 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L227 | 38 | L226 AND ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L228 | 102 | L226 NOT L227 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:52 PM |
| L229 | 67 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:03 PM |
| L230 | 51 | L229 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:04 PM |
| L231 | 48 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:09 PM |
| L232 | 46 | L231 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L233 | 25 | L232 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L234 | 0 | WO02016024770 | (USOCR; FIT (CA, CN, | ADJ | ON | ON | 2023/01/10 |

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| | | | DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | 03:56 PM |
| L235 | 0 | WO2016024770 | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:56 PM |
| L236 | 1 | "10440751".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:58 PM |
| L237 | 1 | "10448333".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:01 PM |
| L238 | 0 | "2017070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L239 | 1 | "20170070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L240 | 1 | "20180270038".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:05 PM |
| L241 | 185 | (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L242 | 0 | L241 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L243 | 271 | (((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L244 | 0 | L243 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L245 | 68 | (((trigger$ frame$ ) near25 ((resource unit) OR RU)) ) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L246 | 48 | L245 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L247 | 37 | L246 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:35 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L248 | 37 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:25 AM |
| L249 | 1 | L217 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L250 | 2676 | ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L251 | 10 | L250 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L252 | 5 | L251 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L253 | 17 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:14 PM |
| L254 | 17 | L253 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:16 PM |
| L255 | 0 | L254 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 03:09 PM |
| L256 | 18 | ((Partial Association ID) near45 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L257 | 12 | L256 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L258 | 38 | ((Partial Association ID) near45 (BSS color)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |
| L259 | 34 | L258 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |
| L260 | 3650 | (trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:35 PM |
| L261 | 2727 | L260 AND (H04W80/08 OR H04W72/0446 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:35 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L262 | 874 | ((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:36 PM |
| L263 | 780 | L262 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:36 PM |
| L265 | 416 | L263 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 07:37 PM |
| L266 | 1353 | ((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:42 PM |
| L267 | 1205 | L266 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| L268 | 361 | L267 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/05/05 08:43 PM |

## PE2E SEARCH - Search History (Interference)

| Ref # | Hits | Search Query | DBs | Default | Plurals | British | Time Stamp |
|---|---|---|---|---|---|---|---|

| | | | | Operator | | Equivalents | |
|---|---|---|---|---|---|---|---|
| N16 | 1716 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:35 PM |
| N17 | 537 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:36 PM |
| N18 | 370 | (((trigger$3 frame$1) and ((physical layer protocol data unit) or PPDU))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N19 | 303 | N18 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N20 | 29 | N16 and N19 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:38 PM |
| N21 | 4 | N19 and (insert$5 near25 (trigger frame$1)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:39 PM |
| N22 | 2 | N16 and N21 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:40 PM |
| N23 | 80 | N19 and ((Basic Service Set$1) or BSS).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N24 | 15 | N16 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N25 | 15 | N17 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N26 | 67 | N23 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:43 PM |
| N171 | 1 | ((((BSS color) near25 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS)).clm. | | | | | 08:51 PM |
| N172 | 1805 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N173 | 1 | N172 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N174 | 595 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N175 | 1 | N174 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N176 | 1 | N171 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N193 | 6 | ((partial Basic service set) near5 color).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| N194 | 5 | N193 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:54 PM |
| N195 | 13 | ((( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N196 | 4 | N195 AND N174 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N197 | 4 | N172 AND N195 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N201 | 0 | (((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" )).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| N202 | 28 | ((((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1)))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:08 PM |
| N203 | 5 | N202 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:09 PM |
| N204 | 11 | (((Partial Association ID) SAME (BSS color))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N205 | 5 | N204 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N206 | 1 | "11284475".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:55 PM |
| N207 | 34 | (((trigger$ frame$1) near25 (info OR information$1 OR identif$ OR ID)) AND (BSS color$3)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:43 PM |
| N208 | 34 | N207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:44 PM |
| N209 | 8 | N208 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/05/05 08:44 PM |

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 1. | 10-2426755 | Jul. 29, 2022 | KR | | | KIPRIS |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 2. | Office Action dated February 6, 2023 for U.S. Patent Application No. 17/670,424. |
| | 3. | Office Action dated April 27, 2023 for Korean Patent Application No. 10-2022-7025792 and its English translation provided by Applicant's foreign counsel |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| | |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 47954867 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 04-MAY-2023 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 23:44:50 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2023-05-04_633517_IDS.pdf | 243049<br>d6a681442cda7ccb8b38a2ec6ad4bb60e882014d | yes | 4 |

| | Multipart Description/PDF files in .zip description | | | | |
|---|---|---|---|---|---|
| | Document Description | | Start | End | |
| | Transmittal Letter | | 1 | 3 | |
| | Information Disclosure Statement (IDS) Form (SB08) | | 4 | 4 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Other reference-Patent/Application/ Search Documents | Ref1_US17670424_1stOA_2-6-23.pdf | 1362124<br>0608aa4a330f5210d3b01e80d6afccf465cd588f | no | 22 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Other reference-Patent/Application/ Search Documents | Ref2_KR10-2022-7025792_1stOA_4-27-23.pdf | 111693<br>3daba4f5c2e331af8dbbabd6a6394b3ad2349f08 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Foreign Reference | Ref3_KR10-2426755B1.pdf | 8058619<br>7edf33617f4919bb4c5d4879eef9bf2942ac7ec1 | no | 124 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 9775485 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**
**National Stage of an International Application under 35 U.S.C. 371**
**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**
**New International Application Filed with the USPTO as a Receiving Office**
**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. | Examiner: Chowdhury, Mohammad Shamsul |
| Serial No.: 17/670,419 | Art Unit: 2467 |
| Filing Date: February 11, 2022 | Conf. No.: 6110 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Our Ref: B-10124CON1 633517-8 |
| Date: May 4, 2023 | Re: ***Information Disclosure Statement*** |

**INFORMATION DISCLOSURE STATEMENT**

**Mail Stop Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97 and 1.98 to disclose information that may be relevant to the above-identified patent application. The Applicant requests the Examiner consider the documents listed on the enclosed form PTO-1449 (modified) in the examination of this application.

The filing of this Information Disclosure Statement (IDS) shall not be construed as a representation that a search has been made (37 C.F.R. 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability, or that no other material information exists.

The filing of this Information Disclosure Statement shall not be construed as an admission against interest in any manner (37 C.F.R § 1.97(h)).

If any additional fee is required for this filing, the Applicant requests the Examiner contact a practitioner associated with the Customer Number listed below for authorization.

This information disclosure statement also includes the statements marked below. Failure to mark a statement should not be construed as a negative assertion.

*Timing and Fees*

This IDS is being filed:

[ ] Concurrently with the application, and no fee is due.

[ ] Within three months of the filing of the national application, other than a continued prosecution application under § 1.53(d), and no fee is due.

[ ] Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, and no fee is due.

[ ] Before the mailing of a first Office Action on the merits, and no fee is due.

[ ] Before the mailing of a first Office Action after the filing of a request for continued examination under§ 1.114, and no fee is due.

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[x] After the periods described above, and before a final Office Action under § 1.113, a Notice of Allowance under § 1.311, or an action that otherwise closes prosecution in the application, and is

- [ ] accompanied by the fee set forth in § 1.17(p), or
- [x] filed with the statement set forth in 37 C.F.R. 1.97(e)(1): That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2): That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

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[ ] After the periods described above, and is accompanied by the fee set forth in § 1.17(p), and is

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

[ ] Concurrently with a Request for Continued Examination, and no additional fee is due for this IDS.

*Items Disclosed*

At least one item listed on the enclosed form PTO-1449 (modified) was

[x] Cited in an Office Action for a related application, the application number of the related application and the issue date of the Office Action are provided below and the Office Action is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

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[ ] Cited in an International Search Report (ISR) or an International Preliminary Report on Patentability (IPRP) or a Written Opinion (WO) of the International Searching Authority (ISA) for the related PCT Application, the PCT application number and the issue date of the ISR/IPRP/WO are provided below and the ISR/IPRP/WO is enclosed.

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*Additional Information*

[x] Translations of the foreign-language documents are also enclosed as machine-translations, human-translations, or counterpart applications as noted. Machine translations were provided by the Japanese Patent Office, ESPACENET, Google Documents, Patent Fetcher® /ESPACENET, Google Translate or Google Translator Toolkit as noted and with OCR by Adobe Acrobat 9 or ABBYY PDF Transformer 3 if needed.

[x] English-language abstracts of foreign-language documents are provided.

[x] Documents listed on the enclosed ISR/IPRP/WO or the Office Action have relevance at least as described therein.

[ ] The documents with the following reference numbers were described in the specification of the present application; omission of a reference from this list does not indicate that it was not discussed in the specification of the present application.

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[x] At least one of the references cited in the Office Action listed on the attached PTO-1449 (modified) were previously submitted in an IDS or cited by the Examiner for the present application on January 23, 2023 and therefore are not submitted in this IDS.

[ ] Other:

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

May 4, 2023
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

/ Young Seok Koo 76255 /

Young Seok Koo
Attorney for Applicant
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LADAS & PARRY LLP
4525 Wilshire Blvd., Suite 240
Los Angeles, CA 90010
(323) 934-2300 voice

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | | |
|---|---|---|---|
| First Named Inventor: | Geonjung KO | Examiner Name: | Chowdhury, Mohammed Shamsul |
| Application No.: | 17/670,419 | Confirmation No.: | 6110 |
| Filing Date: | February 11, 2022 | Group Art Unit: | 2467 |
| Title: | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | Attorney Docket: | B-10124CON1 633517-8 |
| | | Date: | April 24, 2023 |
| | | Re: | **Response to Non-Final Office Action of January 23, 2023** |

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

**RESPONSE TO OFFICE ACTION**

Sir:

This paper is timely submitted in response to the non-Final Office Action mailed on January 23, 2023 for the subject application. Please amend the application as follows and consider the Remarks/Arguments set forth below.

**Amendments to the Claims** begin on page 2 of this paper.

**Remarks/Arguments** begin on page 5 of this paper.

All Amendments and Remarks/Arguments are made without prejudice or disclaimer.

## AMENDMENTS TO THE CLAIMS

Please amend the claims to read as indicated in the following list of claims:

**Listing of claims**

1-20. (Canceled).

21. (Currently Amended) A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes a**n** identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating ~~indicates~~ a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating ~~indicate~~ the BSS color, set the [[~~a~~]] value of the [[~~a~~]] BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmit the trigger-based PPDU based on the trigger frame,

when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

wherein the BSS color is one of identifiers identifying a BSS.

22. (Previously Presented) The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

23. (Previously Presented) The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero,

wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

24. (Currently Amended) A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes an identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating ~~indicates~~ a Basic Service Set (BSS) color, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating ~~indicate~~ the BSS color, setting the [[~~a~~]] value of the [[~~a~~]] BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal,

transmitting the trigger-based PPDU based on the trigger frame, and

when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

wherein the BSS color is one of identifiers identifying a BSS.

## REMARKS/ARGUMENTS

The following Remarks/Arguments are in response to the non-Final Office Action mailed on January 23, 2023 (hereinafter "Office Action") for the subject application. Pending in the application are claims 21-24.

In the Office Action, claims 21 and 24 are objected to as allegedly containing informalities. Claims 21-23 stand rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-4 of U.S. Patent No. 11,284,475. Claim 24 stands rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-2 of U.S. Patent No. 11,284,475. Claims 21-23 stand provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 21-23 of co-pending Application No. 17/670,424. Claims 21-22 and 24 stand rejected under 35 U.S.C. §103 as allegedly being obvious over U.S. Patent Application Publication No. 2017/0325202 (hereinafter "Verma") in view of U.S. Patent Application Publication No. 2018/0110046 (hereinafter "Patil"). Claim 23 stands rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Patil and U.S. Patent Application Publication No. 2018/0146426 (hereinafter "Park").

In this response, claims 21 and 24 are amended. No new matter is presented as a result of these amendments. No claim is added or canceled. Claims 1-20 were previously canceled. Accordingly, the claims pending in this application after entry of this response are claims 21-24.

For at least the following reasons, this application should be considered in condition for allowance and passed to issuance.

### *Claim Objections*

In the Office Action, claims 21 and 24 are objected to as allegedly containing informalities (See Office Action: item 3 at page 2). The Office Action indicates that:

> Claims 21 and 24 in lines 13-14/10-11 respectively, replace "set a value of a BSS color" with "set the value of the BSS color"

(Office Action: item 2 at page 3). Claims 21 and 24 are amended as the Examiner suggested. Therefore, the Applicant respectfully requests reconsideration and withdrawal of the objections to claims 21 and 24.

***Double Patenting***

In the Office Action, claims 21-23 stand rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-4 of U.S. Patent No. 11,284,475 (See Office Action: item 5 at page 3). Claim 24 stands rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 1-2 of U.S. Patent No. 11,284,475 (See Office Action: item 6 at page 6). Claims 21-23 stand provisionally rejected on the ground of nonstatutory double patenting as allegedly being unpatentable over claims 21-23 of co-pending Application No. 17/670,424 (See Office Action: item 7 at page 8). Although the Applicant respectfully questions the position taken by the Examiner, solely to expedite the prosecution of the present application and allowance of the claims, claim 21 is amended to recite "*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" and claim 24 is amended to recite "*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, setting the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added). Accordingly, the Applicant respectfully requests reconsideration and withdrawal of the double patenting rejections of claims 21-24.

***Claim Rejections – 35 U.S.C. §103***

In the Office Action, claims 21-22 and 24 stand rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Patil (See Office Action: item 10 at page 12).

Claim 23 stands rejected under 35 U.S.C. §103 as allegedly being obvious over Verma in view of Patil and Park (See Office Action: item 11 at page 19). These rejections are hereby traversed, and reconsideration and withdrawal are respectfully requested.

**Claim 21**

Claim 21 recites:

*A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:*
*a transceiver configured to transmit and receive wireless signals; and*
*a processor configured to process the wireless signals,*
*wherein the processor is configured to:*
*receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes a**n** identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,*
*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,*
*when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and*
*transmit the trigger-based PPDU based on the trigger frame,*
*when the wireless communication terminal receives information on a BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,*
*wherein the BSS color is one of identifiers identifying a BSS.*

Although the Applicant respectfully disagrees with the Examiner, solely to expedite the prosecution of the present application and allowance of the claims, claim 21 is amended to recite "*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the*

*BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added).

Neither Verma nor Patil discloses, teaches or suggests "***when*** *at least one of* ***physical layer signaling fields*** *of the PPDU including the trigger frame* ***includes a field for indicating a Basic Service Set (BSS) color****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and]* ***when*** *the PPDU including the trigger frame does* ***not include a physical layer signaling field including the field for indicating the BSS color****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

In the Office Action, the Examiner acknowledges that "**Verma** does **not expressly teach** when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal" (Office Action: page 14). Further, as stated above, claim 21 is amended to recite "*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame*" (emphasis added). Accordingly, Verma does not disclose, teach or suggest "*when at least one of physical layer signaling fields of the PPDU including the trigger frame includes a field for indicating a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and] when the PPDU including the trigger frame does not include a physical layer signaling field including the field for indicating the BSS color, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21.

Patil does not cure Verma's failure of teaching or suggesting "***when*** *at least one of* ***physical layer signaling fields*** *of the PPDU including the trigger frame* ***includes a field for indicating a Basic Service Set (BSS) color****, set a value of a BSS color indicated by a trigger-*

*based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and]* ***when*** *the PPDU including the trigger frame does* ***not include a physical layer signaling field including the field for indicating the BSS color****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

The Office Action indicates that:

> Patil explicitly discloses when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal (Fig. 1-7 & ¶0047 - Upon detecting a color collision, the AP may temporarily disable color-related features (such as intra-PPDU power save, multi-NAV operation, spatial reuse, and the like) of its associated STAs. If the AP no longer detects the color collision after a threshold duration, the AP may subsequently re-enable the color-related features of its associated STAs. Fig. 1-7 & ¶0062 – CCD(color collision detection) message may be embedded in management frames, control frames, action frames, data frames, or other communication frames. In some implementations, the CCD message may correspond to a bit in the HE Operation element of frames communicated by the AP to the stations STA1 and STA2. The CCD (color collision detection) message, as transmitted at time $t_0$ , may indicate that the STAs should disable one or more color-related functions (interpreted as BSS color is NOT indicated)….the AP may indicate that the STAs should disable their color-related functions by activating the corresponding bit in the HE Operation field of frames communicated to the stations STA1 and STA2. Fig. 1-7 & ¶0063 - After receiving the CCD message, at time $t_1$, each of the associated stations STA1 and STA2 may disable their respective color-related functions. In some implementations, the color-related features may be disabled for at least a threshold duration (i.e., BSS color is NOT indicated for the duration), from times $t_1$ to $t_2$.)

(Office Action: page 14-15).

Paragraphs [0047] and [0062]-[0063] of Patil teach that "an AP may temporarily **disable** one or more **color-related features** of its associated STAs (such as **intra-PPDU power save, multi-NAV operation, spatial reuse**, and the like) upon first detecting a color collision" (emphasis added). However, Patil does not disclose, teach or suggest that "**disable[ing]** one or more **color-related features** of its associated STAs (such as intra-PPDU power save, multi-NAV operation, spatial reuse, and the like)" in Patil is a specific case of "***when*** *the PPDU including the trigger frame does* ***not include a physical layer signaling field including the field for indicating the BSS color***" (emphasis added).

Further, while paragraph [0046] of Patil states that "[t]he BSS color indicator may be included in a physical layer (PHY) header (such as a high efficiency signaling A (HE SIG A)

field) of communication frames exchanged between wireless devices (such as an AP and a STA)" and paragraph [0047] of Patil teaches that "an AP may temporarily disable one or more color-related features of its associated STAs (such as intra-PPDU power save, multi-NAV operation, spatial reuse, and the like) upon first detecting a color collision", nothing in Patil teaches or suggests that the operation of paragraph [0047] of Patil that "an AP may temporarily **disable** one or more **color-related features** of its associated STAs (such as intra-PPDU power save, multi-NAV operation, spatial reuse, and the like)" is a case mentioned in paragraph [0046] of Patil that "[t]he BSS color indicator [is **not] included in a physical layer (PHY) header** (such as a high efficiency signaling A (HE SIG A) field) of communication frames exchanged between wireless devices (such as an AP and a STA)" (emphasis added). For instance, nowhere does Patil disclose, teach or suggest that "an AP [] temporarily **disable[s]** one or more **color-related features** of its associated STAs (such as intra-PPDU power save, multi-NAV operation, spatial reuse, and the like)" when "[t]he BSS color indicator [is not] **included in a physical layer (PHY) header**" (emphasis added). MPEP §2142 notes that "***[i]mpermissible hindsight must be avoided*** and the legal conclusion must be reached on the basis of the facts gleaned from the prior art".

Accordingly, Patil fails to cure the deficiency of Verma with respect to the limitation of claim 21 of "***when*** *at least one of* ***physical layer signaling fields*** *of the PPDU including the trigger frame* ***includes a field for indicating a Basic Service Set (BSS) color****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and]* ***when*** *the PPDU including the trigger frame does* ***not include a physical layer signaling field including the field for indicating the BSS color****, set the value of the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" (emphasis added).

Hence, Verma and Patil, individually or in combination, do not disclose, teach or suggest "***when*** *at least one of* ***physical layer signaling fields*** *of the PPDU including the trigger frame* ***includes a field for indicating a Basic Service Set (BSS) color****, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, [and]* ***when*** *the PPDU including the trigger frame does* ***not include a physical layer signaling field including the field for indicating the BSS color****, set the value of*

*the BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal*" as recited in claim 21 (emphasis added).

For at least the foregoing reasons, the Applicant respectfully submits that claim 21 is not obvious over Verma in view of Patil, and requests reconsideration and withdrawal of the §103 rejection of claim 21.

**Claims 22-23**

"If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). As discussed above, claim 21 is not obvious over Verma in view of Patil. Park does not cure the deficiency of Verma and Patil with respect to the limitation of claim 21 discussed above. Claims 22-23 depend from claim 21. Therefore, the Applicant respectfully submits that claims 22-23 are not obvious over Verma in view of Patil or over Verma in view of Patil and Park at least by way of their dependencies from claim 21, and requests reconsideration and withdrawal of the §103 rejections of claims 22-23.

**Claim 24**

The Applicant respectfully submits that arguments similar to the arguments set forth for claim 21 can be used, *mutatis mutandis*, to show that claim 24 is not obvious over Verma in view of Patil, and requests reconsideration and withdrawal of the §103 rejection of claim 24.

## CONCLUSION

It is believed that all of the grounds of rejection have been properly traversed, accommodated, or rendered moot. The Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (323) 934-2300.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to deposit account no. 12-0415. In particular, if this response is not timely filed, then the Commissioner is authorized to treat this response as including a petition to extend the time period pursuant to 37 CFR 1.136 (a) requesting an extension of time of the number of months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account no. 12-0415.

I hereby certify that this document is being transmitted electronically to the United States Patent and Trademark Office via electronic filing.

April 24, 2023
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

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| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 47891576 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo/Azatuhi Chinaryan |
| **Filer Authorized By:** | Young Seok Koo |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 24-APR-2023 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 14:57:07 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| Submitted with Payment | no |
|---|---|

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2023-04-24_633517_Response_to_Non-Final_OA_1-23-2023.pdf | 274845<br>6200f1eba82375948e908d7eba035f1f28384ade | yes | 12 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Amendment/Request for Reconsideration-After Non-Final Rejection | 1 | 1 |
| | Claims | 2 | 4 |
| | Applicant Arguments/Remarks Made in an Amendment | 5 | 12 |
| **Warnings:** | | | |
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| | **Total Files Size (in bytes):** | 274845 | |

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**New Applications Under 35 U.S.C. 111**
**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**
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PTO/SB/06 (09-11)
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| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>17/670,419 | Filing Date<br>02/11/2022 | ☐ To be Mailed |
|---|---|---|---|

**ENTITY:** ☑ LARGE ☐ SMALL ☐ MICRO

## APPLICATION AS FILED - PART I

| FOR | (Column 1)<br>NUMBER FILED | (Column 2)<br>NUMBER EXTRA | | RATE ($) | FEE ($) |
|---|---|---|---|---|---|
| ☐ BASIC FEE<br>(37 CFR 1.16(a), (b), or (c)) | N/A | N/A | | N/A | |
| ☐ SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m)) | N/A | N/A | | N/A | |
| ☐ EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q)) | N/A | N/A | | N/A | |
| TOTAL CLAIMS<br>(37 CFR 1.16(i)) | minus 20 = | * | | x $100 = | |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h)) | minus 3 = | * | | x $480 = | |
| ☐ APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | | TOTAL | |

## APPLICATION AS AMENDED - PART II

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | 04/24/2023 | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * 4 | Minus | ** 20 | = 0 | | x $100 = | 0 |
| | Independent<br>(37 CFR 1.16(h)) | * 2 | Minus | *** 3 | = 0 | | x $480 = | 0 |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | 0 |

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * | Minus | ** | = | | x $0 = | |
| | Independent<br>(37 CFR 1.16(h)) | * | Minus | *** | = | | x $0 = | |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | |

| | |
|---|---|
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. | LIE |
| ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". | /LAMONT N MCLAUCHLIN/ |
| *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". | |
| The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. | |

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 | 6110 |

158747 7590 01/23/2023

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| EXAMINER | |
|---|---|
| CHOWDHURY, MOHAMMED SHAMSUL | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2467 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 01/23/2023 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

LA_MAIL@la.ladas.com
achinaryan@la.ladas.com
ykoo@la.ladas.com

| *Office Action Summary* | Application No. 17/670,419 | Applicant(s) KO et al. | |
|---|---|---|---|
| | Examiner MOHAMMED S CHOWDHURY | Art Unit 2467 | AIA (FITF) Status Yes |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☑ Responsive to communication(s) filed on 11 February 2022.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims***

5) ☑ Claim(s) 21-24 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 21-24 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

**Application Papers**

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 11 February 2022 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a)☑ All b)☐ Some** c)☐ None of the:

1.☑ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

**DETAILED ACTION**

***Notice of Pre-AIA or AIA Status***

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

***Information Disclosure Statement***

2. The information disclosure statement (IDS) submitted on **02/11/2022, 03/31/2022** and **08/03/2022** are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

***Claim Objections***

3. Claims **21** and **24** are objected to because of the following informalities:

Claims **21** and **24** in lines **13-14/10-11** respectively, replace "set **a** value of **a** BSS color" with "set **the** value of **the** BSS color";

Appropriate correction is required.

***Double Patenting***

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985);

*In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

5. Claims **21-23** are rejected on the ground of nonstatutory double patenting as being unpatentable over claims **1-4** of U.S. Patent No. **US 11,284,475 B2.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **21-23** are "anticipated by" claims **1-4** of U.S. Patent No. **US 11,284,475 B2**

| **Application No. 17/670,419 (Instant)** | **US 11,284,475 B2** |
|---|---|
| 21. A wireless communication terminal | 1. A wireless communication terminal |

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| wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, | wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, wherein the BSS color is one of identifiers identifying a BSS, wherein the active BSS color indicates a BSS color actually |

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| when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>22. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an intra-BSS PPDU or an inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. | used by the wireless communication terminal.<br>2. The wireless communication terminal of claim 1, wherein the processor is configured to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change.<br>3. The wireless communication terminal of claim 2, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>4. The wireless communication terminal of claim 1, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate part of |

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| | an AID value, wherein the Intra-BSS PPDU is a PPDU transmitted from the BSS including the wireless communication terminal, and the Inter-BSS PPDU is a PPDU transmitted from the BSS not including the wireless communication terminal. |

6. Claim **24** is rejected on the ground of nonstatutory double patenting as being unpatentable over claims **1-2** of U.S. Patent No. **US 11,284,475 B2.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **24** is "anticipated by" claims **1-2** of U.S. Patent No. **US 11,284,475 B2**

| **Application No. 17/670,419 (Instant)** | **US 11,284,475 B2** |
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| 24. A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising: receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when the PPDU including the trigger | 1. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, when |

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| frame indicates a Basic Service Set (BSS) color, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmitting the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS. | the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, wherein the BSS color is one of identifiers identifying a BSS, wherein the active BSS color indicates a BSS color actually used by the wireless communication terminal.<br>2. The wireless communication terminal of claim 1, wherein the processor is configured to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change. |

7. Claims **21-23** are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims **21-23** of co-pending **Application No. 17/670,424.** Although the claims at issue are not identical, they are not patentably distinct from each other because claims **21-23** are "anticipated by" claims **21-23** of co-pending **Application No. 17/670,424**.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

| **Application No. 17/670,419 (Instant)** | **Application No. 17/670,424 (co-pending)** |
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| 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the | 21. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising: a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals, wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame includes a identifier which identifies a wireless communication terminal which is triggered by the trigger frame, and the trigger frame indicates a resource unit |

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| value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers identifying a BSS. | (RU) which is allocated to the wireless communication terminal, when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame, when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame, when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active **BSS** color is a value of a BSS color indicated by the information on the BSS color change, wherein the BSS color is one of identifiers |
| 22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal. | |
| 22. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial | |

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| Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. | identifying a BSS.<br>22. The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.<br>23. The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. |

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

In event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. **Claims 21-22** and **24** are rejected under 35 U.S.C. 103 as being unpatentable over Verma et al. (2017/0325202), Verma hereinafter, in view of Patil et al. (2018/0110046), Patil hereinafter.

**Re. Claims 21** and **24,** Verma teaches a method (¶0008/¶0011) of operating a wireless communication terminal (Fig. 12,STA, 115 / Fig. 2, STA1-2) wirelessly (Fig. 2) communicating with a base wireless communication terminal (Fig. 7, AP, 105 / Fig. 2, AP 105) and a wireless communication terminal (Fig. 12,STA, 115 / Fig. 2, STA1-2) wirelessly (Fig. 2) communicating with a base wireless communication terminal (Fig. 7, AP, 105 / Fig. 2, AP 105), the wireless communication terminal comprising: a transceiver (Fig. 12, 1202) configured to transmit and receive wireless signals (Fig. 2 / Fig.12 & ¶0120 - ***transceiver 1202 for receiving and transmitting radio transmissions****, for example, wireless communications transmitted by at least one AP 105 or wireless transmissions transmitted by another STA 115*); and a processor (Fig. 12, 1212) configured to process the wireless signals (Fig. 2 / Fig. 12 & ¶0115 - ¶0118), wherein the processor is configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal , wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal (Fig. 2-12 & ¶0011 - ***receiving, at a STA, a trigger frame*** *from an AP. The* ***trigger frame*** *may include a per-user information field. The method may further include decoding the* ***trigger frame to identify whether one or more resources allocated to the STA are a single user resource unit allocation*** *or* ***a multi-user resource unit allocation.*** Fig. 2-12 & ¶0035 - ***BSS color is a field in the HE trigger-based PPDU,*** *aspects of the present disclosure ensure that it is set correctly in order to be identical value by* ***all non-AP STAs transmitted the HE trigger-based PPDU****.* Fig. 2-12 & ¶0058 - ***table 400*** *that identifies one example of* ***bit value****s that may be assigned to a* ***resource unit allocation subfield*** *of the per-user information field of* ***the trigger frame*** *to identify whether the one or more* ***resources allocated to the at least one STA are the single user resource unit allocation*** *or the*

*multi-user resource unit allocation.* Fig. 2-12 & ¶0059 - *in table* ***400, the seven (7) bit*** *indices of the resource unit allocation subfield* ***(see FIG. 3B, RU Allocation 320****) may utilize the* ***identified bit values to convey the identified message to the STA*** *based on* ***the determination whether at least one or more allocated resource units are SU or MU****.* Fig. 2-12 & ¶0065 - *At* ***block 520****, the method may include* ***transmitting the trigger frame to the at least one STA****……the* ***trigger fram****e may also include* ***resource allocation information*** *for the STAs to utilize for uplink transmission.),*when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame (Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to th****e common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****….when AID12=0, type dependent per user information field of the* ***trigger frame*** *may be repurposed to i****ndicate the BSS color information****….when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus,* ***all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63)****),*transmit the trigger-based PPDU based on the trigger frame (Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to th****e common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU****….when an AP is allocating resource units (RU) for OBO, then AP may allocate all RUs to AID=0. Thus,* ***all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0040 - *AP1 105-a and/or AP2 105-b may* ***transmit a trigger frame*** *(see FIG. 3A and 3B) to initiate* ***uplink transmission from one or more STAs in the networ****k. … the request to initiate th****e uplink transmission (by the AP via trigger frame)*** *may be based on receiving a buffer status report from one or more STAs 115 that may identify the amount of data that each STA may be queued for uplink transmission. … The AP 105 may achieve*

*this goal by utilizing a* ***trigger frame that identifies the STAs 115 that AP 105 requests to initiate uplink transmission and assigns resources for the STA 115 to use when communicating with the AP 105***), wherein the **BSS** color is one of identifiers identifying a **BSS** (Fig. 2-12 & ¶0036 - Fig. 2-12 & ¶0036 - ***BSS color information*** *may be added to th****e common information field (see FIG. 3A, common info field 305)*** *of the* ***trigger frame*** *that may be* ***transmitted in the HE PPDU*****.....*****all the associated and unassociated STAs may transmit HE_Trig PPDU with a fixed BSS color (e.g., value 0 or 63).*** Fig. 2-12 & ¶0049 - *the AP 105 first* ***identifies a BSS color information*** *and inserts the* ***BSS color information in all the packets sent by the HE AP 105 to the STAs 115****, including the trigger frame 210. In response, the STAs 115 may add the* ***BSS color information identified*** *by the* ***AP 105 in the trigger frame into the packets it sends ou****t*).

Yet, Verma does not expressly teach when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

However, in the analogous art, Patil **explicitly** discloses when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal (Fig. 1-7 & ¶0047 - *Upon detecting a color collision, the AP may temporarily* ***disable color-related features*** *(such as* ***intra-PPDU power save****, multi-NAV operation, spatial reuse, and the like) of its associated STAs. If the AP no longer detects the color collision after a threshold duration,*

*the AP may subsequently re-enable the color-related features of its associated STAs.* Fig. 1-7 & ¶0062 – ***CCD(color collision detection) message*** *may be embedded in* ***management frames****,* ***control frames, action frames****, data frames, or other* ***communication frames****. In some implementations, the* ***CCD message may correspond to a bit in the HE Operation element of frames*** *communicated by the AP to the stations STA1 and STA2. The* ***CCD (color collision detection) message****, as transmitted at* ***time*** $t_0$ *, may indicate that the STAs should* ***disable*** *one or* ***more color-related functions*** *(interpreted as BSS color is NOT indicated)….the AP may indicate that the STAs should* ***disable their color-related functions*** *by activating the* ***corresponding bit*** *in the* ***HE Operation field of frames communicated*** *to the stations STA1 and STA2*. Fig. 1-7 & ¶0063 - *After receiving the CCD message, at time* $t_1$*, each of the associated stations STA1 and STA2 may* ***disable*** *their* ***respective color-related functions.*** *In some implementations, the color-related features may be* ***disabled*** *for at least a threshold duration (i.e., BSS color is NOT indicated for the duration), from times* $t_1$ *to* $t_2$.), and when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active **BSS** color is a value of a BSS color indicated by the information on the BSS color change (Fig. 1-7 & ¶0060 - *if the color collision persists after a threshold period of time has elapsed , the AP may then initiate a* ***dynamic color change operation to change the color of its BSS to a new BSS color****. For example, the* ***AP may coordinate with its associated STAs to ensure that each of the STAs is appropriately notified of the change in BSS colo*****r.** Fig. 1-7 & ¶0065 - *However, if the AP detects that the* ***color collision persists after the color monitoring period expires*** *(at time* $t_2$*), the AP may subsequently* ***trigger a BSS color change operation.*** *.., the* ***CS trigger message*** *may be embedded in* ***management frames, control frames, action***

*frames, data frames, or other communication frames. More specifically, the* ***CS trigger message may indicate a time*** *at which the color change operation is to occur (referred to hereinafter as a "****color-switching" time.*** Fig. 1-7 & ¶0066- *It may be desirable to perform the* ***color change operatio****n at a time when all (or at least most) of the STAs of a particular BSS are listening to the AP. .. the AP may perform th****e color change operation during a target beacon transmission time (TBTT),*** *when its associated STAs expect to receive a beacon frame from the AP. The CS trigger message may specify or otherwise* ***indicate a particular TBTT (TBTT$_{CS}$)*** *at* ***which the BSS color change is to occur.*** Fig. 1-7 & ¶0067 - *the beacon frame broadcast during the c****olor-switching time (TBTT$_{CS}$)*** *may include a* ***BSS color identifier with the new BSS color.*** Fig. 1-7 & ¶0070 - *the CS trigger message may indicate a* ***time (TBTT$_{CS}$)*** *at which* ***a color change operation is scheduled to occu****r*),

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames at an access point in a wireless local network to include Patil's invention of a system and a method for dynamically changing parameters of a basic service set (BSS) of a wireless network, because it provides an efficient mechanism in improving throughput of communications in dense deployment scenarios where one BSS (Basic Service Set) may hinder or otherwise interfere with communications in an overlapping BSS (OBSS) in a wireless local area network (WLAN) as served by one or more access points (APs) providing a shared wireless communication medium for use by a number of client devices or stations (STAs). (¶0002 - ¶0005, Patil)

**Re. Claim 22,** Verma and Patil teach claim 21.

Yet, Verma does not expressly teach wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

However, in the analogous art, Patil **explicitly** discloses wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal. (Fig. 1-7 & ¶0066- *It may be desirable to perform the* ***color change operatio****n at a time when all (or at least most) of the STAs of a particular BSS are listening to the AP. .. the AP may perform th****e color change operation during a target beacon transmission time (TBTT),*** *when its associated STAs expect to receive a beacon frame from the AP. The CS trigger message may specify or otherwise* ***indicate a particular TBTT (TBTT$_{CS}$)*** *at* ***which the BSS color change is to occur.*** Fig. 1-7 & ¶0067 - *the beacon frame broadcast during the c****olor-switching time (TBTT$_{CS}$)*** *may include a* ***BSS color identifier with the new BSS color.*** Fig. 1-7 & ¶0070 - *the CS trigger message may indicate a* ***time (TBTT$_{CS}$)*** *at which* ***a color change operation is scheduled to occu****r*),

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames at an access point in a wireless local network to include Patil's invention of a system and a method for dynamically changing parameters of a basic service set (BSS) of a wireless network, because it provides an efficient mechanism in improving throughput of communications in dense deployment scenarios where one BSS (Basic Service Set) may hinder or otherwise interfere with communications in an

overlapping BSS (OBSS) in a wireless local area network (WLAN) as served by one or more access points (APs) providing a shared wireless communication medium for use by a number of client devices or stations (STAs). (¶0002 - ¶0005, Patil)

11. **Claim 23** is rejected under 35 U.S.C. 103 as being unpatentable over Verma, in view of Patil, further in view of Park et al. (2018/0146426), Park hereinafter.

**Re. Claim 23,** Verma and Patil teach claim 21.

Yet, Verma and Patil do not **expressly** teach wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

However, in the analogous art, Park **explicitly** discloses wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor (Fig. 14, 21) determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero, wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value. (Fig. 8- 13 & ¶0217 - *For the two NAVs maintained by an HE STA, **one is identified as intra-BSS NAV**, and the second one is identified as basic NAV. **Intra-BSS NAV is used to store NAV value, if needed, from a PPDU identified as intra-BSS.** Basic NAV is used to store NAV value, if needed, from a **PPDU identified as inter-BSS.*** Fig. 8- 13 & ¶0222 - *The RXVECTOR parameter **PARTIAL_AID in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 0** is the same as the BSSID[39:47] of the AP to **which the STA is associated.*** Fig. 8- 13 & ¶0223 - ***The value of RXVECTOR parameter PARTIAL_AID [5:8] in the received VHT PPDU with the RXVECTOR parameter GROUP_ID equal to 63 is the same as the partial BSS color announced by the AP to which the STA is associated** when the Partial BSS Color field in the most recently received HE Operation element is 1.*).

Therefore, it would have been obvious to one of the ordinary skill in the art before the effective filling date of the claimed invention to combine Verma's invention of a technique in generating trigger frames

at an access point and Patil's invention of a system and a method for dynamically changing parameters of a basic service set (BSS) of a wireless network to include Park's invention of transmitting a physical layer protocol data unit (PPDU) in a wireless local area network, because it provides an improved protection mechanism to prevent collisions due to simultaneous transmissions of STAs by using high efficiency WLAN system (e.g., IEEE 802.11ax) in the wireless local area network. (¶0004-¶0006, Park)

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Park et al. (2018/0014327); See ¶0011, ¶0143,¶0276-¶0293 , claims 1-3 along with Fig.1-27.
- Kim et al; (2018/0176865); See ¶0130, ¶0244-¶0254 along with Fig.1-30.
- IEEE: doc.: **IEEE 802.11-16/0024r1**, March 2016 ; See §9.4.2.21, §25.9.2, §25.11, §25.13.1, §26.2.2, §26.3.9.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MOHAMMED SHAMSUL CHOWDHURY whose telephone number is (571)272-0485. The examiner can normally be reached on Monday-Thursday 9 AM- 6 PM EST (Friday Var.).

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Phillips can be reached on 571-272-3940. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MOHAMMED S CHOWDHURY/
Primary Examiner, Art Unit 2467

| Notice of References Cited | Application/Control No. 17/670,419 | Applicant(s)/Patent Under Reexamination KO et al. | |
|---|---|---|---|
| | Examiner MOHAMMED S CHOWDHURY | Art Unit 2467 | Page 1 of 1 |

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| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | CPC Classification | US Classification |
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| * | B | US-20180110046-A1 | 04-2018 | Patil; Abhishek Pramod | H04W72/0446 | 1/1 |
| * | C | US-20180146426-A1 | 05-2018 | PARK; Jong Hoon | H04W52/0229 | 1/1 |
| * | D | US-20180014327-A1 | 01-2018 | PARK; Jong Hoon | H04W74/006 | 1/1 |
| * | E | US-20180176865-A1 | 06-2018 | KIM; Jeongki | H04W74/06 | 1/1 |
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**FOREIGN PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Country | Name | CPC Classification |
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**NON-PATENT DOCUMENTS**

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| | U | IEEE: doc.: IEEE 802.11-16/0024r1, March 2016 (Year: 2016) |
| | V | |
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| | X | |

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| CPC - Searched* | | |
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| **Symbol** | **Date** | **Examiner** |
| H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

| CPC Combination Sets - Searched* | | |
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| US Classification - Searched* | | | |
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| **Class** | **Subclass** | **Date** | **Examiner** |
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* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

| | |
|---|---|
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | Examiner | Art Unit |
| | MOHAMMED S CHOWDHURY | 2467 |

| Search Notes | | |
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| **Search Notes** | **Date** | **Examiner** |
| East Text Search (See search history printout) | 06/10/2021 | MC |
| Inventor search (PALM and EAST) | 06/10/2021 | MC |
| Assignee Search (PALM and EAST) | 06/10/2021 | MC |
| No 101 or double patenting or 112 (b) issues are found. | 06/10/2021 | MC |
| IEEE Technical Specification Search (Relevant documents attached) . See PTO-892 | 06/10/2021 | MC |
| IP.COM (Patent & NPL Search), Google Patent Search (attached) | 06/13/2021 | MC |
| No 101 or 112 (b) issues are found but double patenting issues are found, addressed accordingly. It's a continuation of 16/590,302 (US Pat. No. 11,284,475) as prosecuted by the same examiner. | 01/11/2023 | MC |
| Updated search from "SEARCH" tool. ... attached | 01/11/2023 | MC |
| Updated search from IP.COM (Patent & NPL Search), Google Patent Search (attached) | 01/11/2023 | MC |

| Interference Search | | | |
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| **US Class/CPC Symbol** | **US Subclass/CPC Group** | **Date** | **Examiner** |
| H04W,Y02D | H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70 | 06/10/2021 | MC |
| H04W | H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/ 0833 OR H04W84/12 OR H04W74/06 OR H04W52 /02 OR H04W28/06 OR H04W52/0216 OR H04W74/002 | 01/11/2023 | MC |

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|---|---|
| /MOHAMMED S CHOWDHURY/<br>Primary Examiner, Art Unit 2467 | |

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/670,419 | KO et al. |
| | **Examiner** | **Art Unit** |
| | MOHAMMED S CHOWDHURY | 2467 |

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| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

**CLAIMS**

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
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| Final | Original | 01/18/2023 | | | | | | | | |
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| | 24 | ✓ | | | | | | | | |
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# Bibliographic Data

Application No: 17/670,419

Foreign Priority claimed: ◉ Yes ○ No

35 USC 119 (a-d) conditions met: ☑ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /MOHAMMED S CHOWDHURY/ Examiner's Signature | Initials

Title: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

| FILING or 371(c) DATE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|
| 02/11/2022 | 370 | 2467 | B-10124CON1 633517-8 |
| RULE | | | |

**APPLICANTS**

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Jinsam KWAK, Gyeonggi-do, KOREA, REPUBLIC OF

**CONTINUING DATA**

This application is a CON of 16590302 10/01/2019 PAT 11284475

16590302 is a CON of PCT/KR2018/004397 04/16/2018

**FOREIGN APPLICATIONS**

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KOREA, REPUBLIC OF KR10-2017-0146356 11/04/2017

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02/15/2022

**STATE OR COUNTRY**

KOREA, REPUBLIC OF

**ADDRESS**

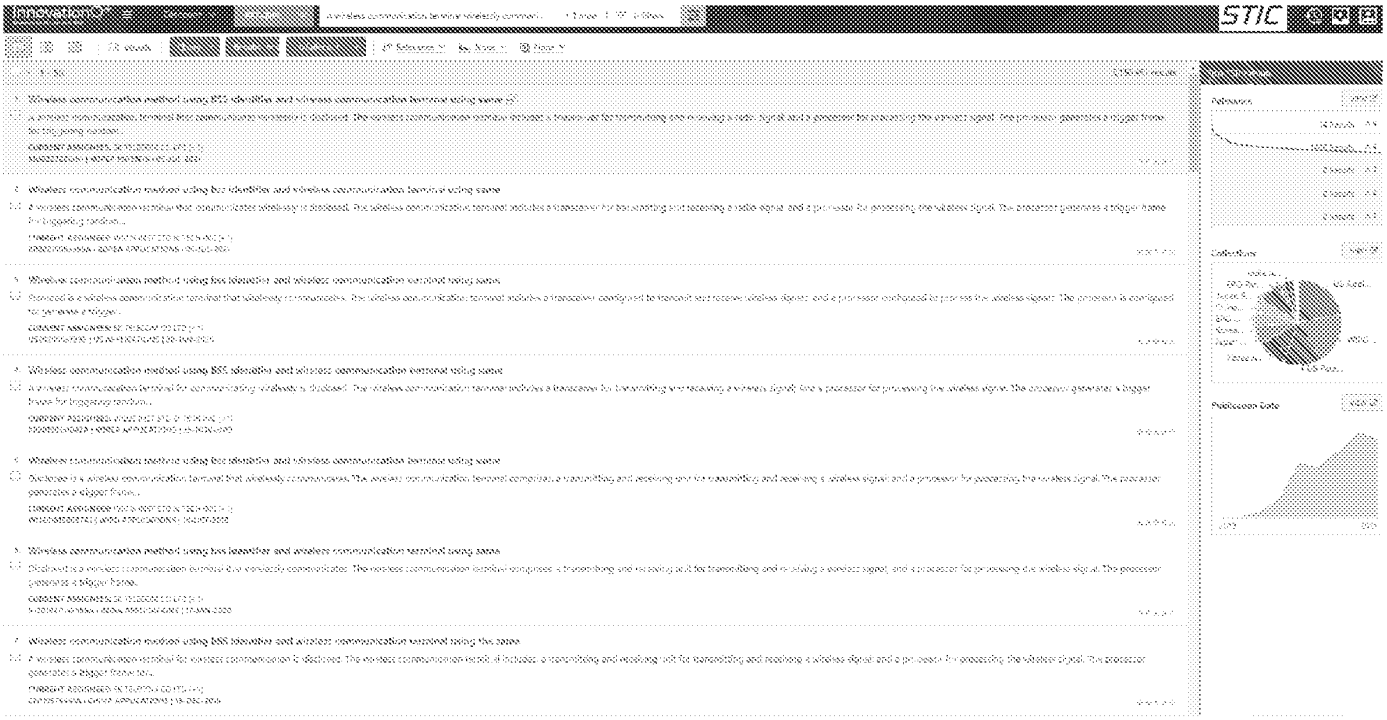
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Google Patents

(wireless communication) (communication terminal) (ppdu) (bss) (value)

Search

Refine results

wireless communication

communication terminal

ppdu

bss

value

Date Priority

Assignee

Inventor

Patent Office Language

Status Type

Litigation

About 30,877 results

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Sort by Relevance Group by None Deduplicate by Family Results / page 10

Wireless communication method and wireless communication terminal in high- ...

WO EP US CN JP KR

Priority 2019-10-25 Filed 2020-10-26 Published 2021-05-06

The method according to claim 6, determining whether or not the sub-channel of the **BSS** including the **wireless communication terminal** is idle adjusts the first threshold value based on the transmission power of the **PPDU** transmitted by the **wireless communication terminal**, including doing, The method ...

The wireless communications method and wireless communication terminal that the ...

WO US CN EP

Priority 2016-03-31 Filed 2017-03-16 Published 2017-10-05

5. **wireless communication terminal** according to claim 1, wherein transmit the predetermined **value** as the **BSS** color Number notice PLCP protocol Data Unit (**PPDU**) be not recognized as between **BSS** based on the **BSS** color or the predetermined **value** **PPDU** in **PPDU** or **BSS**, whereby, in the **BSS** **PPDU** ...

... method using ofdma random access and wireless communication terminal using same

WO EP US CN JP KR

Priority 2017-03-27 Filed 2017-12-27 Granted 2021-08-17 Published 2021-08-19

In another specific embodiment, when the **wireless communication terminal** changes the **BSS** color in the TBTT of the beacon frame included in the **PPDU** ... **wireless communication terminal**. In claim 1, The processor is Does not decrease the counter **value** based on the trigger frame transmitted from the **BSS** ...

Wireless communication method and wireless communication terminal in high- ...

Priority 2019-10-18 Filed 2019-10-21 Granted 2021-10-01 Published 2021-10-07

In addition, if the **value** of the **BSS** color indicated by the signaling field of the **PPDU** is different from the **BSS** color of the **BSS** including the **wireless communication terminal**, and the corresponding MPDU is an Intra-**BSS** frame as a result of determination based on the address field of the MAC ...

Wireless communication method and wireless communication terminal in high- ...

Priority 2019-10-25 Filed 2019-10-30 Granted 2021-09-10 Published 2021-09-13

In addition, if the **value** of the **BSS** color indicated by the signaling field of the **PPDU** is different from the **BSS** color of the **BSS** including the **wireless communication terminal**, and the corresponding MPDU is an Intra-**BSS** frame as a result of determination based on the Address field of the MAC ...

Wireless communication method and wireless communication terminal in high- ...

Priority 2019-10-25 Filed 2019-10-30 Published 2021-05-06

In addition, if the **value** of the **BSS** color indicated by the signaling field of the **PPDU** is different from the **BSS** color of the **BSS** including the **wireless communication terminal**, and the corresponding MPDU is an Intra-**BSS** frame as a result of determination based on the Address field of the MAC ...

Top 1000 results by filing date

Relative count of top 5 values

| Assignee | Inventors | CPCs |
|---|---|---|
| [redacted] | | 16% |
| LG Electronics Inc. | | 10.4% |
| [redacted] | | 7.1% |
| Qualcomm Incorporated | | 7% |
| [redacted] | | 5.6% |

Expand

August 2, 2022

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 1. | 2016/186469 | Nov. 24, 2016 | WO | | | Espacenet |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 2. | Notice of Allowance dated September 28, 2021 for Korean Patent Application No. 10-2021-7020224 and its English translation provided by Applicant's foreign counsel |
| | 3. | Office Action dated June 30, 2022 for Chinese Patent Application No. 201880024847.X and its English translation provided by Applicant's foreign counsel |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| /MOHAMMED S CHOWDHURY/ (01/10/2023) | 01/10/2023 |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.C./

## PE2E SEARCH - Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| L1 | 1 | "16590302" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:24 PM |
| L2 | 5 | ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) and MinTrigProcTime$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:41 PM |
| L3 | 2 | L2 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:43 PM |
| L4 | 3 | ("20170202015" "20150139200" "20180014325").pn. | (US-PGPUB; USPAT) | OR | ON | ON | 2021/06/10 04:59 PM |
| L5 | 3 | L4 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 04:59 PM |
| L6 | 160 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:05 PM |
| L7 | 166 | ((insert$5 or add$4 or inject$4 or allow$4 or push$4 or introduc$4 or put$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:06 PM |
| L8 | 138 | L7 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:08 PM |
| L10 | 119 | L8 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:12 PM |
| L11 | 17 | ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:31 PM |

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| | | PPDU)) | | | | | |
| L12 | 10 | L11 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:32 PM |
| L13 | 10 | L12 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:33 PM |
| L14 | 776 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (USPAT) | ADJ | ON | ON | 2021/06/10 05:34 PM |
| L15 | 552 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT) | ADJ | ON | ON | 2021/06/10 05:35 PM |
| L27 | 1108 | ((transmit$4 or send$3 or forward$3 or transmission$1 or communicat$4 or relay$3 or transfer$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:56 PM |
| L28 | 932 | L27 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:57 PM |

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| | | Y02D30/70).cpc. | | | | | |
| L29 | 771 | L28 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 11:58 PM |
| L30 | 1004 | ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:16 AM |
| L31 | 840 | L30 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L32 | 701 | L31 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 12:17 AM |
| L33 | 699 | ((BSS color) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:46 AM |
| L34 | 642 | L33 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:47 AM |
| L35 | 12653 | ((BSS or (Basic Service Set)) near25 identif$7) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L36 | 1292 | ((BSS or (Basic Service Set)) near25 identif$7) and (Trigger$5 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:49 AM |
| L37 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:50 AM |
| L38 | 477 | L37 and (H04W80/08 or H04W76/11 or H04W72/0446 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:51 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L39 | 381 | L38 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:52 AM |
| L40 | 540 | ((BSS or (Basic Service Set)) near25 identif$7) and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L41 | 477 | L40 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L42 | 381 | L41 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L43 | 96 | L42 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:02 PM |
| L44 | 58 | L43 and ((BSS or (Basic Service Set)) near25 color$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:06 PM |
| L45 | 11 | L44 and ((BSS or (Basic Service Set)) near25 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:13 PM |
| L46 | 11 | L44 and ((BSS or (Basic Service Set)) near15 unassociat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:14 PM |
| L50 | 6 | L46 and ((generat$5 or produc$4) near15 (Trigger frame$1) near25 (uplink transmission)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:25 PM |
| L51 | 6 | L46 and (((generat$5 or produc$4) near15 (Trigger frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:26 PM |

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|---|---|---|---|---|---|---|---|
| | | near25 (uplink transmission)) same (random access)) | | | | | |
| L52 | 6 | L51 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:29 PM |
| L53 | 6 | L52 and ((transmit$4 or send$3) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:31 PM |
| L54 | 0 | L53 and ((insert$5) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:32 PM |
| L55 | 6 | L53 and (((insert$5 or add$4 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:33 PM |
| L56 | 0 | L53 and (((insert$5 or inject$4 or allow$4 or push$4 introduc$4) near25 (trigger frame$1) near25 ((physical layer protocol data unit) or PPDU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:34 PM |
| L57 | 6 | L53 and (OFDMA backoff) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:35 PM |
| L59 | 6 | L53 and OBO | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 03:36 PM |
| L60 | 6 | L59 and ((Overlapp$5 Basic Service Set) or OBSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:06 PM |
| L64 | 6 | L60 and ((Association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 04:08 PM |
| L65 | 491 | ((trigger$3 frame$1) near15 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:19 PM |
| L66 | 436 | L65 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:20 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L67 | 411 | L66 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:22 PM |
| L68 | 86 | L67 and ((trigger frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:24 PM |
| L69 | 86 | L67 and ((trigger frame$1) near25 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:28 PM |
| L70 | 49 | L69 and ((Trigger frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:29 PM |
| L71 | 44 | L70 and ((Trigger frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L72 | 92 | L67 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:30 PM |
| L73 | 49 | L72 and ((Trigger$3 frame$1) near25 (random access)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L74 | 44 | L73 and ((Trigger$3 frame$1) near25 uplink) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 10:31 PM |
| L75 | 0 | L74 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:29 PM |
| L76 | 0 | L74 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L77 | 16 | L65 and ((receiver address) near25 (power near2 (sav$3 or consumption$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L78 | 15 | L77 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:30 PM |
| L79 | 15 | L78 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:31 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L80 | 1 | L65 and ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L81 | 6 | ((receiver address) near25 (TWT)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L82 | 2 | L81 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:32 PM |
| L83 | 16 | L74 and (receiver address) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/11 11:34 PM |
| L84 | 108 | ((Target Wake Time) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:44 AM |
| L85 | 117 | (((Target Wake Time) or (target wait time)) and (receiver address) and (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:46 AM |
| L86 | 1 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:48 AM |
| L87 | 0 | (((Target Wake Time) or (target wait time) or TWT) near30 (receiver address) near30 (Trigger$3 frame$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L88 | 2 | (((Target Wake Time) or (target wait time) or TWT) same (receiver address) same (Trigger$3 frame$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:49 AM |
| L89 | 104 | L85 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L90 | 78 | L89 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:50 AM |
| L91 | 32 | ((receiver address) and (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |

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|---|---|---|---|---|---|---|---|
| L92 | 30 | L91 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:53 AM |
| L93 | 29 | L92 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:54 AM |
| L94 | 6 | ((receiver address) near25 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:58 AM |
| L95 | 6 | ((receiver address) near35 (Trigger$3 frame$1)) same (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L96 | 109 | ((receiver address) near35 (Trigger$3 frame$1)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 08:59 AM |
| L97 | 47 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:33 AM |
| L98 | 41 | L97 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L99 | 20 | L98 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:34 AM |
| L100 | 1 | (((association ID) or AID) near25 (frequenc$4 or band$1 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:38 AM |

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|---|---|---|---|---|---|---|---|
| | | or channel$1) near25 (user info$9)) same (power near2 (sav$3 or consumption$1)) | | | | | |
| L101 | 16 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 (user info$9)) and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L102 | 15 | L101 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:39 AM |
| L103 | 12 | L102 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 09:40 AM |
| L104 | 0 | (((association ID) or AID) near25 (frequenc$4 or band$1 or channel$1) near25 ((user info) or (user information$1))) and (power near2 (sav$3 or consumption$1)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:06 AM |
| L106 | 59 | (((pre?determined or predetermined) near25 reserved) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L107 | 54 | L106 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |
| L108 | 20 | L107 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 12:26 PM |

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|---|---|---|---|---|---|---|---|
| L109 | 16 | (((pre?determined or predetermined) near25 (reserved value$1)) same (((association ID) or AID))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:01 PM |
| L110 | 15 | L109 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L111 | 10 | L110 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:02 PM |
| L112 | 131 | ((pre?determined or predetermined) near15 "2044") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:03 PM |
| L113 | 6 | L112 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L114 | 4 | L113 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:04 PM |
| L115 | 18 | ((pre?determined or predetermined) near15 "2044") and ((association ID) or AID) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L116 | 13 | L115 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |
| L117 | 0 | L116 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 01:05 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L118 | 38 | (TID Aggregation limit$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:47 PM |
| L119 | 37 | L118 and (A?MPDU or (Aggregate MAC protocol data unit) or (A MPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:52 PM |
| L120 | 32 | L119 and (user info$8) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:53 PM |
| L121 | 11 | L120 and (power near2 (sav$3 or consumption$1)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 02:54 PM |
| L122 | 7 | L121 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:38 PM |
| L123 | 7 | L122 and (Trigger$3 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 03:41 PM |
| L124 | 14 | (without near10 indicat$5 near25 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:53 PM |
| L125 | 9 | L124 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L126 | 0 | (without near10 indicat$5 near25 (BSS color)) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/12 10:54 PM |
| L127 | 0 | (trigger frame$1) near25 ("no" or "not") near25 indicat$5 near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L128 | 3 | (trigger frame$1) near25 ("no" or "not") near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:58 PM |
| L129 | 0 | (trigger frame$1) near25 (does) near25 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 10:59 PM |
| L130 | 0 | (trigger frame$1) near45 (does) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L131 | 67 | (trigger frame) near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:00 PM |
| L132 | 39 | (trigger frame) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:01 PM |
| L133 | 0 | (trigger frame) near45 (no) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:02 PM |
| L134 | 0 | (trigger frame) near45 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 |

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|---|---|---|---|---|---|---|---|
| | | ("not") near45 indicat$6 near45 (BSS color) | | | | | 11:02 PM |
| L135 | 0 | (trigger frame) near45 (does) near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L136 | 0 | (trigger frame) near45 does near45 indicat$6 near45 (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L137 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L138 | 84 | (trigger frame) near45 color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L139 | 0 | (trigger frame) near45 does | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:03 PM |
| L140 | 0 | (trigger frame) near45 "does" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L141 | 240 | (trigger frame) near45 do$2 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:04 PM |
| L142 | 35 | L132 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/12 11:05 PM |
| L143 | 3 | active BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:41 AM |
| L144 | 0 | active BSS color | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/06/13 06:42 AM |
| L145 | 3 | L143 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L146 | 0 | L145 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 06:43 AM |
| L147 | 43 | partial BSS color | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L148 | 38 | L147 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:13 AM |
| L150 | 34 | L148 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:14 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L151 | 25 | L150 and (trigger$4 frame$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:29 AM |
| L152 | 68 | ((partial BSS color) or (partial Basic Service Set)) and ((partial AID) or (partial association)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:53 AM |
| L153 | 29 | L152 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 07:55 AM |
| L154 | 17 | (((((partial BSS color) or (partial Basic Service Set)) near10 PPDU) and (((partial AID) or (partial association)) near10 PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:00 AM |
| L155 | 15 | L154 and (((inter?BSS) or (intra?BSS)) near10 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/13 08:01 AM |
| L156 | 697 | ((BSS color) near25 indicat$5) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:22 PM |
| L157 | 270 | ((BSS color) near25 indicat$5)same (PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:27 PM |
| L158 | 155 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L159 | 118 | L158 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:28 PM |
| L160 | 95 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:31 PM |
| L161 | 92 | L160 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |

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|---|---|---|---|---|---|---|---|
| | | Y02D30/70).cpc. | | | | | |
| L162 | 72 | L161 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:32 PM |
| L163 | 16 | L162 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:41 PM |
| L164 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) same (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L165 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and(Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L166 | 3 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:49 PM |
| L167 | 0 | L166 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L168 | 4 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L169 | 0 | L168 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L170 | 0 | (((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 08:50 PM |
| L177 | 94 | ((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 (zero or "0")) and (trigger$3 frame$1 near25 PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L178 | 91 | L177 and (H04W80/08 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 |

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|---|---|---|---|---|---|---|---|
| | | or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | 09:39 PM |
| L179 | 71 | L178 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L180 | 16 | L179 and ((BSS color) near25 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L181 | 8 | L180 and (BSS color change$1) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:39 PM |
| L183 | 2 | L181 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:43 PM |
| L184 | 0 | L181 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:50 PM |
| L185 | 1 | L177 and ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L186 | 11 | ((partial Basic service set) near5 color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L187 | 10 | L186 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:51 PM |
| L188 | 15 | ((partial Basic service set) near5 color) | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:52 PM |
| L189 | 15 | L188 and (@ad or @rlad or @prad or @ptad)<"20170414" | (USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| L190 | 13 | L177 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L191 | 9 | L190 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:17 PM |
| L192 | 9 | L191 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 11:19 PM |

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|---|---|---|---|---|---|---|---|
| | | H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | | | | | |
| L195 | 1 | ("20160212246").PN. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:34 PM |
| L196 | 0 | L195 and ((BSS color change time) or (target beacon transmission time$1) or TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:35 PM |
| L197 | 1 | L195 and ((trigger$3 frame$1) near15 ((physical layer protocol data unit) or PPDU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:36 PM |
| L198 | 0 | L197 and (BSS color) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/12/04 02:37 PM |
| L199 | 11 | ("20160212246" OR "20160330742" OR "20160353275" OR "20170325178" OR "20180146426" OR "20180184285" OR "20180227950" OR "20180242355" OR "20190182864" OR "20200037395" OR "20210127427").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:45 PM |
| L200 | 2 | ("20160174254" OR "20170070962").pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:48 PM |
| L203 | 1 | ("17/670,419").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L204 | 2 | ("16/590,302").app. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:50 PM |
| L205 | 170 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:54 PM |
| L206 | 156 | L205 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L207 | 245 | (( physical layer | (USOCR; FIT (CA, CN, | ADJ | ON | ON | 2022/11/27 |

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|---|---|---|---|---|---|---|---|
| | | protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | 02:55 PM |
| L208 | 220 | L207 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:55 PM |
| L209 | 124 | L206 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L210 | 121 | L208 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 02:56 PM |
| L212 | 65 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND (((trigger$ frame$1) near25 ((resource unit$1) OR RU))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L213 | 47 | L212 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:15 PM |
| L214 | 36 | L213 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:16 PM |
| L215 | 36 | ((trigger$ frame$1) near25 ((resource unit$1) OR RU)) AND | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 03:22 PM |

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|---|---|---|---|---|---|---|---|
| | | L209 | | | | | |
| L216 | 2 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L217 | 1 | (( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) AND ((BSS color) near25 ((modif$ OR adjust$) near10 (time OR period$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 04:53 PM |
| L218 | 1689 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:26 PM |
| L219 | 369 | ((trigger$ frame$ ) near25 ((resource unit) OR RU)) AND (transmitter address) AND (receiver address ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L220 | 294 | L219 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:28 PM |
| L222 | 209 | L220 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:29 PM |
| L223 | 161 | L222 AND (( physical layer protocol data unit) OR PPDU) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:35 PM |
| L224 | 25 | L223 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:42 PM |
| L225 | 185 | (((BSS color) OR (( | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 |

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|---|---|---|---|---|---|---|---|
| | | Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | | | | | 02:50 PM |
| L226 | 140 | L225 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L227 | 38 | L226 AND ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:51 PM |
| L228 | 102 | L226 NOT L227 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 02:52 PM |
| L229 | 67 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:03 PM |
| L230 | 51 | L229 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:04 PM |
| L231 | 48 | ((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" ) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:09 PM |
| L232 | 46 | L231 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L233 | 25 | L232 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| L234 | 0 | WO02016024770 | (USOCR; FIT (CA, CN, | ADJ | ON | ON | 2023/01/10 |

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| | | | DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | | | | 03:56 PM |
| L235 | 0 | WO2016024770 | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/10 03:56 PM |
| L236 | 1 | "10440751".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:58 PM |
| L237 | 1 | "10448333".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:01 PM |
| L238 | 0 | "2017070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L239 | 1 | "20170070962".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:04 PM |
| L240 | 1 | "20180270038".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:05 PM |
| L241 | 185 | (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L242 | 0 | L241 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L243 | 271 | (((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L244 | 0 | L243 AND L240 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:07 PM |
| L245 | 68 | (((trigger$ frame$ ) near25 ((resource unit) OR RU)) ) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L246 | 48 | L245 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:34 AM |
| L247 | 37 | L246 AND (H04W80/08 OR H04W72/0446 OR H04W72/1268 OR H04W74/0866 OR H04W76/11 OR H04W74/0833 OR H04W84/12 OR H04W74/06 OR H04W52/02 OR | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 12:35 AM |

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|---|---|---|---|---|---|---|---|
| | | H04W28/06 OR H04W52/0216 OR H04W74/002).cpc. | | | | | |
| L248 | 37 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:25 AM |
| L249 | 1 | L217 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L250 | 2676 | ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:40 AM |
| L251 | 10 | L250 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L252 | 5 | L251 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:41 AM |
| L253 | 17 | L247 AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 "63") | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:14 PM |
| L254 | 17 | L253 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 01:16 PM |
| L255 | 0 | L254 AND ((target beacon transmission time) OR TBTT) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 03:09 PM |
| L256 | 18 | ((Partial Association ID) near45 (BSS color)) | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L257 | 12 | L256 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:07 PM |
| L258 | 38 | ((Partial Association ID) near45 (BSS color)) | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |
| L259 | 34 | L258 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (USOCR; FIT (CA, CN, DE, EP, FR, GB, IL, JP, KR, SG, TW, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | ADJ | ON | ON | 2023/01/11 06:10 PM |

## PE2E SEARCH - Search History (Interference)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| N16 | 1716 | ((("WILUS") near3 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 |

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|---|---|---|---|---|---|---|---|
| | | ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | | | | | 05:35 PM |
| N17 | 537 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:36 PM |
| N18 | 370 | (((trigger$3 frame$1) and ((physical layer protocol data unit) or PPDU))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N19 | 303 | N18 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:37 PM |
| N20 | 29 | N16 and N19 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:38 PM |
| N21 | 4 | N19 and (insert$5 near25 (trigger frame$1)).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:39 PM |
| N22 | 2 | N16 and N21 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:40 PM |
| N23 | 80 | N19 and ((Basic Service Set$1) or BSS).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N24 | 15 | N16 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N25 | 15 | N17 and N23 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:42 PM |
| N26 | 67 | N23 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/06/10 05:43 PM |
| N171 | 1 | ((((BSS color) near25 indicat$5)same (PPDU) and (PPDU near25 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |

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|---|---|---|---|---|---|---|---|
| | | (zero or "0")) and (trigger$3 frame$1 near25 PPDU)) and (Active near15 BSS)).clm. | | | | | |
| N172 | 1805 | ((("WILUS") near3 ("INSTITUTE") near3 ("OF") near3 ("STANDARDS") near3 ("AND") near3 ("TECHNOLOGY") near3 ("INC")) OR (("SK") near3 ("TELECOM") near3 ("CO") near3 ("LTD"))).AS,AANM. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N173 | 1 | N172 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:51 PM |
| N174 | 595 | ((("KO") near3 ("Geonjung")) OR (("AHN") near3 ("Woojin")) OR (("SON") near3 ("Juhyung")) OR (("KWAK") near3 ("Jinsam"))).INV. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N175 | 1 | N174 and N171 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N176 | 1 | N171 and (H04W80/08 or H04W76/11 or H04W72/0446 or H04W72/1268 or H04W74/0866 or H04W74/0833 or H04W84/12 or H04W74/06 or H04W52/02 or H04W52/0216 or H04W28/06 or H04W74/002 or Y02D30/70).cpc. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 08:52 PM |
| N193 | 6 | ((partial Basic service set) near5 color).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:53 PM |
| N194 | 5 | N193 and (@ad or @rlad or @prad or @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2021/10/24 09:54 PM |
| N195 | 13 | ((( physical layer protocol data unit) OR PPDU) AND (((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1))))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N196 | 4 | N195 AND N174 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N197 | 4 | N172 AND N195 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2022/11/27 02:57 PM |
| N201 | 0 | (((((BSS color) OR (( Basic Service Set) near5 color)) near45 (trigger$ near5 (PPDU OR frame$1)))) SAME (omit$ OR disabl$ OR miss$ OR "not" )).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 03:10 PM |
| N202 | 28 | ((((BSS color) OR (( Basic Service Set) near5 color)) SAME (trigger$ near5 (PPDU OR frame$1))))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:08 PM |
| N203 | 5 | N202 AND N172 | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/10 04:09 PM |
| N204 | 11 | (((Partial Association ID) SAME (BSS color))).clm. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N205 | 5 | N204 AND (@ad OR @rlad OR @prad OR @ptad)<"20170414" | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:12 PM |
| N206 | 1 | "11284475".pn. | (US-PGPUB; USPAT) | ADJ | ON | ON | 2023/01/11 06:55 PM |

February 9, 2022

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>N/A |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | FILING DATE<br>Concurrently Herewith |
| | | GROUP NO.<br>N/A |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | 1. | 2017/0325178 | Nov. 9, 2017 | VERMA et al. | | | |
| | 2. | 2016/0330742 | Nov. 10, 2016 | LI et al. | | | |
| | 3. | 2019/0182864 | Jun. 13, 2019 | HUANG et al. | | | |
| | 4. | 2018/0242355 | Aug. 23, 2018 | Lou et al. | | | |
| | 5. | 2021/0127427 | Apr. 29, 2021 | NOH et al. | | | |
| | 6. | 2018/0227950 | Aug. 9, 2018 | IWAI et al. | | | |
| | 7. | 2018/0146426 | May 24, 2018 | PARK | | | |
| | 8. | 2016/0353275 | Dec. 1, 2016 | Liu et al. | | | |
| | 9. | 2018/0184285 | Jun. 28, 2018 | Patil et al. | | | |
| | 10. | 2016/0212246 | Jul. 21, 2016 | SEOK | | | |
| | 11. | 2020/0037395 | Jan. 30, 2020 | KO et al. | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 12. | 2016/024770 | Feb. 18, 2016 | WO | | | Espacenet |
| | 13. | 2016/195402 | Dec. 8, 2016 | WO | | | Espacenet |
| | 14. | 10-2017-0038746 | Apr. 7, 2017 | KR | | | KIPRIS |
| | 15. | 2018/190697 | Oct. 18, 2018 | WO | | | Espacenet |
| | 16. | 106487737 | Mar. 8, 2017 | CN | | | Espacenet |
| | 17. | 104350799 | Feb. 11, 2015 | CN | | | Espacenet |



ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.C./

February 9, 2022

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 18. | International Search Report for PCT/KR2018/004397 mailed on August 7, 2018 and its English translation from WIPO (now published as WO 2018/190697) |
| | 19. | Written Opinion of the International Searching Authority for PCT/KR2018/004397 mailed on August 7, 2018 and its English translation by Google Translate (now published as WO 2018/190697) |
| | 20. | Geonjung KO et al., "Text for Intra-PPDU Power Save for a Multiple BSSID Set Case", WILUS, IEEE 802.11-16/1205r0, September 12, 2016. Pages 1-2. |
| | 21. | Geonjung KO et al., "Discussions on Partial BSS Color", WILUS, IEEE 802.11-16/0918r1; September 12, 2016. Slides 1-14. |
| | 22. | International Preliminary Report on Patentability (Chapter I) for PCT/KR2018/004397 issued on October 15, 2019 and its English translation from WIPO (now published as WO2018/190697) |
| | 23. | Office Action for Indian Patent Application No. 201927042859 mailed on March 25, 2021 |
| | 24. | Office Action for Korean Patent Application No. 10-2019-7028525 mailed on September 9, 2020 and its English translation from Global Dossier |
| | 25. | Office Action dated September 27, 2021 for Chinese Patent Application No. 201880024847.X and its English translation provided by Applicant's foreign counsel. |
| | 26. | Khan, Gul Zameen et al.: "On the Field Level Loss of a VHT PPDU in a MIMO-OFDM System for a WiFi Direct 802.11ac WLAN", Conference Title: PROCEEDINGS OF THE 14TH INTERNATIONAL CONFERENCE ON FRONTIERS OF INFORMATION TECHNOLOGY PROCEEDINGS – FIT 2016, PP. 1-6. |
| | 27. | Graham Smith: "TG ax: A Unified Approach to Spatial Reuse", SR technologies, IEEE 802.11-16/1064r3, October 2016, pp. 1-14. |
| | 28. | Jianhan Liu et al.: "AID Assign Rule Based on BSS Color and HE Operation Element", Mediatek, USA, IEEE 802.11-16/0364r3, March 11, 2016, Slides 1-19. |
| | 29. | Notice of Allowance dated November 8, 2021 for U.S. Patent Application No. 16/590,302 (now published as US 2020/0037395). |
| | 30. | Office Action dated June 28, 2021 for U.S. Patent Application No. 16/590,302 (now published as US 2020/0037395). |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| /MOHAMMED S CHOWDHURY/ (01/10/2023) | 01/10/2023 |

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March 31, 2022

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | 1. | 2017/0070962 | Mar. 9, 2017 | Wang et al. | | | |
| | 2. | 2016/0174254 | Jun. 16, 2016 | HEDAYAT | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 3. | 2016/112306 | Jul. 14, 2016 | WO | | | |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 4. | Office Action dated March 3, 2022 for Chinese Patent Application No. 201880024847.X and its English translation provided by Applicant's foreign counsel |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| /MOHAMMED S CHOWDHURY/ (01/10/2023) | 01/10/2023 |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**



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| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 1. | 2016/186469 | Nov. 24, 2016 | WO | | | Espacenet |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 2. | Notice of Allowance dated September 28, 2021 for Korean Patent Application No. 10-2021-7020224 and its English translation provided by Applicant's foreign counsel |
| | 3. | Office Action dated June 30, 2022 for Chinese Patent Application No. 201880024847.X and its English translation provided by Applicant's foreign counsel |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
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**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 46328082 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo/Azatuhi Chinaryan |
| **Filer Authorized By:** | Young Seok Koo |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 03-AUG-2022 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 00:13:39 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2022-08-02_633517_IDS.pdf | 244845<br>710b2529ef8ffb0ba165c27ab676f1cf5fd90180 | yes | 4 |

| | Multipart Description/PDF files in .zip description | | | | |
|---|---|---|---|---|---|
| | Document Description | | Start | End | |
| | Transmittal Letter | | 1 | 3 | |
| | Information Disclosure Statement (IDS) Form (SB08) | | 4 | 4 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Other reference-Patent/Application/ Search Documents | Ref1_KR10-2021-7020224_NOA_9-28-21.pdf | 45447<br>2c9ec1360f16400fcf0dafa1965090f3a7f67cc8 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Other reference-Patent/Application/ Search Documents | Ref2_CN201880024847X_OA_6-30-22.pdf | 915691<br>41fc18fdc60912aaba7f1af40209e9a55ef42275 | no | 18 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Foreign Reference | Ref3_WO2016-186469A1.pdf | 7277338<br>31a3d9aed30cc95594df341263b95b73c91bc643 | no | 136 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 8483321 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | Examiner: Central, Docket |
| | Art Unit: 2467 |
| Serial No.: 17/670,419 | Conf. No.: 6110 |
| Filing Date: February 11, 2022 | Our Ref: B-10124CON1 633517-8 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Re: ***Information Disclosure Statement*** |
| Date: August 2, 2022 | |

**INFORMATION DISCLOSURE STATEMENT**

**Mail Stop Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97 and 1.98 to disclose information that may be relevant to the above-identified patent application. The Applicant requests the Examiner consider the documents listed on the enclosed form PTO-1449 (modified) in the examination of this application.

The filing of this Information Disclosure Statement (IDS) shall not be construed as a representation that a search has been made (37 C.F.R. 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability, or that no other material information exists.

The filing of this Information Disclosure Statement shall not be construed as an admission against interest in any manner (37 C.F.R § 1.97(h)).

If any additional fee is required for this filing, the Applicant requests the Examiner contact a practitioner associated with the Customer Number listed below for authorization.

This information disclosure statement also includes the statements marked below. Failure to mark a statement should not be construed as a negative assertion.

*Timing and Fees*

This IDS is being filed:

[ ] Concurrently with the application, and no fee is due.

[ ] Within three months of the filing of the national application, other than a continued prosecution application under § 1.53(d), and no fee is due.

[ ] Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, and no fee is due.

[x] Before the mailing of a first Office Action on the merits, and no fee is due.

[ ] Before the mailing of a first Office Action after the filing of a request for continued examination under§ 1.114, and no fee is due.

---

[ ] After the periods described above, and before a final Office Action under § 1.113, a Notice of Allowance under § 1.311, or an action that otherwise closes prosecution in the application, and is

- [ ] accompanied by the fee set forth in § 1.17(p), or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1): That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2): That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

---

[ ] After the periods described above, and is accompanied by the fee set forth in § 1.17(p), and is

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

[ ] Concurrently with a Request for Continued Examination, and no additional fee is due for this IDS.

*Items Disclosed*

At least one item listed on the enclosed form PTO-1449 (modified) was

[x] Cited in an Office Action for a related application, the application number of the related application and the issue date of the Office Action are provided below and the Office Action is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

---

[ ] Cited in an International Search Report (ISR) or an International Preliminary Report on Patentability (IPRP) or a Written Opinion (WO) of the International Searching Authority (ISA) for the related PCT Application, the PCT application number and the issue date of the ISR/IPRP/WO are provided below and the ISR/IPRP/WO is enclosed.

---

*Additional Information*

[x] Translations of the foreign-language documents are also enclosed as machine-translations, human-translations, or counterpart applications as noted. Machine translations were provided by the Japanese Patent Office, ESPACENET, Google Documents, Patent Fetcher® /ESPACENET, Google Translate or Google Translator Toolkit as noted and with OCR by Adobe Acrobat 9 or ABBYY PDF Transformer 3 if needed.

[x] English-language abstracts of foreign-language documents are provided.

[x] Documents listed on the enclosed ISR/IPRP/WO or the Office Action have relevance at least as described therein.

[ ] The documents with the following reference numbers were described in the specification of the present application; omission of a reference from this list does not indicate that it was not discussed in the specification of the present application.

---

[x] At least one of the references cited in the Office Action listed on the attached PTO-1449 (modified) were previously submitted in an IDS or cited by the Examiner for the present application on February 11, 2022 and March 31, 2022 and therefore are not submitted in this IDS.

[ ] Other:

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

August 2, 2022
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

/ Young Seok Koo 76255 /

Young Seok Koo
Attorney for Applicant
Registration No. 76,255
LADAS & PARRY LLP
4525 Wilshire Blvd., Suite 240
Los Angeles, CA 90010
(323) 934-2300 voice

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 17/670,419 | 02/11/2022 | Geonjung KO | B-10124CON1 633517-8 |

**CONFIRMATION NO. 6110**

158747
LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

**PUBLICATION NOTICE**

*OC000000134125407*

**Title:**WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

**Publication No.**US-2022-0167460-A1
**Publication Date:**05/26/2022

## NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>17/670,419 |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | FILING DATE<br>February 11, 2022 |
| | | GROUP NO.<br>2467 |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | 1. | 2017/0070962 | Mar. 9, 2017 | Wang et al. | | | |
| | 2. | 2016/0174254 | Jun. 16, 2016 | HEDAYAT | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 3. | 2016/112306 | Jul. 14, 2016 | WO | | | |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 4. | Office Action dated March 3, 2022 for Chinese Patent Application No. 201880024847.X and its English translation provided by Applicant's foreign counsel |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| | |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

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| | |
|---|---|
| **EFS ID:** | 45371091 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo/Azatuhi Chinaryan |
| **Filer Authorized By:** | Young Seok Koo |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 31-MAR-2022 |
| **Filing Date:** | 11-FEB-2022 |
| **Time Stamp:** | 22:36:45 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2022-03-31_633517_IDS.pdf | 244760<br>1b88e7d2d850f40ebae3312d8e919f48fb544325 | yes | 4 |

| | Multipart Description/PDF files in .zip description | | | | |
|---|---|---|---|---|---|
| | **Document Description** | | **Start** | **End** | |
| | Transmittal Letter | | 1 | 3 | |
| | Information Disclosure Statement (IDS) Form (SB08) | | 4 | 4 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Other reference-Patent/Application/ Search Documents | Ref1_CN201880024847X_OA_3-3-22.pdf | 914554<br>131aa4c8aecf7fd1bb8829abebf83327aa9ce48d | no | 16 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Foreign Reference | Ref3_WO2016-112306A1.pdf | 5005127<br>923be748acaa47581d6b22f1e6989f85a9bc2650 | no | 76 |
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**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | Examiner: Central, Docket |
| | Art Unit: 2467 |
| Serial No.: 17/670,419 | Conf. No.: 6110 |
| Filing Date: February 11, 2022 | Our Ref: B-10124CON1 633517-8 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Re: ***Information Disclosure Statement*** |
| Date: March 31, 2022 | |

**INFORMATION DISCLOSURE STATEMENT**

**Mail Stop Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97 and 1.98 to disclose information that may be relevant to the above-identified patent application. The Applicant requests the Examiner consider the documents listed on the enclosed form PTO-1449 (modified) in the examination of this application.

The filing of this Information Disclosure Statement (IDS) shall not be construed as a representation that a search has been made (37 C.F.R. 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability, or that no other material information exists.

The filing of this Information Disclosure Statement shall not be construed as an admission against interest in any manner (37 C.F.R § 1.97(h)).

If any additional fee is required for this filing, the Applicant requests the Examiner contact a practitioner associated with the Customer Number listed below for authorization.

This information disclosure statement also includes the statements marked below. Failure to mark a statement should not be construed as a negative assertion.

*Timing and Fees*

This IDS is being filed:

[ ] Concurrently with the application, and no fee is due.

[ ] Within three months of the filing of the national application, other than a continued prosecution application under § 1.53(d), and no fee is due.

[ ] Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, and no fee is due.

[x] Before the mailing of a first Office Action on the merits, and no fee is due.

[ ] Before the mailing of a first Office Action after the filing of a request for continued examination under§ 1.114, and no fee is due.

---

[ ] After the periods described above, and before a final Office Action under § 1.113, a Notice of Allowance under § 1.311, or an action that otherwise closes prosecution in the application, and is

- [ ] accompanied by the fee set forth in § 1.17(p), or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1): That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2): That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

---

[ ] After the periods described above, and is accompanied by the fee set forth in § 1.17(p), and is

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

[ ] Concurrently with a Request for Continued Examination, and no additional fee is due for this IDS.

*Items Disclosed*

At least one item listed on the enclosed form PTO-1449 (modified) was

[x] Cited in an Office Action for a related application, the application number of the related application and the issue date of the Office Action are provided below and the Office Action is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

---

[ ] Cited in an International Search Report (ISR) or an International Preliminary Report on Patentability (IPRP) or a Written Opinion (WO) of the International Searching Authority (ISA) for the related PCT Application, the PCT application number and the issue date of the ISR/IPRP/WO are provided below and the ISR/IPRP/WO is enclosed.

---

*Additional Information*

[x] Translations of the foreign-language documents are also enclosed as machine-translations, human-translations, or counterpart applications as noted. Machine translations were provided by the Japanese Patent Office, ESPACENET, Google Documents, Patent Fetcher® /ESPACENET, Google Translate or Google Translator Toolkit as noted and with OCR by Adobe Acrobat 9 or ABBYY PDF Transformer 3 if needed.

[ ] English-language abstracts of foreign-language documents are provided.

[x] Documents listed on the enclosed ISR/IPRP/WO or the Office Action have relevance at least as described therein.

[ ] The documents with the following reference numbers were described in the specification of the present application; omission of a reference from this list does not indicate that it was not discussed in the specification of the present application.

---

[ ] At least one of the references cited in the Office Action listed on the attached PTO-1449 (modified) were previously submitted in an IDS or cited by the Examiner for the present application on _____ and therefore are not submitted in this IDS.

[ ] Other:

I hereby certify that this document is being transmitted to the Patent and Trademark Office via electronic filing.

March 31, 2022
(Date of Transmission)

Azatuhi Chinaryan
(Name of Person Transmitting)

/ Azatuhi Chinaryan /
(Signature)

Respectfully submitted,

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# KOREAN INTELLECTUAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office.

출 원 번 호 : 10-2017-0146356
Application Number

출 원 년 월 일 : 2017년 11월 04일
Filing Date Nov. 04, 2017

출 원 인 : 주식회사 윌러스표준기술연구소

Applicant(s) WILUS Institute of Standards and Technology Inc.

2022년 02월 17일

특 허 청
COMMISSIONER

제출 일자 : 2017-05-02

# 【서지사항】

【서류명】 특허출원서

【참조번호】 WILP170118KR

【출원구분】 특허출원

【출원인】

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【특허고객번호】 1-2013-022334-3

【대리인】

【성명】 임국일

【대리인번호】 9-2014-000874-4

【포괄위임등록번호】 2014-036557-3

【발명의 국문명칭】 무선랜 광대역 환경에서 단말의 타겟 웨이크 타임 동작 방법

【발명의 영문명칭】 METHOD OF TARGET WAKE TIME OPERATION OF STATION IN WIDEBAND WIRELESS LAN NETWORKS

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【주민등록번호】 831010-1XXXXXX

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제출 일자 : 2017-05-02

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제출 일자 : 2017-05-02

【국적】 KR

【출원언어】 국어

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 임국일 (서명 또는 인)

【수수료】

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| 【출원료】 | 0 | 면 | 46,000 원 |
| 【가산출원료】 | 34 | 면 | 0 원 |
| 【우선권주장료】 | 0 | 건 | 0 원 |
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【합계】 46,000 원

【감면사유】 소기업(70%감면)[1]

【감면후 수수료】 13,800 원

제출 일자 : 2017-05-02

# 【발명의 설명】

## 【발명의 명칭】

무선랜 광대역 환경에서 단말의 타겟 웨이크 타임 동작 방법 {METHOD OF TARGET WAKE TIME OPERATION OF STATION IN WIDEBAND WIRELESS LAN NETWORKS}

## 【기술분야】

【0001】 본 발명은 전송 효율을 향상시키기 위한 방법으로서, 더욱 상세하게는 무선랜에서 향상된 채널 접속 방법을 제안하여 전송 효율을 향상시키는 다양한 방법, 장치 및 시스템에 관한 것이다.

## 【발명의 배경이 되는 기술】

【0002】 최근 모바일 기기의 보급이 확대됨에 따라 이들에게 빠른 무선 인터넷 서비스를 제공할 수 있는 무선랜(Wireless LAN) 기술이 많은 각광을 받고 있다. 무선랜 기술은 근거리에서 무선 통신 기술을 바탕으로 스마트 폰, 스마트 패드, 랩탑 컴퓨터, 휴대형 멀티미디어 플레이어, 임베디드 기기 등과 같은 모바일 기기들을 가정이나 기업 또는 특정 서비스 제공지역에서 무선으로 인터넷에 접속할 수 있도록 하는 기술이다.

【0003】 IEEE(Institute of Electrical and Electronics Engineers) 802.11은 2.4GHz 주파수를 이용한 초기의 무선랜 기술을 지원한 이래, 다양한 기술의 표준을 실용화 또는 개발 중에 있다. 먼저, IEEE 802.11b는 2.4GHz 밴드의 주파수를 사용하면서 최고 11Mbps의 통신 속도를 지원한다. IEEE 802.11b 이후에 상용화된

IEEE 802.11a는 2.4GHz 밴드가 아닌 5GHz 밴드의 주파수를 사용함으로써 상당히 혼잡한 2.4GHz 밴드의 주파수에 비해 간섭에 대한 영향을 줄였으며, OFDM 기술을 사용하여 통신 속도를 최대 54Mbps까지 향상시켰다. 그러나 IEEE 802.11a는 IEEE 802.11b에 비해 통신 거리가 짧은 단점이 있다. 그리고 IEEE 802.11g는 IEEE 802.11b와 마찬가지로 2.4GHz 밴드의 주파수를 사용하여 최대 54Mbps의 통신속도를 구현하며, 하위 호환성(backward compatibility)을 만족하고 있어 상당한 주목을 받았는데, 통신 거리에 있어서도 IEEE 802.11a보다 우위에 있다.

【0004】 그리고 무선랜에서 취약점으로 지적되어온 통신 속도에 대한 한계를 극복하기 위하여 제정된 기술 규격으로서 IEEE 802.11n이 있다. IEEE 802.11n은 네트워크의 속도와 신뢰성을 증가시키고, 무선 네트워크의 운영 거리를 확장하는데 목적을 두고 있다. 보다 구체적으로, IEEE 802.11n에서는 데이터 처리 속도가 최대 540Mbps 이상인 고처리율(High Throughput, HT)을 지원하며, 또한 전송 에러를 최소화하고 데이터 속도를 최적화하기 위해 송신부와 수신부 양단 모두에 다중 안테나를 사용하는 MIMO(Multiple Inputs and Multiple Outputs) 기술에 기반을 두고 있다. 또한, 이 규격은 데이터 신뢰성을 높이기 위해 중복되는 사본을 여러 개 전송하는 코딩 방식을 사용할 수 있다.

【0005】 무선랜의 보급이 활성화되고 또한 이를 이용한 어플리케이션이 다양화됨에 따라, IEEE 802.11n이 지원하는 데이터 처리 속도보다 더 높은 처리율(Very High Throughput, VHT)을 지원하기 위한 새로운 무선랜 시스템에 대한 필요성이 대두되었다. 이 중 IEEE 802.11ac는 5GHz 주파수에서 넓은 대역폭(80MHz~160MHz)을

지원한다. IEEE 802.11ac 표준은 5GHz 대역에서만 정의되어 있으나 기존 2.4GHz 대역 제품들과의 하위 호환성을 위해 초기 11ac 칩셋들은 2.4GHz 대역에서의 동작도 지원할 것이다. 이론적으로, 이 규격에 따르면 다중 스테이션의 무선랜 속도는 최소 1Gbps, 최대 단일 링크 속도는 최소 500Mbps까지 가능하게 된다. 이는 더 넓은 무선 주파수 대역폭(최대 160MHz), 더 많은 MIMO 공간적 스트림(최대 8개), 다중 사용자 MIMO, 그리고 높은 밀도의 변조(최대 256 QAM) 등 802.11n에서 받아들인 무선 인터페이스 개념을 확장하여 이루어진다. 또한, 기존 2.4GHz/5GHz 대신 60GHz 밴드를 사용해 데이터를 전송하는 방식으로 IEEE 802.11ad가 있다. IEEE 802.11ad는 빔포밍 기술을 이용하여 최대 7Gbps의 속도를 제공하는 전송규격으로서, 대용량의 데이터나 무압축 HD 비디오 등 높은 비트레이트 동영상 스트리밍에 적합하다. 하지만 60GHz 주파수 밴드는 장애물 통과가 어려워 근거리 공간에서의 디바이스들 간에만 이용이 가능한 단점이 있다.

【0006】 한편, 최근에는 802.11ac 및 802.11ad 이후의 차세대 무선랜 표준으로서, 고밀도 환경에서의 고효율 및 고성능의 무선랜 통신 기술을 제공하기 위한 논의가 계속해서 이루어지고 있다. 즉, 차세대 무선랜 환경에서는 고밀도의 스테이션과 AP(Access Point)의 존재 하에 실내/외에서 높은 주파수 효율의 통신이 제공되어야 하며, 이를 구현하기 위한 다양한 기술들이 필요하다.

**【발명의 내용】**

**【해결하고자 하는 과제】**

【0007】 본 발명은 전술한 바와 같이 고밀도 환경에서의 고효율/고성능의 무선랜 통신을 제공하기 위한 목적을 가지고 있다.

**【과제의 해결 수단】**

【0008】 본 발명의 실시예에 따르면, 무선랜을 위한 장치, 시스템 및 무선랜 통신 방법이 제공될 수 있다.

**【발명의 효과】**

【0009】 본 발명의 실시예에 따르면, 전송 효율을 향상시킬 수 있는 방법을 제공한다. 본 발명은 무선랜을 이용하는 스테이션 내지 액세스 포인트, 셀룰러 통신을 이용하는 스테이션 내지 기지국 등 다양한 통신 디바이스에 사용 가능하다.

**【도면의 간단한 설명】**

【0010】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 나타낸 도면.

도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템을 나타낸 도면.

도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도.

도 4는 본 발명의 일 실시예에 따른 액세스 포인트의 구성을 나타낸 블록도.

도 5는 본 발명의 실시예에 따른 무선랜의 MPDU aggregation 방법을 도시하고 있다.

도 6은 본 발명의 실시예에 따른 802.11ax 표준 무선랜의 A-MPDU 구성방법을 도시하고 있다.

도 7은 본 발명의 실시예에 따른 트리거 프레임 구조를 도시하고 있다.

도 8은 본 발명의 일 실시예에 따른 다중 사용자 상향 전송시의 EDCA parameter 제어방법을 도시하고 있다.

도 9는 본 발명의 실시예에 따른 단말의 Buffer Status Report (BSR) 방법을 도시하고 있다.

도 10은 본 발명의 실시예에 따른 단말의 UORA를 이용한 TWT 동작을 도시하고 있다.

도 11은 본 발명의 실시예에 따른 TWT 참여 단말의 MU EDCA 동작을 도시하고 있다.

**【발명을 실시하기 위한 구체적인 내용】**

【0011】본 명세서에서 사용되는 용어는 본 발명에서의 기능을 고려하면서 가능한 현재 널리 사용되는 일반적인 용어를 선택하였으나, 이는 당 분야에 종사하는 기술자의 의도, 관례 또는 새로운 기술의 출현 등에 따라 달라질 수 있다. 또한 특정 경우는 출원인이 임의로 선정한 용어도 있으며, 이 경우 해당되는 발명의 설명 부분에서 그 의미를 기재할 것이다. 따라서 본 명세서에서 사용되는 용어는, 단순한 용어의 명칭이 아닌 그 용어가 가진 실질적인 의미와 본 명세서의 전반에 걸친 내용을 토대로 해석되어야 함을 밝혀두고자 한다.

【0012】명세서 전체에서, 어떤 구성이 다른 구성과 “연결”되어 있다고 할 때, 이는 “직접적으로 연결”되어 있는 경우뿐 아니라, 그 중간에 다른 구성요소를 사이에 두고 “전기적으로 연결”되어 있는 경우도 포함한다. 또한 어떤 구성

이 특정 구성요소를 “포함”한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다. 이에 더하여, 특정 임계값을 기준으로 “이상” 또는 “이하”라는 한정 사항은 실시예에 따라 각각 “초과” 또는 “미만”으로 적절하게 대체될 수 있다.

【0013】도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다. 무선랜 시스템은 하나 또는 그 이상의 베이직 서비스 세트(Basic Service Set, BSS)를 포함하는데, BSS는 성공적으로 동기화를 이루어서 서로 통신할 수 있는 기기들의 집합을 나타낸다. 일반적으로 BSS는 인프라스트럭쳐 BSS(infrastructure BSS)와 독립 BSS(Independent BSS, IBSS)로 구분될 수 있으며, 도 1은 이 중 인프라스트럭쳐 BSS를 나타내고 있다.

【0014】도 1에 도시된 바와 같이 인프라스트럭쳐 BSS(BSS1, BSS2)는 하나 또는 그 이상의 스테이션(STA-1, STA-2, STA-3, STA-4, STA-5), 분배 서비스(Distribution Service)를 제공하는 스테이션인 액세스 포인트(PCP/AP-1, PCP/AP-2), 및 다수의 액세스 포인트(PCP/AP-1, PCP/AP-2)를 연결시키는 분배 시스템(Distribution System, DS)을 포함한다.

【0015】스테이션(Station, STA)은 IEEE 802.11 표준의 규정을 따르는 매체 접속 제어(Medium Access Control, MAC)와 무선 매체에 대한 물리층(Physical Layer) 인터페이스를 포함하는 임의의 디바이스로서, 광의로는 비 액세스 포인트(Non-AP) 스테이션뿐만 아니라 액세스 포인트(AP)를 모두 포함한다. 또한, 본 명

세서에서는 스테이션과 AP 등의 무선랜 통신 디바이스를 모두 포함하는 개념으로서 '단말' 이라는 용어가 사용될 수 있다. 무선 통신을 위한 스테이션은 프로세서(Processor)와 트랜시버(transceiver)를 포함하고, 실시예에 따라 유저 인터페이스부와 디스플레이 유닛 등을 더 포함할 수 있다. 프로세서는 무선 네트워크를 통해 전송할 프레임을 생성하거나 또는 상기 무선 네트워크를 통해 수신된 프레임을 처리하며, 그 밖에 스테이션을 제어하기 위한 다양한 처리를 수행할 수 있다. 그리고, 트랜시버는 상기 프로세서와 기능적으로 연결되어 있으며 스테이션을 위하여 무선 네트워크를 통해 프레임을 송수신한다.

【0016】 액세스 포인트(Access Point, AP)는 자신에게 결합된(associated) 스테이션을 위하여 무선 매체를 경유하여 분배시스템(DS)에 대한 접속을 제공하는 개체이다. 인프라스트럭쳐 BSS에서 비 AP 스테이션들 사이의 통신은 AP를 경유하여 이루어지는 것이 원칙이지만, 다이렉트 링크가 설정된 경우에는 비AP 스테이션들 사이에서도 직접 통신이 가능하다. 한편, 본 발명에서 AP는 PCP(Personal BSS Coordination Point)를 포함하는 개념으로 사용되며, 광의적으로는 집중 제어기, 기지국(Base Station, BS), 노드-B, BTS(Base Transceiver System), 또는 사이트 제어기 등의 개념을 모두 포함할 수 있다.

【0017】 복수의 인프라스트럭쳐 BSS는 분배 시스템(DS)을 통해 상호 연결될 수 있다. 이때, 분배 시스템을 통하여 연결된 복수의 BSS를 확장 서비스 세트(Extended Service Set, ESS)라 한다.

【0018】 도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다. 도 2의 실시예에서 도 1의 실시예와 동일하거나 상응하는 부분은 중복적인 설명을 생략하도록 한다.

【0019】 도 2에 도시된 BSS-3는 독립 BSS이며 AP를 포함하지 않기 때문에, 모든 스테이션(STA-6, STA-7)이 AP와 접속되지 않은 상태이다. 독립 BSS는 분배 시스템으로의 접속이 허용되지 않으며, 자기 완비적 네트워크(self-contained network)를 이룬다. 독립 BSS에서 각각의 스테이션들(STA-6, STA-7)은 다이렉트로 서로 연결될 수 있다.

【0020】 도 3은 본 발명의 일 실시예에 따른 스테이션(100)의 구성을 나타낸 블록도이다.

【0021】 도시된 바와 같이, 본 발명의 실시예에 따른 스테이션(100)은 프로세서(110), 네트워크 인터페이스 카드(NIC, 120), 유저 인터페이스부(140), 디스플레이 유닛(150) 및 메모리(160)를 포함할 수 있다.

【0022】 먼저, 네트워크 인터페이스 카드(120)는 무선랜 접속을 수행하기 위한 모듈이며, 스테이션(100)을 위한 패킷 전송과 수신을 수행한다. 네트워크 인터페이스 카드(120)는 스테이션(100)에 내장되거나 외장으로 구비될 수 있으며, 실시예에 따라 서로 다른 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 이를 테면, 상기 네트워크 인터페이스 카드는 2.4GHz, 5GHz 및 60GHz 등의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드

모듈을 포함할 수 있다. 일 실시예에 따르면, 스테이션(100)은 6GHz 이상의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈은 해당 네트워크 인터페이스 카드 모듈이 지원하는 주파수 밴드의 무선랜 규격에 따라 AP 또는 외부 스테이션과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드(120)는 스테이션(100)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈을 함께 동작시킬 수 있다. 스테이션(100)이 복수의 네트워크 인터페이스 카드 모듈을 포함할 경우, 각 네트워크 인터페이스 카드 모듈은 각각 독립된 형태로 구비될 수도 있으며, 하나의 칩으로 통합되어 구비될 수도 있다.

【0023】 다음으로, 유저 인터페이스부(140)는 스테이션(100)에 구비된 다양한 형태의 입/출력 수단을 포함한다. 즉, 유저 인터페이스부(140)는 다양한 입력 수단을 이용하여 유저의 입력을 수신할 수 있으며, 프로세서(110)는 수신된 유저 입력에 기초하여 스테이션(100)을 제어할 수 있다. 또한, 유저 인터페이스부(140)는 다양한 출력 수단을 이용하여 프로세서(110)의 명령에 기초한 출력을 수행할 수 있다.

【0024】 다음으로, 디스플레이 유닛(150)은 디스플레이 화면에 이미지를 출력한다. 상기 디스플레이 유닛(150)은 프로세서(110)에 의해 실행되는 컨텐츠 또는 프로세서(110)의 제어 명령에 기초한 유저 인터페이스 등의 다양한 디스플레이

오브젝트를 출력할 수 있다. 또한, 메모리(160)는 스테이션(100)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 스테이션(100)이 AP 또는 외부 스테이션과 접속을 수행하는데 필요한 접속 프로그램이 포함될 수 있다.

【0025】 본 발명의 프로세서(110)는 다양한 명령 또는 프로그램을 실행하고, 스테이션(100) 내부의 데이터를 프로세싱 할 수 있다. 또한, 상기 프로세서(110)는 상술한 스테이션(100)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(110)는 메모리(160)에 저장된 AP와의 접속을 위한 프로그램을 실행하고, AP가 전송한 통신 설정 메시지를 수신할 수 있다. 또한, 프로세서(110)는 통신 설정 메시지에 포함된 스테이션(100)의 우선 조건에 대한 정보를 판독하고, 스테이션(100)의 우선 조건에 대한 정보에 기초하여 AP에 대한 접속을 요청할 수 있다. 이에 대한 구체적인 실시예는 추후 기술하기로 한다.

【0026】 도 3에 도시된 스테이션(100)은 본 발명의 일 실시예에 따른 블록도로서, 분리하여 표시한 블록들은 디바이스의 엘리먼트들을 논리적으로 구별하여 도시한 것이다. 따라서 상술한 디바이스의 엘리먼트들은 디바이스의 설계에 따라 하나의 칩으로 또는 복수의 칩으로 장착될 수 있다. 또한, 본 발명의 실시예에서 상기 스테이션(100)의 일부 구성들, 이를 테면 유저 인터페이스부(140) 및 디스플레이 유닛(150) 등은 스테이션(100)에 선택적으로 구비될 수 있다.

【0027】 도 4는 본 발명의 일 실시예에 따른 AP(200)의 구성을 나타낸 블록도이다.

【0028】 도시된 바와 같이, 본 발명의 실시예에 따른 AP(200)는 프로세서(210), 네트워크 인터페이스 카드(220) 및 메모리(260)를 포함할 수 있다. 도 4에서 AP(200)의 구성 중 도 3의 스테이션(100)의 구성과 동일하거나 상응하는 부분에 대해서는 중복적인 설명을 생략하도록 한다.

【0029】 도 4를 참조하면, 본 발명에 따른 AP(200)는 적어도 하나의 주파수 밴드에서 BSS를 운영하기 위한 네트워크 인터페이스 카드(220)를 구비한다. 도 3의 실시예에서 전술한 바와 같이, 상기 AP(200)의 네트워크 인터페이스 카드(220) 또한 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 즉, 본 발명의 실시예에 따른 AP(200)는 서로 다른 주파수 밴드, 이를 테면 2.4GHz, 5GHz, 60GHz 중 두 개 이상의 네트워크 인터페이스 카드 모듈을 함께 구비할 수 있다. 바람직하게는, AP(200)는 6GHz 이상의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈은 해당 네트워크 인터페이스 카드 모듈이 지원하는 주파수 밴드의 무선랜 규격에 따라 스테이션과 무선 통신을 수행할 수 있다. 상기 네트워크 인터페이스 카드(220)는 AP(200)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈을 함께 동작시킬 수 있다.

【0030】 다음으로, 메모리(260)는 AP(200)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 스테이션의 접속을 관리하는 접속 프로그램이 포함될 수 있다. 또한, 프로세서(210)는 AP(200)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(210)는 메모리(260)에 저장된 스테이션과의 접속을 위한 프로그램을 실행하고, 하나 이상의 스테이션에 대한 통신 설정 메시지를 전송할 수 있다. 이때, 통신 설정 메시지에는 각 스테이션의 접속 우선 조건에 대한 정보가 포함될 수 있다. 또한, 프로세서(210)는 스테이션의 접속 요청에 따라 접속 설정을 수행한다. 이에 대한 구체적인 실시예는 추후 기술하기로 한다.

【0031】 도 5는 본 발명의 실시예에 따른 무선랜의 MPDU aggregation 방법을 도시하고 있다.

【0032】 경쟁 기반의 무선랜에서는 데이터 전송을 시도할 때마다 단말이 채널 점유를 위한 경쟁을 거쳐야 한다. 따라서 BSS 내의 단말의 밀도 및 단말 당 전송 데이터의 양이 증가함에 따라 경쟁 시간 대비 실질적인 데이터 전송량의 효율이 급격하게 감소할 수 있다.

【0033】 상기한 문제를 해결하고 단말들의 데이터 전송 효율을 높이기 위하여 여러 개의 데이터 MPDU를 하나의 Aggregated MPDU (A-MPDU)로 생성하여 전송할 수 있다. 이 때, 개별적인 MPDU들의 앞에는 해당 MPDU에 대한 정보가 담긴 MPDU delimiter가 전송되며, 이 MPDU delimiter에는 전체 A-MPDU 전송의 종료를 알리는 EOF (End Of Frame) field, MPDU Length field, delimiter의 오류를 검출하는 CRC

field, 수신 단말이 delimiter를 검출할 수 있도록 하는 Delimiter Signature field 등이 포함될 수 있다. 따라서 BlockAck 형태의 응답을 받을 수 있도록 BA agreement negotiation을 마친 TID에 속한 데이터 MPDU들은 EOF field가 0으로 설정되고, non-zero 값의 MPDU length 값을 가진 delimiter의 선행하에 다수의 MPDU가 동시에 전송될 수 있다(pre EOF padding A-MPDU). pre EOF padding A-MPDU의 뒤에는 EOF field가 1이고 zero MPDU length 값을 갖는 하나 이상의 EOF padding delimiter가 전송되어 A-MPDU 전송이 끝남을 알릴 수 있다.

【0034】A-MPDU의 전송은 송신 단말에 데이터가 많을 경우 효율적이나, delimiter가 매 MPDU마다 추가되어야 하고, 수신 단말이 반드시 BA bitmap이 포함된 BlockAck 기반의 응답 프레임으로 응답해야 하기 때문에 송신단말이 MPDU를 하나씩 전송하고자 할 경우 비효율적일 수 있다. 또한 802.11ac의 무선랜은 VHT PPDU로 전송되는 모든 데이터를 A-MPDU 형식으로 보내도록 되어있으므로, 상기한 특수한 상황에서 비효율적인 전송 구조를 개선하기 위한 방법으로, 송신 단말이 하나의 MPDU만을 전송하는 경우에 한하여 데이터 MPDU의 delimiter의 EOF field를 1로 설정하고 MPDU length field를 non-zero 값으로 설정하여 전송되는 MPDU가 A-MPDU 내에 단독 (single) MPDU (S-MPDU)임을 명시할 수 있다. S-MPDU 이후에는 다른 A-MPDU와 마찬가지로 EOF padding subframe이 추가될 수 있다. 따라서 수신자가 S-MPDU임이 명시된 A-MPDU를 수신한 경우, 송수신자 간에 BA agreement 존재 여부와 관계 없이 BlockAck이 아닌 일반 Ack frame으로 응답할 수 있다.

【0035】 도 6은 본 발명의 실시예에 따른 802.11ax 표준 무선랜의 A-MPDU 구성방법을 도시하고 있다.

【0036】 802.11ax 이전의 기존 무선랜에서는 A-MPDU 전송 시에 모든 MPDU가 동일한 TID에 속한 MPDU여야 한다는 제약이 있다. 따라서 데이터 MPDU와 Action frame 들이 함께 aggregation 될 수 없었으며, 수신 단말이 EOF가 1로 설정된 특정 TID의 QoS 데이터 MPDU를 수신하였을 경우, 다른 TID의 MPDU가 함께 포함될 수 없었기 때문에 그 MPDU가 전체 A-MPDU에 속한 유일한 MPDU임을 확신할 수 있다. 그러나 새로운 802.11ax 표준에서는 MU 전송 상황과 특정 조건을 만족하는 SU 전송 상황에서 A-MPDU 전송시에 하나 이상의 TID를 함께 aggregation하여 전송하는 Multi TID A-MPDU 전송이 허용됨에 따라 A-MPDU의 생성 방법 및 A-MPDU 수신 시의 응답 방법의 경우의 수가 증가하게 되었다.

【0037】 802.11ax의 표준에 따르면 송신 단말이 A-MPDU를 구성할 때, Multi TID aggregation rule 의 조건 하에서 EOF가 1로 표시된 MPDU가 하나 이상 존재할 수 있으며, 해당 MPDU들은 서로 다른 TID이며, A-MPDU 내에서 해당 TID의 유일한 MPDU여야 한다. BA agreement가 있는 TID의 QoS Data라도 A-MPDU 내에서 동일 TID의 유일한 MPDU라면 EOF를 1로 설정할 수 있으며, Ack frame의 응답을 요청하는 Action frame 역시 A-MPDU 내에 Action frame은 하나만 존재해야 한다는 조건하에 다른 데이터와 aggregation 되는 경우 EOF를 1로 설정하여 전송할 수 있다. 해당 EOF:1 MPDU는 단독 전송되었을 경우에는 Ack 프레임으로 응답받지만, 즉각적인 응답을 요청하는 다른 데이터들과 함께 전송되었을 경우에는 M-BA에서 BA bitmap을

생략한 per AID TID 필드로 응답받을 수 있다. 이 경우 per AID TID 필드의 Ack type 필드는 1로 설정되어 (Ack context in M-BA) BA bitmap을 요청하는 다른 per AID TID 필드(BlockAck context in M-BA)의 Ack type 값이 다르게 설정된다.

【0038】 TID 중 BA agreement를 맺지 않은 TID의 데이터 역시 multi TID A-MPDU가 허용될 경우 EOF:1의 설정으로 다른 TID data들과 함께 aggregation 되어 전송될 수 있다. BA agreement가 없을 경우 해당 프레임들은 기본적으로 BlockAck 응답을 지원하지 않지만 M-BA에서는 Ack context의 응답을 지원하기 때문에 M-BA로 응답받을 수 있다. 만약 BA agreement가 없는 TID의 데이터가 A-MPDU로 전송되었을 경우에는 그 데이터가 해당 TID의 유일한 MPDU 임이 자명하기 때문에 EOF를 0으로 설정하여 전송할 수 있다는 조건이 추가될 수도 있다. 그러나 이 경우에도 다른 데이터들이 즉각적인 응답을 요청하는 경우에는 M-BA의 Ack context로 응답받을 수 있다.

【0039】 또한 EOF가 1로 설정된 MPDU 외에 BA agreement가 있는 다른 TID 들은 EOF를 0으로 설정하여 다수의 MPDU를 aggregation 하는 것 또한 허용되어 있다. 따라서 기존의 무선랜에서 수신자가 A-MPDU에서 처음 수신하는 MPDU delimiter의 EOF가 1일 경우, 그것이 A-MPDU에서 전송되는 유일한 MPDU임을 알 수 있었던 것과 달리, 802.11ax에서는 그 후에 위치한 다른 MPDU delimiter 및 MPDU의 실제 내용을 파악한 뒤에 그것이 S-MPDU인지, A-MPDU인지의 여부를 파악할 수 있다.

【0040】 도 7은 본 발명의 실시예에 따른 트리거 프레임 구조를 도시하고 있다.

【0041】 무선랜에서는 각 단말에 전송할 데이터가 있을 경우 바로 전송을 시도하지 않고 각 트래픽이 속한 AC 별로 지정된 대기 시간 (AIFS[AC])을 거친 후에 전송을 시도한다. 또한, 만약 채널이 busy 상태였다가 idle로 전환이 되었을 때에는 지정된 대기시간에 추가적으로 Backoff timer (BO) 값을 설정하여 timer 만큼 더 대기 하였다가 전송을 시도한다. 상기한 BO 값 역시 AC 별로 독립적으로 관리되며, 각 AC 별로 서로 다른 Contention Window (CW[AC])의 범위에서 임의의 값으로 선택된다.

【0042】 802.11ax에서는 OFDMA를 이용한 다중 사용자 상향 전송 (UL MU)이 채택되었으며, 기존의 전송기법과 다르게 다중 사용자 상향 전송에서는 데이터를 전송하는 각 단말이 아닌 AP가 Trigger Frame을 전송함으로써 전체 전송과정이 시작된다.

【0043】 도 7에서 도시하고 있는 Trigger frame의 구조는 일반적인 무선랜 프레임 구조에 Common Info 필드와 다수의 User Info 필드가 추가될 수 있다.

【0044】 Common Info 필드에는 다수 단말이 UL OFDMA로 HE TB PPDU를 동시에 전송할 시에 중첩되게 전송하는 프리앰블 부분을 깨지지 않게 하기 위한 공통 정보들이 포함되어 있으며 HE TB PPDU가 전송되는 길이 및 BW 정보등을 담고 있다.

【0045】 User Info 필드는 전체 BW에서 어떠한 RU가 어떠한 단말(AID12)에게 할당되는지 정보를 담고 있으며, 또한 각 단말 별로 다른 형태로 주어질 수 있는 전송 관련 파라미터들이 Trigger dependent user info 필드에 전송될 수 있다.

Trigger Dependent User info 해당 User Info 필드에 할당된 단말이 A-MPDU 전송시 각 MPDU 간격에 관한 정보 (MPDU MU Spacing Factor), 해당 전송시에 몇 개의 서로 다른 TID를 전송할 수 있는지, 전송시에 어떠한 AC의 데이터를 우선적으로 전송해야 하는지에 대한 정보가 추가될 수 있다.

【0046】 만약 AID12에 0이 할당된다면 그것은 해당 RU가 random access RU임을 의미하므로 해당 RU에 전송 가능한 모든 단말이 random access RU로 할당된 RU들을 특정 조건하에 임의로 선택하여 UL OFDMA Random Access 동작을 할 수 있다 (UORA). 만약 2045가 할당된다면 unassociated 단말들이 random access로 접속할 수 있음을 의미한다.

【0047】 도 8은 본 발명의 일 실시예에 따른 다중 사용자 상향 전송시의 EDCA parameter 제어방법을 도시하고 있다.

【0048】 802.11ax 네트워크에서는 기존의 전송기법과 다르게 다중 사용자 상향 전송에서는 데이터를 전송하는 각 단말이 아닌 AP가 Trigger Frame을 전송함으로써 전체 전송과정이 시작된다. 다중 사용자 상향 전송을 위한 전송시도를 AP가 함에따라 UL MU에 참여하는 단말들은 UL MU 전송과 무관하게 기존의 동작대로 전송을 위한 경쟁을 시도하며, AP의 TF를 수신하게되면 경쟁 동작을 멈추고 AP의 지시에 따라 UL MU 전송을 시작한다. 11ax의 동작에 따르면 UL MU 전송이 각 단말들의 경쟁 동작에 전혀 영향을 미치지 않기 때문에 단말들은 동일한 트래픽에 대해서 각자의 SU 전송 시도와 AP의 TF 전송 시도의 중복된 전송 기회를 갖게되어 기존의 무선랜 단말에 비해 높은 경쟁 우위를 점할 수 있다는 문제가 발생할 수 있다. 또한

AP가 특정 단말의 트래픽을 UL MU를 위해 UL MU 전송에 스케쥴링 한 뒤에 TF 전송을 시도하는 경우, 동일한 트래픽에 대해 AP와 단말이 동시에 경쟁을 하는 상황이 발생하여 결과적으로 채널 상에서 충돌이 발생하는 확률을 증가시킬 수 있다.

【0049】 상기한 두 가지 문제점을 해결하기 위한 방법으로 UL MU 전송에 참여하는 단말이 기존 상황보다 더 낮은 확률로 채널에 접속을 시도하도록 하는 방법을 이용할 수 있다. 만약 단말이 과거 시점에 Buffer Status Report 등을 통해 자신의 데이터 존재 유무를 AP에게 알렸고, 특정 시점에 AP로부터 1) 자신의 AID를 지시하고 있는 User Info field를 가지고 있는 Trigger frame을 수신하였고, 2) 그에 대한 응답으로 QoS Data를 전송하였으며, 3) immediate response (e.g., M-BA) 등을 수신함으로써 전송이 성공하였다 판단하였다 가정하면, 그 단말은 UL MU 전송으로 인한 혜택을 얻었고 또한 이후의 UL MU 전송에도 스케쥴링 될 것으로 기대할 수 있기 때문에, SU 전송을 위한 접속 확률을 낮출 수 있다. 이를 위하여, 해당 단말은 사전에 정의된 별도의 EDCA parameter set(MU EDCA parameter set)으로 경쟁에 참여하도록 할 수 있다. MU EDCA parameter set에는 각 AC 별로 AIFS[AC]의 길이를 결정하는 AIFSN[AC] 값과 CW[AC] 범위를 결정하는 CWmin[AC], CWmax[AC] 값 등이 포함할 수 있다. 따라서 MU EDCA Parameter Set Element를 수신하였고, 상기한 MU EDCA mode 조건을 충족한 단말은 immediate response frame이 포함된 PPDU의 종료시점, 혹은 (immediate response를 요청하지 않는 HE trigger-based PPDU를 전송한 경우) 전송한 HE trigger-based PPDU의 종료시점에 상기한 조건에서 전송한 QoS Data가 속한 모든 AC에 대하여 AIFSN[AC], CWmin[AC], CWmax[AC] 값을 업데이

트 한다. 또한, MU EDCA를 적용한 시점부터 특정 기간 동안 추가로 성공적인 UL MU 전송을 하지 못하였을 경우에 다시 정상적인 접속 확률로 SU 전송을 하도록 할 수 있는데, 상기한 특정 기간을 지시하기 위하여 각 AC 별로 MUEDCATimer 값을 정하여 해당 타이머 값이 0이 될 경우에 해당 AC에 대해서 다시 Legacy EDCA parameter set을 이용할 수 있도록 할 수 있고, 상기한 MUEDCATimer 역시 MU EDCA Parameter Set에 포함될 수 있다. MU EDCA parameter set은 Information element의 형태로 Beacon 등에 포함되어 전송될 수 있다.

【0050】도 9는 본 발명의 실시예에 따른 단말의 Buffer Status Report (BSR) 방법을 도시하고 있다.

【0051】802.11ax에서는 802.11ah에서 정의하고 있는 UL MU 전송이 원할하게 이루어지기 위해서는 AP가 자신의 BSS에 속한 단말들의 Buffer Status를 인지하고 있는 것이 중요하다. 이 목적을 위해서 11ax에서는 다양한 방법의 BSR을 정의하고 있으며, 그 중에서 가장 빈번하게 사용되는 방법이 단말이 전송하는 QoS 프레임의 QoS Control 필드 내의 Queue Size 서브필드를 이용하는 방법이다.

【0052】802.11ax 단말이 802.11ax AP에게 Queue Size 서브필드를 전송하는 경우에는 8비트의 Queue Size 서브필드 중 MSB 2비트는 Scaling Factor로 이용되며 나머지 6비트는 Unscaled value로 이용된다. 이때, 현재 전송 중인 A-MPDU에 포함된 MPDU 및 동일 TID의 버퍼에 있는 데이터의 총량을 각 SF 별로 지정된 공식에 따라 근사화하여 삽입하는데, 근사화 과정에서 실제 데이터 량이 round up 된다. 이를 전송받은 AP는 이것을 역산하여 BSR을 전송한 단말의 버퍼량을 추정하는데, 만

약 단말이 Queue Size 서브필드를 전송한 A-MPDU에서 해당 TID의 데이터를 모두 전송한 경우, 단말의 버퍼엔 해당 TID의 데이터가 남아있지 않지만, AP 측에서는 round-up 연산에 의해 실제 SF 별 오차범위의 데이터가 단말에게 남아있는 것으로 알려지게 된다. 따라서 AP는 해당 단말에게 남아있는 데이터 전송을 유도하기 위하여 추가적으로 UL MU 스케쥴링을 진행할 수 있지만, 만약 단말이 전송할 데이터가 실제로 존재하지 않았다면 불필요한 자원 낭비로 이어질 수 있다. 따라서 위의 문제를 방지하기 위하여 11ax 단말이 11ax AP에게 Queue Size 서브필드를 전송할 시에는 기존에 지정된 공식에서 round down 연산을 하도록 규칙을 변경할 수 있다. 따라서 변경된 규칙은 아래와 같다.

【0053】 - When SF is equal to 0, the actual queue size is rounded down to the nearest 16 octets and placed into the UV subfield.

【0054】 - When SF is equal to 1, the actual queue size minus 1024 is rounded down to the nearest 256 octets and placed into the UV subfield.

【0055】 - When SF is equal to 2, the actual queue size minus 17,408 is rounded down to the nearest 2048 octets and placed into the UV subfield.

【0056】 - When SF is equal to 3, the actual queue size minus 148,480 is rounded down to the nearest 32,768 octets and placed into the UV subfield.

【0057】 변경된 규칙을 따를 경우, 반대의 상황으로 AP가 단말에게 데이터가 남아있음에도 불구하고 UL MU 전송을 위한 스케쥴링을 수행하지 않을 수도 있지만,

단말이 UL SU 전송을 통해 남은 데이터를 전송할 수 있으며, 혹은 단말이 다른 TID에 대하여 추가적인 상향 전송 스케쥴링을 받은 경우에 남아있는 데이터를 함께 전송하는 것도 가능하기 때문에 자원 관리 측면에서 더 효율적일 수 있다.

【0058】 다른 방법으로 Queue Size 서브필드가 나타낼 수 있는 값 중 특정 값을 별도로 할당하여 해당 전송에서 해당 Queue Size 서브필드가 나타내는 TID의 남아있는 모든 데이터를 전송한다는 것을 의미하는 값으로 이용할 수 있다. 가령 현재 11111111의 값은 2,147,328 이상의 데이터가 의미하는 값으로 별도 지정되어 있으므로 11111110 등의 값을 상기한 목적을 위해 할당할 수 있다.

【0059】 도 10은 본 발명의 실시예에 따른 단말의 UORA를 이용한 TWT 동작을 도시하고 있다.

【0060】 802.11ax에서는 802.11ah에서 정의하고 있는 Target Wake Time (TWT) 기술을 응용하여 이용할 수 있다. 11ah의 TWT에서는 단말이 AP와 개별적으로 TWT를 설정했던 것과는 달리 11ax에서는 AP가 특정 TWT 및 해당 TWT의 Service Period (SP) 정보들을 Beacon 등을 통해 BSS 내의 모든 단말들에게 알릴 수 있다 (Broadcast TWT). 또한 설정을 통해 특정 TWT SP에서 random access RU를 포함하는 Trigger frame (TF-R)을 전송할 것임을 예고 할 수 있다. 해당 TWT는 TWT element에서 trigger-enabled로 설정되고, Flow identifier를 1이 아닌 값으로 설정함으로서 가능하다. 따라서 TWT 동작을 수행가능하며 random access 동작을 할 수 있는 단말은 AP와 별도의 TWT negotiaion을 수행하지 않고 암묵적으로 해당 TWT의 member로서 동작 할 수 있으며, 해당 시점까지 doze state를 유지하여 power save

동작을 수행하고 정의된 TWT에서 awake state로 변경하여 AP가 전송하는 TF-R에서 자신이 깨어났음을 알리는 PS-poll 혹은 U-APSD trigger frame 등을 전송할 수 있다. 해당 TWT는 TWT element에서 trigger-enabled로 설정되고, Flow identifier를 1이 아닌 값으로 설정함으로서 가능하다.

【0061】TF-R을 전송하도록 지정되어있는 TWT의 시작시점에 AP는 TWT에 awake state 전환하여 buffered BU(Bufferable Unit)를 전달받고자 하는 단말이 누구인지를 알기 위해 TF-R을 보낼 수 있다(presence check). 그러나 해당 TF-R은 TWT 관련 동작을 하는 단말들 외에 BSS 내에 동작하고 있는 모든 단말들에게 전송되며 random access 시도에 제한을 둘 수 없다. 따라서 실제로 AP가 의도한 presence check 과정에서 TWT 동작하는 단말의 PS-poll 등이 TWT 동작을 수행하지 않는 단말의 random access 시도로 인한 충돌로 전송 성공 확률이 매우 낮아질 수 있다. 상기한 문제를 해결하기 위한 방법으로 다음과 같은 방법들을 고려할 수 있다.

【0062】1) 전송하는 TF-R의 RA를 TF-R이 전송되는 TWT에 참여하는 단말들을 위한 group address로 설정될 수 있다. 상기 group address는 해당 TWT를 broadcast 하는 TWT element에 포함될 수 있다. 따라서 해당 TF-R에는 해당 TWT에 대한 정보를 알고 있으며 해당 TWT SP에 동작하고자 하는 단말에 한하여 해당 TF-R의 random access RU에 접속을 시도 할 수 있으며, 구체적으로 해당 RU에 접속을 시도 할시에 PS-poll 혹은 U-APSD trigger frame만을 전송할 수 있다는 조건을 추가할 수 있다.

【0063】 2) 전송하는 TF-R에서 random access RU로 할당되는 User Info 필드의 AID12 값을 기 설정된 값으로 지정할 수 있다. 가령 현재 개별적으로 할당되지 않는 2044와 같은 AID를 할당하여 해당 TWT에 대한 정보를 알고 있으며 해당 TWT SP에 동작하고자 하는 단말에 한하여 해당 RU에 접속을 시도 할 수 있도록 하는 AID로 지정할 수 있다. 구체적으로 해당 RU에 접속을 시도 할시에 PS-poll 혹은 U-APSD trigger frame만을 전송할 수 있다는 조건을 추가할 수 있다.

【0064】 3) 전송하는 TF-R에서 random access RU로 할당되는 User Info 필드의 Trigger Dependent User Info 필드의 특정 값을 이용할 수 있다. 가령, TID Aggregation Limit의 경우 random access RU인 경우에는 0 혹은 1의 값으로 설정되도록 권장되고 있다. 따라서 random access RU로 지정된 User Info 필드에 한하여 TID Aggregation의 특정 값을 해당 TWT SP에 동작하고자 하는 단말에 한하여 해당 random access RU에 PS-poll 혹은 U-APSD trigger frame만을 전송할 수 있게 하는 값으로 지정할 수 있다. 구체적으로 6의 값이 할당될 수 있다. 혹은 다른 방법으로 Trigger Dependent User Info 필드의 reserved 상태인 한 비트를 상기한 동작을 활성화하는 비트로 사용할 수도 있다.

【0065】 도 11은 본 발명의 실시예에 따른 TWT 참여 단말의 MU EDCA 동작을 도시하고 있다.

【0066】 11ax 단말 중, TWT에 참여하는 단말은 특정 조건에 따라 Opportunistic Power Saving (OPS) 동작을 수행할 수 있다. 만약 단말 및 AP가 모두 OPS를 지원하는 기기라면, AP는 특정 Broadcast TWT에 대하여 TWT flow

identifier를 3으로 지정함으로써 그것을 OPS를 이용하는 TWT임을 단말들에게 알릴 수 있다.

【0067】주기적으로 설정되어 있는 OPS TWT SP에서 AP는 SP 시작 시점에 OPS TWT에 속한 모든 단말들에 대한 스케쥴링 정보를 TIM element를 이용하여 전송할 수 있다. 해당 TIM element는 OPS TWT에 참여하지 않는 단말에 대해서는 기존의 TIM element와 동일한 정보를 주지만, OPS TWT에 참여하는 단말에 대해서는, 해당 단말의 AID에 해당하는 비트맵 부분이 비활성화 되었을 경우, 금회 OPS TWT에서 해당 단말에게 UL MU 전송을 위한 스케쥴링이 없을 것임을 의미하게 된다. 따라서 해당 단말은 상향 전송 동작을 수행하지 않아도 될 경우, 차회 OPS TWT 시점까지 doze state로 동작하여 추가적인 파워 세이빙 동작을 하는 것이 가능하다. 만약 단말이 추가적인 상향 전송이 필요한 경우에는 개별적으로 EDCA 동작을 수행하여 UL SU 전송을 하는 것은 가능하다.

【0068】그러나 단말이 기존에 수행한 UL MU 전송에 의하여 MU EDCA parameter를 이용하여 동작을 하는 경우, UL MU 스케쥴링을 기대할 수 없는 상황에서 UL SU 전송을 위한 채널 접속 확률도 현저하게 낮아진 상태라 할 수 있다. 따라서 긴급하게 처리해야 하는 데이터가 있는 경우에 정상적으로 채널 접속을 하지 못하는 상황이 발생할 수 있다. 따라서 OPS TWT SP에서 전송된 TIM element에서 비활성화 된 비트맵을 확인한 OPS 단말은 MU EDCA parameter 이용을 중지하고 기존의 Legacy EDCA parameter를 이용하여 채널 접속을 할 수 있도록 하는 동작을 추가할 수 있다. 구체적으로 OPS TWT SP에서 전송된 TIM element에서 비활성화 된 비트맵

을 확인한 OPS 단말은 모든 AC의 MU EDCA Timer를 0으로 즉시 설정할 수 있다. 이에 따라 단말은 기존 MU EDCA 동작에 따라 EDCA Parameter를 Legacy EDCA parameter로 변환하게 된다.

【0069】 위에서 명시한 규칙을 적용할 경우, UL MU를 기반으로 동작하는 OPS TWT에서 TIM element 수신 시점마다 다수의 단말이 MU EDCA parameter를 이용한 동작을 취소하여 MU EDCA parameter가 이용되는 본래의 목적인 AP의 채널 접속 확률 보장이 정상적으로 이루어지지 않을 수 있다. 따라서 AP의 채널 접속 확률을 보장하기 위하여 다음과 같은 추가적인 규칙을 지정할 수도 있다. 제안하는 규칙에 따르면 TIM element를 수신하는 시점에 남아있는 MU EDCA timer의 값이 차회의 OPS TWT 시점보다 빠른 AC에 한하여 MU EDCA timer를 0으로 설정할 수 있다. 위 규칙을 적용할 경우, MU EDCA timer가 비교적 가까운 시점에 설정된 단말의 AC는 AP의 채널 접속을 위하여 낮은 채널 접속 확률을 유지하면서 차회 OPS TWT 스케쥴링을 기대할 수 있으며, MU EDCA parameter를 긴 시간동안 유지한 단말의 AC는 UL MU 스케쥴링을 배제당한 상황에서 좀더 이른 시점에 정상적인 채널 접속 확률을 얻을 수 있다.

【0070】 전술한 본 발명의 설명은 예시를 위한 것이며, 본 발명이 속하는 기술분야의 통상의 지식을 가진 자는 본 발명의 기술적 사상이나 필수적인 특징을 변경하지 않고서 다른 구체적인 형태로 쉽게 변형이 가능하다는 것을 이해할 수 있을 것이다. 그러므로 이상에서 기술한 실시예들은 모든 면에서 예시적인 것이며 한정적인 것이 아는 것으로 해석해야 한다. 예를 들어, 단일형으로 설명되어 있는 각

구성 요소는 분산되어 실시될 수도 있으며, 마찬가지로 분산된 것으로 설명되어 있는 구성 요소들도 결합된 형태로 실시될 수 있다.

【0071】본 발명의 범위는 상기 상세한 설명보다는 후술하는 특허청구범위에 의하여 나타내어지며, 특허청구범위의 의미 및 범위 그리고 그 균등 개념으로부터 도출되는 모든 변경 또는 변형된 형태가 본 발명의 범위에 포함되는 것으로 해석되어야 한다.

**【부호의 설명】**

【0072】100 : 스테이션

200 : 액세스 포인트

제출 일자 : 2017-05-02

## 【특허청구범위】

### 【청구항 1】

무선랜을 위한 방법, 장치 및 시스템.

제출 일자 : 2017-05-02

# 【요약서】

## 【요약】

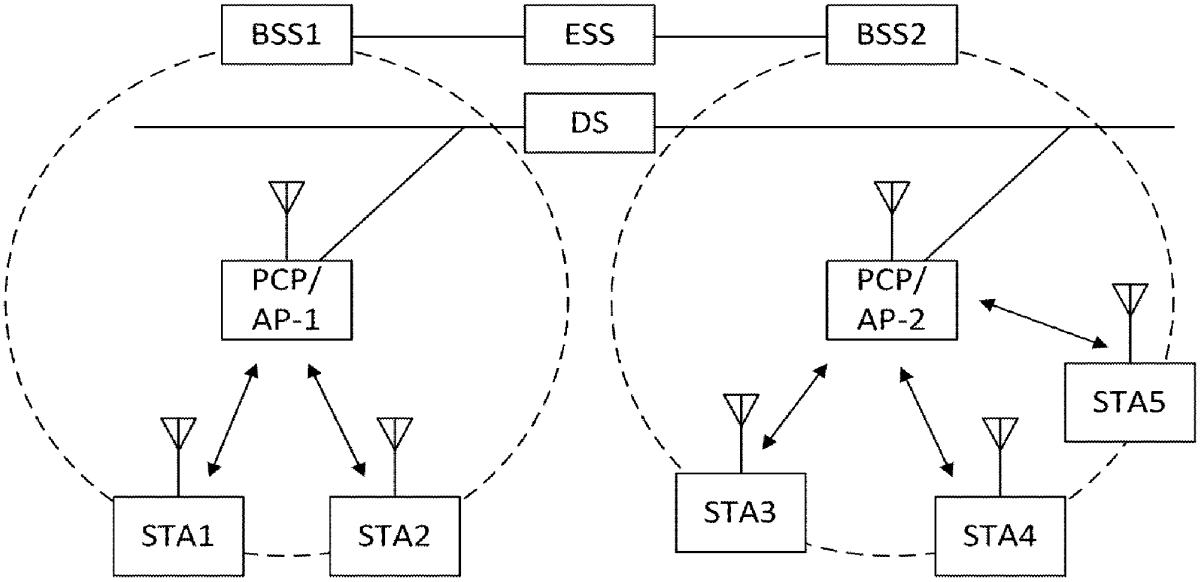
무선 통신 장치 및 방법이 제공된다.

## 【대표도】

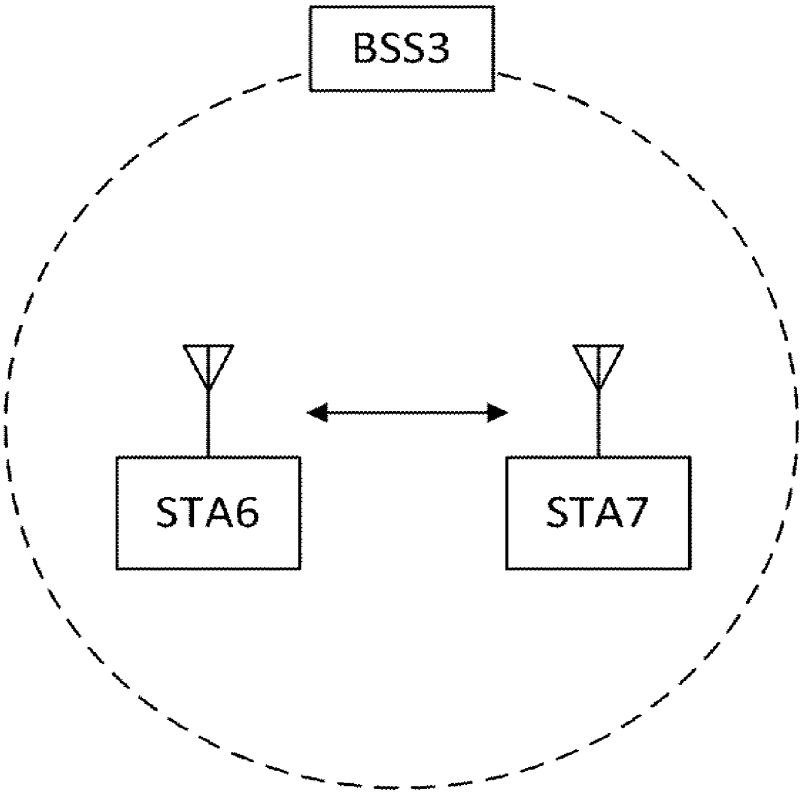
도 9

【도면】

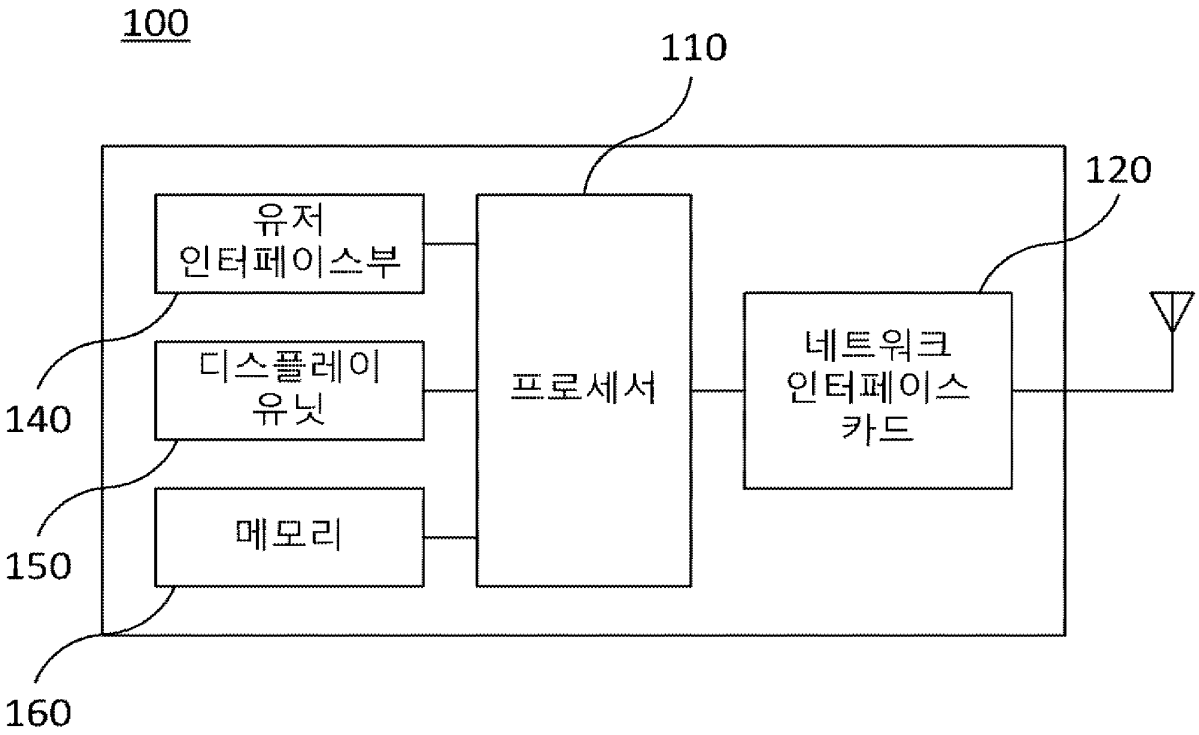
【도 1】



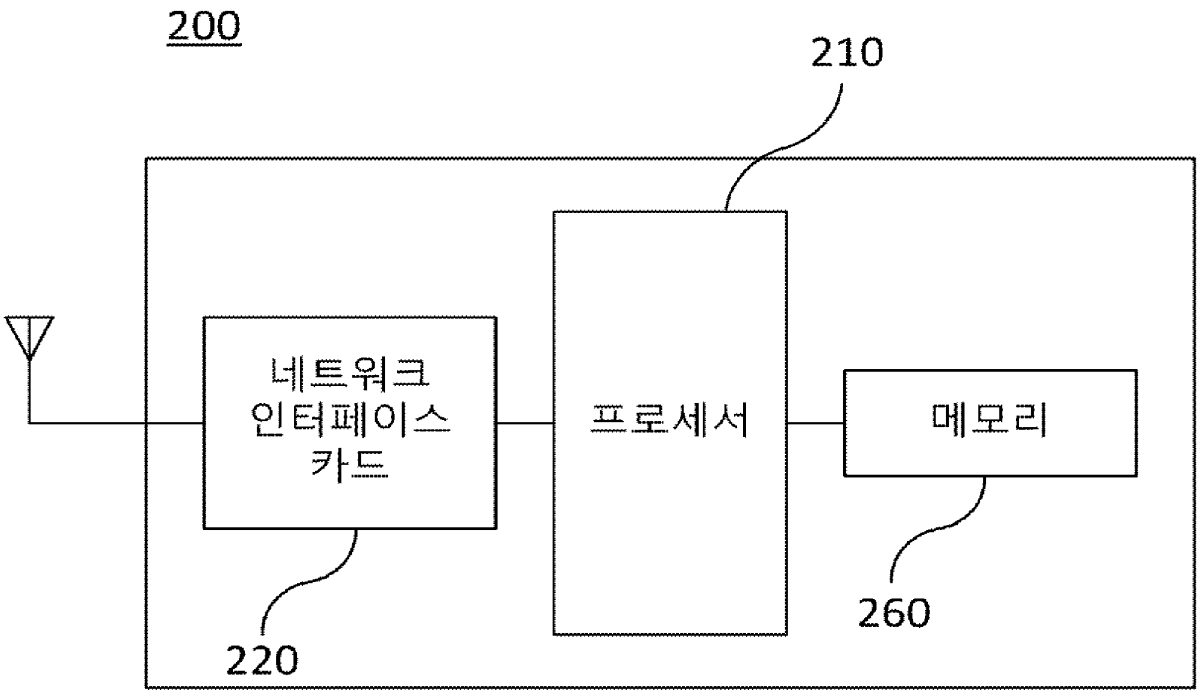
【도 2】



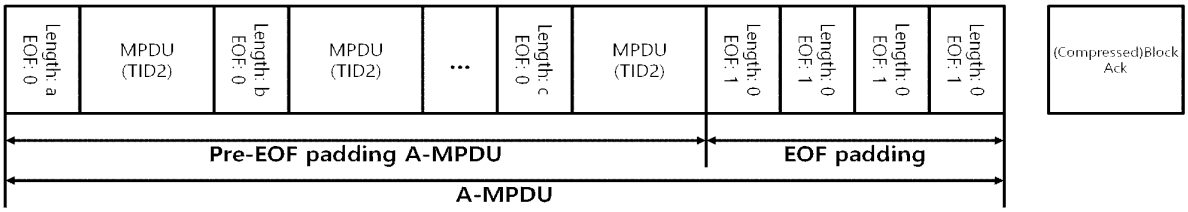
【도 3】

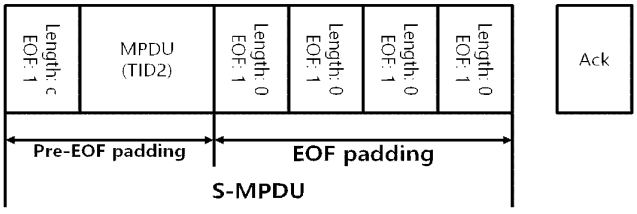

100
110
120
유저
인터페이스부
디스플레이
유닛
메모리
프로세서
네트워크
인터페이스
카드
140
150
160

【도 4】

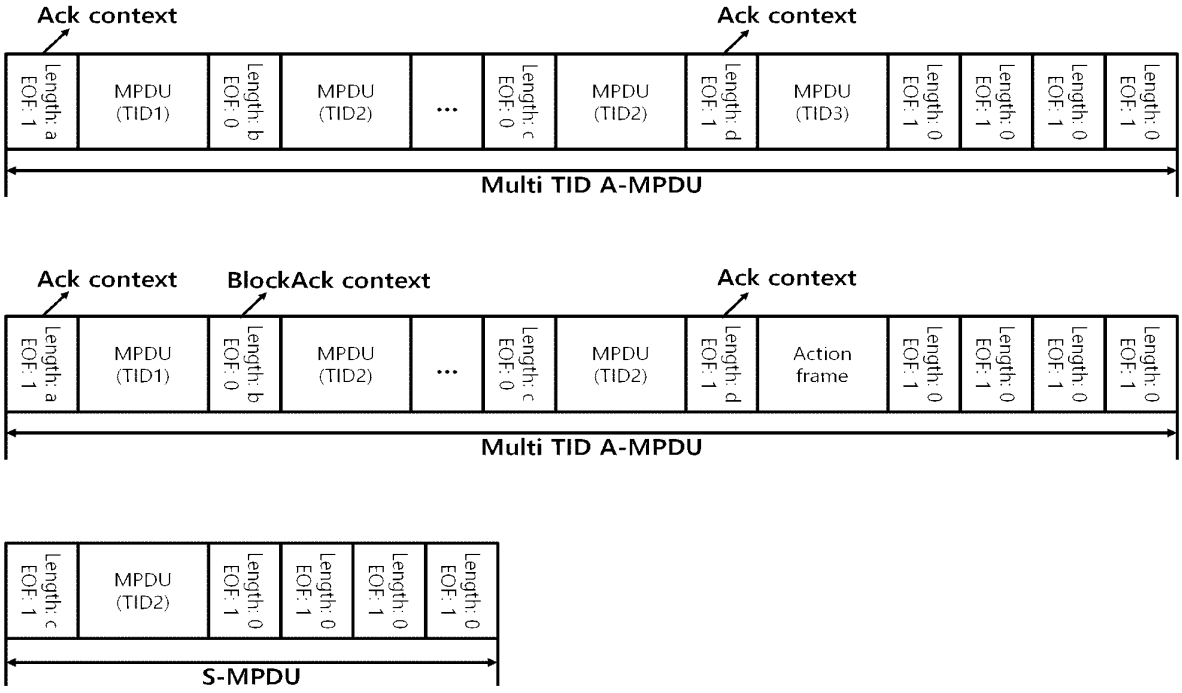

200
210
네트워크
인터페이스
카드
프로세서
메모리
220
260

【도 5】

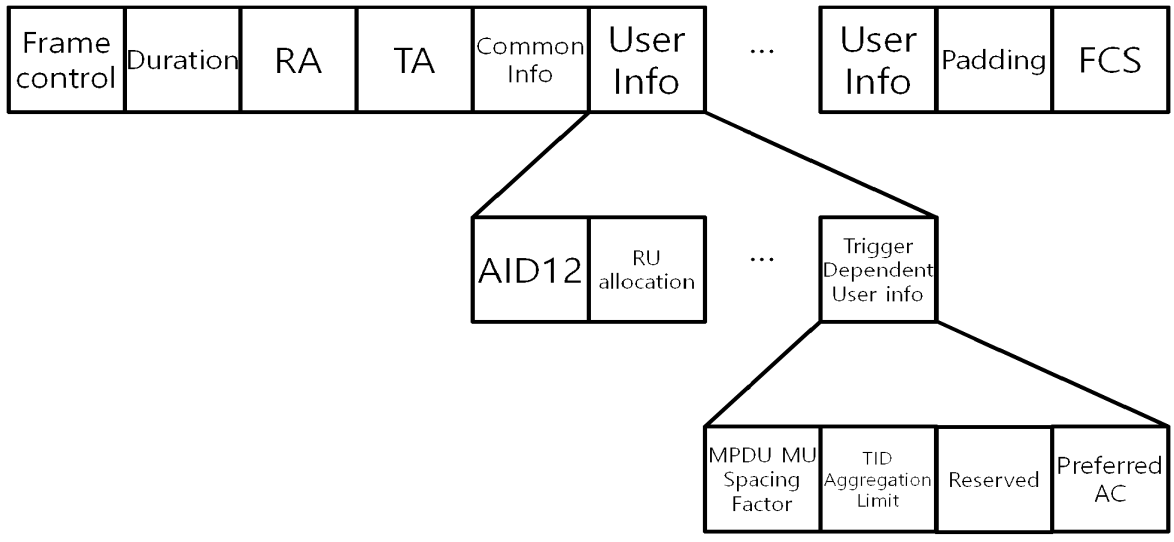

Length: a
EOF: 0
MPDU
(TID2)
Length: b
EOF: 0
MPDU
(TID2)
...
Length: c
EOF: 0
MPDU
(TID2)
Length: 0
EOF: 1
Length: 0
EOF: 1
Length: 0
EOF: 1
Length: 0
EOF: 1
(Compressed)Block
Ack
Pre-EOF padding A-MPDU
EOF padding
A-MPDU


Length: c
EOF: 1
MPDU
(TID2)
Length: 0
EOF: 1
Length: 0
EOF: 1
Length: 0
EOF: 1
Length: 0
EOF: 1
Ack
Pre-EOF padding
EOF padding
S-MPDU

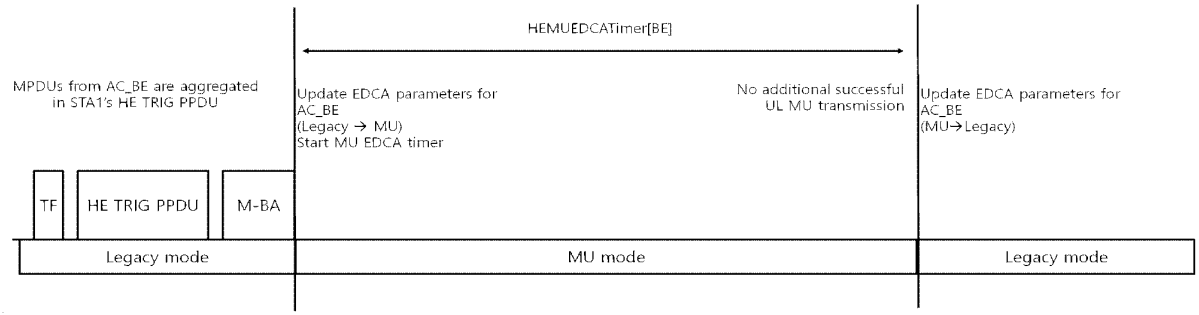
【도 6】


Ack context
Ack context
Length: a EOF: 1
MPDU (TID1)
Length: b EOF: 0
MPDU (TID2)
...
Length: c EOF: 0
MPDU (TID2)
Length: d EOF: 1
MPDU (TID3)
Length: 0 EOF: 1
Length: 0 EOF: 1
Length: 0 EOF: 1
Length: 0 EOF: 1
Multi TID A-MPDU
Ack context
BlockAck context
Ack context
Length: a EOF: 1
MPDU (TID1)
Length: b EOF: 0
MPDU (TID2)
...
Length: c EOF: 0
MPDU (TID2)
Length: d EOF: 1
Action frame
Length: 0 EOF: 1
Length: 0 EOF: 1
Length: 0 EOF: 1
Length: 0 EOF: 1
Multi TID A-MPDU
Length: c EOF: 1
MPDU (TID2)
Length: 0 EOF: 1
Length: 0 EOF: 1
Length: 0 EOF: 1
Length: 0 EOF: 1
S-MPDU

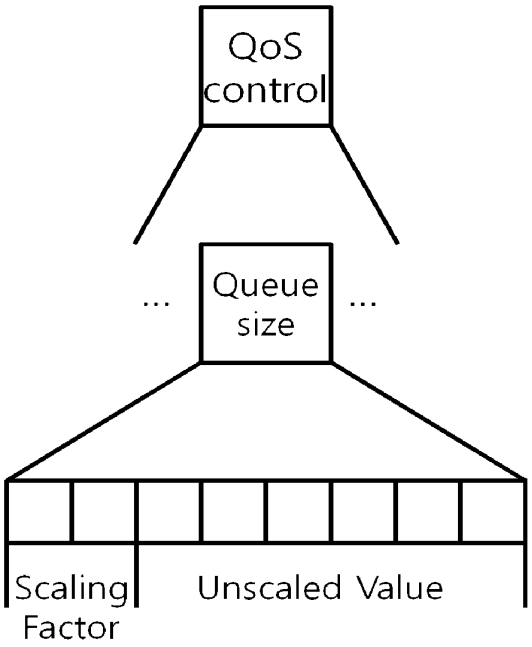
【도 7】


Frame control
Duration
RA
TA
Common Info
User Info
...
User Info
Padding
FCS
AID12
RU allocation
...
Trigger Dependent User info
MPDU MU Spacing Factor
TID Aggregation Limit
Reserved
Preferred AC

【도 8】

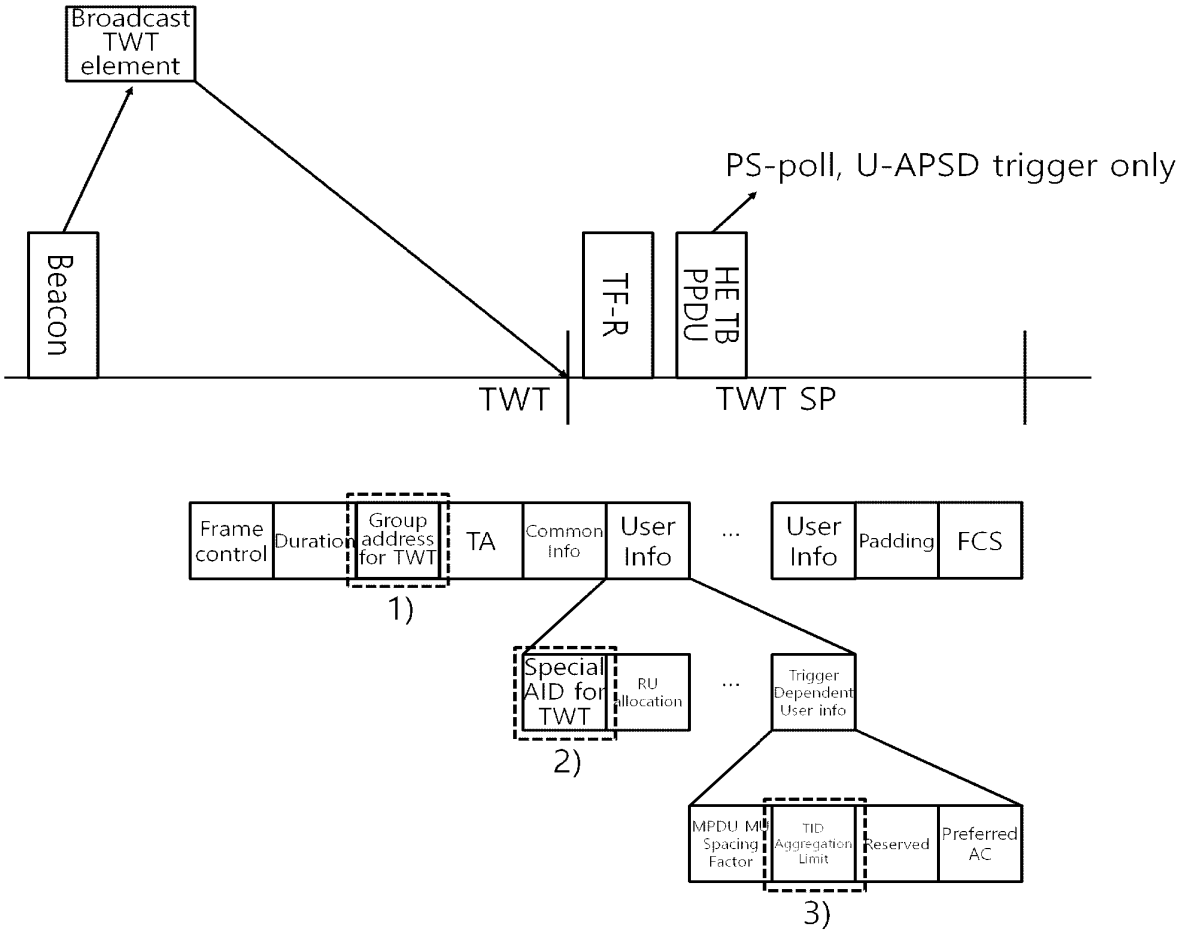

HEMUEDCATimer[BE]
MPDUs from AC_BE are aggregated in STA1's HE TRIG PPDU
Update EDCA parameters for AC_BE (Legacy → MU) Start MU EDCA timer
No additional successful UL MU transmission
Update EDCA parameters for AC_BE (MU→Legacy)
TF
HE TRIG PPDU
M-BA
Legacy mode
MU mode
Legacy mode

【도 9】

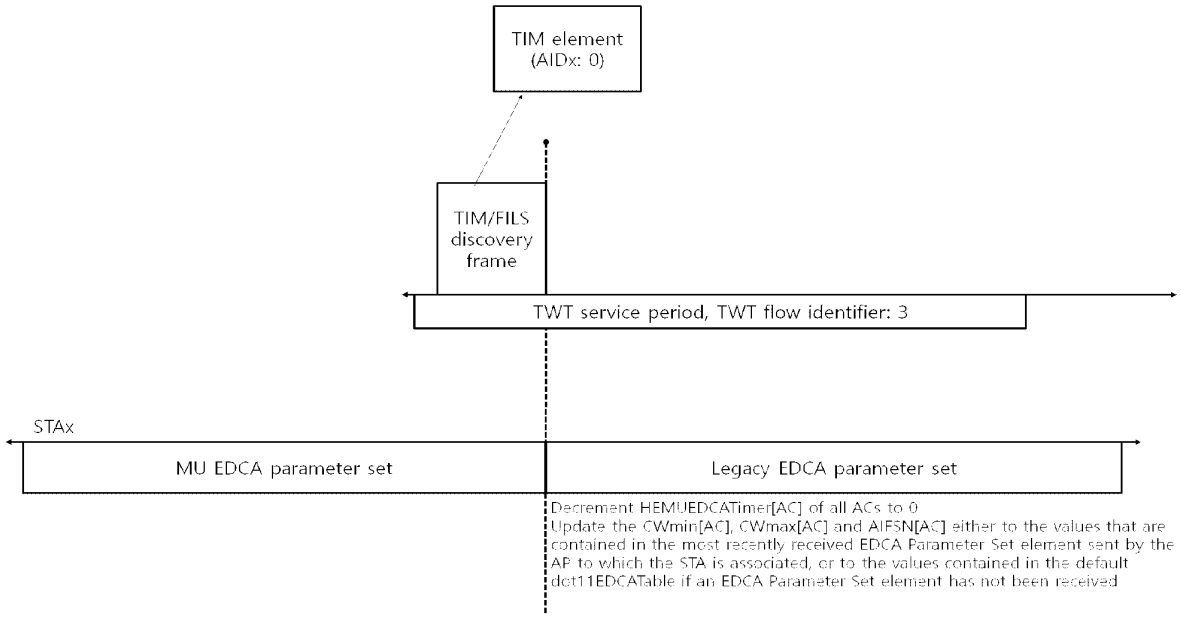



1) When SF is equal to 0, the actual queue size is rounded down to the nearest 16 octets and placed into the UV subfield.
2) When SF is equal to 1, the actual queue size minus 1024 is rounded down to the nearest 256 octets and placed into the UV subfield.
3) When SF is equal to 2, the actual queue size minus 17,408 is rounded down to the nearest 2048 octets and placed into the UV subfield.
4) When SF is equal to 3, the actual queue size minus 148,480 is rounded down to the nearest 32,768 octets and placed into the UV subfield.

【도 10】


Broadcast TWT element
PS-poll, U-APSD trigger only
Beacon
TF-R
HE TB PPDU
TWT
TWT SP
Frame control
Duration
Group address for TWT
TA
Common Info
User Info
...
User Info
Padding
FCS
1)
Special AID for TWT
RU allocation
...
Trigger Dependent User info
2)
MPDU MB Spacing Factor
TID Aggregation Limit
Reserved
Preferred AC
3)

【도 11】


TIM element
(AIDx: 0)
TIM/FILS
discovery
frame
TWT service period, TWT flow identifier: 3
STAx
MU EDCA parameter set
Legacy EDCA parameter set
Decrement HEMUEDCATimer[AC] of all ACs to 0
Update the CWmin[AC], CWmax[AC] and AIFSN[AC] either to the values that are contained in the most recently received EDCA Parameter Set element sent by the AP to which the STA is associated, or to the values contained in the default dot11EDCATable if an EDCA Parameter Set element has not been received

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This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office.

출 원 번 호 : 10-2017-0048762
Application Number

출 원 년 월 일 : 2017년 04월 14일
Filing Date Apr. 14, 2017

출 원 인 : 주식회사 윌러스표준기술연구소

Applicant(s) WILUS Institute of Standards and Technology Inc.

2022년 02월 17일

특 허 청
COMMISSIONER

제출 일자 : 2017-04-14

# 【서지사항】

【서류명】 특허출원서

【참조번호】 WILP170041KR

【출원구분】 특허출원

【출원인】

【명칭】 주식회사 윌러스표준기술연구소

【특허고객번호】 1-2013-022334-3

【대리인】

【성명】 임국일

【대리인번호】 9-2014-000874-4

【포괄위임등록번호】 2014-036557-3

【발명의 국문명칭】 효율적인 BSS 판단과 NAV 설정을 위한 방법, 장치 및 시스템

【발명의 영문명칭】 METHOD, APPARATUS, AND SYSTEM FOR EFFICIENT BSS DETERMINATION AND NAV SETTING

【발명자】

【성명】 고건중

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【주민등록번호】 860909-1XXXXXX

【우편번호】 16547

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【국적】 KR

【발명자】

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【성명의 영문표기】 Juhyung SON

【주민등록번호】 770724-1XXXXXX

【우편번호】 16024

【주소】 경기도 의왕시 내손순환로 7, 308동 1402호 (내손동, 래미안에버하임)

【국적】 KR

【발명자】

【성명】 안우진

【성명의 영문표기】 Woojin AHN

【주민등록번호】 831010-1XXXXXX

【우편번호】 14084

【주소】 경기도 안양시 만안구 안양천서로 117, 214동 2803호

【국적】 KR

【발명자】

【성명】 곽진삼

【성명의 영문표기】 Jinsam KWAK

【주민등록번호】 740908-1XXXXXX

【우편번호】 16021

【주소】 경기도 의왕시 내손중앙로 11 의왕내손이편한세상 1113동1704호

제출 일자 : 2017-04-14

【국적】 KR

【출원언어】 국어

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 임국일 (서명 또는 인)

【수수료】

| | | | |
|---|---|---|---|
| 【출원료】 | 0 | 면 | 46,000 원 |
| 【가산출원료】 | 81 | 면 | 0 원 |
| 【우선권주장료】 | 0 | 건 | 0 원 |
| 【심사청구료】 | 0 | 항 | 0 원 |

【합계】 46,000 원

【감면사유】 소기업(70%감면)[1]

【감면후 수수료】 13,800 원

제출 일자 : 2017-04-14

# 【발명의 설명】

## 【발명의 명칭】

효율적인 BSS 판단과 NAV 설정을 위한 방법, 장치 및 시스템{METHOD, APPARATUS, AND SYSTEM FOR EFFICIENT BSS DETERMINATION AND NAV SETTING}

## 【기술분야】

【0001】 본 발명은 BSS 판단과 NAV 설정을 위한 방법으로서, 더욱 상세하게는 무선랜에서 BSS 판단과 NAV 설정을 효율적으로 하여 바람직한 MAC 동작을 하기 위한 다양한 방법, 장치 및 시스템에 관한 것이다.

## 【발명의 배경이 되는 기술】

【0002】 최근 모바일 기기의 보급이 확대됨에 따라 이들에게 빠른 무선 인터넷 서비스를 제공할 수 있는 무선랜(Wireless LAN) 기술이 많은 각광을 받고 있다. 무선랜 기술은 근거리에서 무선 통신 기술을 바탕으로 스마트 폰, 스마트 패드, 랩탑 컴퓨터, 휴대형 멀티미디어 플레이어, 임베디드 기기 등과 같은 모바일 기기들을 가정이나 기업 또는 특정 서비스 제공지역에서 무선으로 인터넷에 접속할 수 있도록 하는 기술이다.

【0003】 IEEE(Institute of Electrical and Electronics Engineers) 802.11은 2.4GHz 주파수를 이용한 초기의 무선랜 기술을 지원한 이래, 다양한 기술의 표준을 실용화 또는 개발 중에 있다. 먼저, IEEE 802.11b는 2.4GHz 밴드의 주파수를 사용하면서 최고 11Mbps의 통신 속도를 지원한다. IEEE 802.11b 이후에 상용화된

IEEE 802.11a는 2.4GHz 밴드가 아닌 5GHz 밴드의 주파수를 사용함으로써 상당히 혼잡한 2.4GHz 밴드의 주파수에 비해 간섭에 대한 영향을 줄였으며, OFDM 기술을 사용하여 통신 속도를 최대 54Mbps까지 향상시켰다. 그러나 IEEE 802.11a는 IEEE 802.11b에 비해 통신 거리가 짧은 단점이 있다. 그리고 IEEE 802.11g는 IEEE 802.11b와 마찬가지로 2.4GHz 밴드의 주파수를 사용하여 최대 54Mbps의 통신속도를 구현하며, 하위 호환성(backward compatibility)을 만족하고 있어 상당한 주목을 받았는데, 통신 거리에 있어서도 IEEE 802.11a보다 우위에 있다.

【0004】 그리고 무선랜에서 취약점으로 지적되어온 통신 속도에 대한 한계를 극복하기 위하여 제정된 기술 규격으로서 IEEE 802.11n이 있다. IEEE 802.11n은 네트워크의 속도와 신뢰성을 증가시키고, 무선 네트워크의 운영 거리를 확장하는데 목적을 두고 있다. 보다 구체적으로, IEEE 802.11n에서는 데이터 처리 속도가 최대 540Mbps 이상인 고처리율(High Throughput, HT)을 지원하며, 또한 전송 에러를 최소화하고 데이터 속도를 최적화하기 위해 송신부와 수신부 양단 모두에 다중 안테나를 사용하는 MIMO(Multiple Inputs and Multiple Outputs) 기술에 기반을 두고 있다. 또한, 이 규격은 데이터 신뢰성을 높이기 위해 중복되는 사본을 여러 개 전송하는 코딩 방식을 사용할 수 있다.

【0005】 무선랜의 보급이 활성화되고 또한 이를 이용한 어플리케이션이 다양화됨에 따라, IEEE 802.11n이 지원하는 데이터 처리 속도보다 더 높은 처리율(Very High Throughput, VHT)을 지원하기 위한 새로운 무선랜 시스템에 대한 필요성이 대두되었다. 이 중 IEEE 802.11ac는 5GHz 주파수에서 넓은 대역폭(80MHz~160MHz)을

지원한다. IEEE 802.11ac 표준은 5GHz 대역에서만 정의되어 있으나 기존 2.4GHz 대역 제품들과의 하위 호환성을 위해 초기 11ac 칩셋들은 2.4GHz 대역에서의 동작도 지원할 것이다. 이론적으로, 이 규격에 따르면 다중 스테이션의 무선랜 속도는 최소 1Gbps, 최대 단일 링크 속도는 최소 500Mbps까지 가능하게 된다. 이는 더 넓은 무선 주파수 대역폭(최대 160MHz), 더 많은 MIMO 공간적 스트림(최대 8개), 다중 사용자 MIMO, 그리고 높은 밀도의 변조(최대 256 QAM) 등 802.11n에서 받아들인 무선 인터페이스 개념을 확장하여 이루어진다. 또한, 기존 2.4GHz/5GHz 대신 60GHz 밴드를 사용해 데이터를 전송하는 방식으로 IEEE 802.11ad가 있다. IEEE 802.11ad는 빔포밍 기술을 이용하여 최대 7Gbps의 속도를 제공하는 전송규격으로서, 대용량의 데이터나 무압축 HD 비디오 등 높은 비트레이트 동영상 스트리밍에 적합하다. 하지만 60GHz 주파수 밴드는 장애물 통과가 어려워 근거리 공간에서의 디바이스들 간에만 이용이 가능한 단점이 있다.

【0006】 한편, 최근에는 802.11ac 및 802.11ad 이후의 차세대 무선랜 표준으로서, 고밀도 환경에서의 고효율 및 고성능의 무선랜 통신 기술을 제공하기 위한 논의가 계속해서 이루어지고 있다. 즉, 차세대 무선랜 환경에서는 고밀도의 스테이션과 AP(Access Point)의 존재 하에 실내/외에서 높은 주파수 효율의 통신이 제공되어야 하며, 이를 구현하기 위한 다양한 기술들이 필요하다.

**【발명의 내용】**

**【해결하고자 하는 과제】**

【0007】 본 발명은 전술한 바와 같이 고밀도 환경에서의 고효율/고성능의 무선랜 통신을 제공하기 위한 목적을 가지고 있다.

**【과제의 해결 수단】**

【0008】 본 발명의 실시 예에 따르면 무선랜을 위한 장치, 시스템 및 무선랜 통신 방법이 제공될 수 있다.

**【발명의 효과】**

【0009】 본 발명의 실시예에 따르면, 맥 헤더에 컨트롤 정보를 효율적으로 포함시킬 수 있는 방법을 제공한다. 본 발명은 무선랜을 이용하는 스테이션 내지 액세스 포인트, 셀룰러 통신을 이용하는 스테이션 내지 기지국 등 다양한 통신 디바이스에 사용 가능하다.

**【도면의 간단한 설명】**

【0010】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 나타낸 도면.

도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템을 나타낸 도면.

도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도.

도 4는 본 발명의 일 실시예에 따른 액세스 포인트의 구성을 나타낸 블록도.

도 5는 본 발명의 일 실시예에 따른 UL MU 과정을 나타낸 도면.

도 6은 본 발명의 일 실시예에 따른 트리거 프레임 포맷을 나타낸 도면.

도 7은 본 발명의 일 실시예에 따른 트리거 프레임의 Common Info 필드와 User Info 필드를 나타낸 도면.

도 8은 본 발명의 일 실시예에 따른 랜덤 엑세스(random access) 과정을 나타낸 도면.

도 9는 본 발명의 일 실시예에 따른 RAPS(OFDMA-based Random Access Parameter Set) element 포맷을 나타낸 도면.

도 10은 본 발명의 일 실시예에 따른 UL MU 동작 및 NAV 셋팅을 나타낸 도면.

도 11은 본 발명의 일 실시예에 따른 UL MU 동작 및 power save 동작을 나타낸 도면.

도 12는 본 발명의 일 실시예에 따른 UL MU 동작 및 채널 유휴 상태 판단을 나타낸 도면.

도 13은 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면.

도 14는 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면.

도 15는 본 발명의 일 실시예에 따른 Trigger frame의 User Info 필드 포맷을 나타낸 도면.

도 16은 본 발명의 일 실시예에 따른 VHT SU PPDU의 TXVECTOR parameters GROUP_ID와 PARTIAL_AID 설정 방법을 나타낸 도면.

도 17은 본 발명의 일 실시예에 따른 채널 유휴 상태 판단을 나타낸 도면.

도 18은 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면.

도 19는 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면.

**【발명을 실시하기 위한 구체적인 내용】**

【0011】 본 명세서에서 사용되는 용어는 본 발명에서의 기능을 고려하면서 가능한 현재 널리 사용되는 일반적인 용어를 선택하였으나, 이는 당 분야에 종사하는 기술자의 의도, 관례 또는 새로운 기술의 출현 등에 따라 달라질 수 있다. 또한 특정 경우는 출원인이 임의로 선정한 용어도 있으며, 이 경우 해당되는 발명의 설명 부분에서 그 의미를 기재할 것이다. 따라서 본 명세서에서 사용되는 용어는, 단순한 용어의 명칭이 아닌 그 용어가 가진 실질적인 의미와 본 명세서의 전반에 걸친 내용을 토대로 해석되어야 함을 밝혀두고자 한다.

【0012】 명세서 전체에서, 어떤 구성이 다른 구성과 “연결”되어 있다고 할 때, 이는 “직접적으로 연결”되어 있는 경우뿐 아니라, 그 중간에 다른 구성요소를 사이에 두고 “전기적으로 연결”되어 있는 경우도 포함한다. 또한 어떤 구성이 특정 구성요소를 “포함”한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다. 이에 더하여, 특정 임계값을 기준으로 “이상” 또는 “이하”라는 한정 사항은 실시예에 따라 각각 “초과” 또는 “미만”으로 적절하게 대체될 수 있다.

【0013】도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다. 무선랜 시스템은 하나 또는 그 이상의 베이직 서비스 세트(Basic Service Set, BSS)를 포함하는데, BSS는 성공적으로 동기화를 이루어서 서로 통신할 수 있는 기기들의 집합을 나타낸다. 일반적으로 BSS는 인프라스트럭쳐 BSS(infrastructure BSS)와 독립 BSS(Independent BSS, IBSS)로 구분될 수 있으며, 도 1은 이 중 인프라스트럭쳐 BSS를 나타내고 있다.

【0014】도 1에 도시된 바와 같이 인프라스트럭쳐 BSS(BSS1, BSS2)는 하나 또는 그 이상의 스테이션(STA-1, STA-2, STA-3, STA-4, STA-5), 분배 서비스(Distribution Service)를 제공하는 스테이션인 액세스 포인트(PCP/AP-1, PCP/AP-2), 및 다수의 액세스 포인트(PCP/AP-1, PCP/AP-2)를 연결시키는 분배 시스템(Distribution System, DS)을 포함한다.

【0015】스테이션(Station, STA)은 IEEE 802.11 표준의 규정을 따르는 매체 접속 제어(Medium Access Control, MAC)와 무선 매체에 대한 물리층(Physical Layer) 인터페이스를 포함하는 임의의 디바이스로서, 광의로는 비 액세스 포인트(Non-AP) 스테이션뿐만 아니라 액세스 포인트(AP)를 모두 포함한다. 또한, 본 명세서에서는 스테이션과 AP 등의 무선랜 통신 디바이스를 모두 포함하는 개념으로서 '단말' 이라는 용어가 사용될 수 있다. 무선 통신을 위한 스테이션은 프로세서(Processor)와 트랜시버(transceiver)를 포함하고, 실시예에 따라 유저 인터페이스부와 디스플레이 유닛 등을 더 포함할 수 있다. 프로세서는 무선 네트워크를 통해 전송할 프레임을 생성하거나 또는 상기 무선 네트워크를 통해 수신된 프레임을 처

리하며, 그 밖에 스테이션을 제어하기 위한 다양한 처리를 수행할 수 있다. 그리고, 트랜시버는 상기 프로세서와 기능적으로 연결되어 있으며 스테이션을 위하여 무선 네트워크를 통해 프레임을 송수신한다.

【0016】 액세스 포인트(Access Point, AP)는 자신에게 결합된(associated) 스테이션을 위하여 무선 매체를 경유하여 분배시스템(DS)에 대한 접속을 제공하는 개체이다. 인프라스트럭쳐 BSS에서 비 AP 스테이션들 사이의 통신은 AP를 경유하여 이루어지는 것이 원칙이지만, 다이렉트 링크가 설정된 경우에는 비AP 스테이션들 사이에서도 직접 통신이 가능하다. 한편, 본 발명에서 AP는 PCP(Personal BSS Coordination Point)를 포함하는 개념으로 사용되며, 광의적으로는 집중 제어기, 기지국(Base Station, BS), 노드-B, BTS(Base Transceiver System), 또는 사이트 제어기 등의 개념을 모두 포함할 수 있다.

【0017】 복수의 인프라스트럭쳐 BSS는 분배 시스템(DS)을 통해 상호 연결될 수 있다. 이때, 분배 시스템을 통하여 연결된 복수의 BSS를 확장 서비스 세트(Extended Service Set, ESS)라 한다.

【0018】 도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다. 도 2의 실시예에서 도 1의 실시예와 동일하거나 상응하는 부분은 중복적인 설명을 생략하도록 한다.

【0019】 도 2에 도시된 BSS-3는 독립 BSS이며 AP를 포함하지 않기 때문에, 모든 스테이션(STA-6, STA-7)이 AP와 접속되지 않은 상태이다. 독립 BSS는 분배 시스템으로의 접속이 허용되지 않으며, 자기 완비적 네트워크(self-contained

network)를 이룬다. 독립 BSS에서 각각의 스테이션들(STA-6, STA-7)은 다이렉트로 서로 연결될 수 있다.

【0020】 도 3은 본 발명의 일 실시예에 따른 스테이션(100)의 구성을 나타낸 블록도이다.

【0021】 도시된 바와 같이, 본 발명의 실시예에 따른 스테이션(100)은 프로세서(110), 네트워크 인터페이스 카드(NIC, 120), 유저 인터페이스부(140), 디스플레이 유닛(150) 및 메모리(160)를 포함할 수 있다.

【0022】 먼저, 네트워크 인터페이스 카드(120)는 무선랜 접속을 수행하기 위한 모듈이며, 스테이션(100)을 위한 패킷 전송과 수신을 수행한다. 네트워크 인터페이스 카드(120)는 스테이션(100)에 내장되거나 외장으로 구비될 수 있으며, 실시예에 따라 서로 다른 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 이를 테면, 상기 네트워크 인터페이스 카드는 2.4GHz, 5GHz 및 60GHz 등의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 일 실시예에 따르면, 스테이션(100)은 6GHz 이상의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈은 해당 네트워크 인터페이스 카드 모듈이 지원하는 주파수 밴드의 무선랜 규격에 따라 AP 또는 외부 스테이션과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드(120)는 스테이션(100)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈만을 동작시키거나 동시에 다수의 네트

워크 인터페이스 카드 모듈을 함께 동작시킬 수 있다. 스테이션(100)이 복수의 네트워크 인터페이스 카드 모듈을 포함할 경우, 각 네트워크 인터페이스 카드 모듈은 각각 독립된 형태로 구비될 수도 있으며, 하나의 칩으로 통합되어 구비될 수도 있다.

【0023】 다음으로, 유저 인터페이스부(140)는 스테이션(100)에 구비된 다양한 형태의 입/출력 수단을 포함한다. 즉, 유저 인터페이스부(140)는 다양한 입력 수단을 이용하여 유저의 입력을 수신할 수 있으며, 프로세서(110)는 수신된 유저 입력에 기초하여 스테이션(100)을 제어할 수 있다. 또한, 유저 인터페이스부(140)는 다양한 출력 수단을 이용하여 프로세서(110)의 명령에 기초한 출력을 수행할 수 있다.

【0024】 다음으로, 디스플레이 유닛(150)은 디스플레이 화면에 이미지를 출력한다. 상기 디스플레이 유닛(150)은 프로세서(110)에 의해 실행되는 컨텐츠 또는 프로세서(110)의 제어 명령에 기초한 유저 인터페이스 등의 다양한 디스플레이 오브젝트를 출력할 수 있다. 또한, 메모리(160)는 스테이션(100)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 스테이션(100)이 AP 또는 외부 스테이션과 접속을 수행하는데 필요한 접속 프로그램이 포함될 수 있다.

【0025】 본 발명의 프로세서(110)는 다양한 명령 또는 프로그램을 실행하고, 스테이션(100) 내부의 데이터를 프로세싱 할 수 있다. 또한, 상기 프로세서(110)는 상술한 스테이션(100)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을

제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(110)는 메모리(160)에 저장된 AP와의 접속을 위한 프로그램을 실행하고, AP가 전송한 통신 설정 메시지를 수신할 수 있다. 또한, 프로세서(110)는 통신 설정 메시지에 포함된 스테이션(100)의 우선 조건에 대한 정보를 판독하고, 스테이션(100)의 우선 조건에 대한 정보에 기초하여 AP에 대한 접속을 요청할 수 있다. 이에 대한 구체적인 실시예는 추후 기술하기로 한다.

【0026】 도 3에 도시된 스테이션(100)은 본 발명의 일 실시예에 따른 블록도로서, 분리하여 표시한 블록들은 디바이스의 엘리먼트들을 논리적으로 구별하여 도시한 것이다. 따라서 상술한 디바이스의 엘리먼트들은 디바이스의 설계에 따라 하나의 칩으로 또는 복수의 칩으로 장착될 수 있다. 또한, 본 발명의 실시예에서 상기 스테이션(100)의 일부 구성들, 이를 테면 유저 인터페이스부(140) 및 디스플레이 유닛(150) 등은 스테이션(100)에 선택적으로 구비될 수 있다.

【0027】 도 4는 본 발명의 일 실시예에 따른 AP(200)의 구성을 나타낸 블록도이다.

【0028】 도시된 바와 같이, 본 발명의 실시예에 따른 AP(200)는 프로세서(210), 네트워크 인터페이스 카드(220) 및 메모리(260)를 포함할 수 있다. 도 4에서 AP(200)의 구성 중 도 3의 스테이션(100)의 구성과 동일하거나 상응하는 부분에 대해서는 중복적인 설명을 생략하도록 한다.

【0029】 도 4를 참조하면, 본 발명에 따른 AP(200)는 적어도 하나의 주파수 밴드에서 BSS를 운영하기 위한 네트워크 인터페이스 카드(220)를 구비한다. 도 3의 실시예에서 전술한 바와 같이, 상기 AP(200)의 네트워크 인터페이스 카드(220) 또한 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 즉, 본 발명의 실시예에 따른 AP(200)는 서로 다른 주파수 밴드, 이를 테면 2.4GHz, 5GHz, 60GHz 중 두 개 이상의 네트워크 인터페이스 카드 모듈을 함께 구비할 수 있다. 바람직하게는, AP(200)는 6GHz 이상의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈은 해당 네트워크 인터페이스 카드 모듈이 지원하는 주파수 밴드의 무선랜 규격에 따라 스테이션과 무선 통신을 수행할 수 있다. 상기 네트워크 인터페이스 카드(220)는 AP(200)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈을 함께 동작시킬 수 있다.

【0030】 다음으로, 메모리(260)는 AP(200)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 스테이션의 접속을 관리하는 접속 프로그램이 포함될 수 있다. 또한, 프로세서(210)는 AP(200)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(210)는 메모리(260)에 저장된 스테이션과의 접속을 위한 프로그램을 실행하고, 하나 이상의 스테이션에 대한 통신 설정 메시지를 전송할 수

있다. 이때, 통신 설정 메시지에는 각 스테이션의 접속 우선 조건에 대한 정보가 포함될 수 있다. 또한, 프로세서(210)는 스테이션의 접속 요청에 따라 접속 설정을 수행한다. 이에 대한 구체적인 실시예는 추후 기술하기로 한다.

【0032】 도 5는 본 발명의 일 실시예에 따른 UL MU 과정을 나타낸 도면이다.

【0033】 본 발명의 일 실시예에 따르면 UL MU 과정을 통해 하나 이상의 STA가 같은 시간에 전송할 수 있다. 여기서 STA는 non-AP STA일 수 있다. 예를 들면 UL MU 과정은 AP가 하나 이상의 STA로부터 simultaneous immediate response frames를 요청함(solicit)으로써 이루어질 수 있다. 도 5를 참조하면 AP가 트리거 프레임(Trigger Frame)을 통해 하나 이상의 STA로부터 simultaneous immediate response frames를 요청하였고, STA0, STA1, STA2, STA3는 그에 대한 응답으로 동시에 HE trigger-based PPDU를 전송하였다. HE trigger-based PPDU는 트리거 프레임을 포함한 PPDU의 끝으로부터 SIFS 뒤에 전송될 수 있다. 또한 도 5에서는 HE Trigger-based PPDU를 통한 STA들의 전송 뒤에 AP가 Acknowledgment를 전송하고 있다.

【0034】 AP는 UL MU 과정을 지시할 때 트리거 프레임을 이용할 수도 있고, 맥 헤더의 필드를 이용할 수 있다. 맥 헤더의 필드를 이용하는 경우 UL MU Response Scheduling A-Control 필드를 통해 지시할 수 있다. UL MU 과정에서 STA가 그 응답을 전송할 때는 HE trigger-based PPDU를 이용할 수 있고, 이때 UL OFDMA 또는 UL MU-MIMO가 사용될 수 있고, 둘 다 사용될 수 있다. 단, 트리거 프레

임이 MU-RTS 타입일 때 STA는 HE trigger-based PPDU를 사용하는 것이 아니고, non-HT PPDU 포맷을 사용해서 응답할 수 있다. AP가 전송하는 트리거 프레임은 도 6과 같을 수 있다.

【0035】 트리거 프레임을 통해 하나 이상의 STA로부터 HE trigger-based PPDU를 요청하는 경우, 하나 이상의 트리거 프레임이 하나 이상의 User Info 필드를 포함할 수 있고, User Info 필드가 recipient STAs에 address될 수 있다. User Info 필드가 recipient STAs에 address되었다는 것은 User Info 필드의 AID12 서브필드가 STA의 AID로 지시된 경우를 나타낼 수 있다. 또는 0으로 지시된 경우에 User Info 필드가 recipient STAs에 address된 것일 수 있다.

【0036】 UL MU Response Scheduling A-Control 서브필드를 통해 HE trigger-based PPDU를 요청하는 경우, 이 UL MU Response Scheduling A-Control 서브필드를 포함하는 MPDU의 수신자가 이에 응답하여 HE trigger-based PPDU를 전송할 수 있다.

【0037】 본 발명의 일 실시예에 따르면 두개 이상의 트리거 프레임이 하나의 A-MPDU 안에 aggregation될 수 있으며, 이 경우에 트리거 프레임들의 내용은 같을 수 있다. 또한 하나의 A-MPDU 안에 어떤 STA에 address된 User Info 필드를 갖고 있는 트리거 프레임과 같은 STA에 address되고 UL MU Response Scheduling A-Control 서브필드를 포함하는 MPDU는 같이 있지 않을 수 있다.

【0039】 도 6은 본 발명의 일 실시예에 따른 트리거 프레임 포맷을 나타낸 도면이다.

【0040】 도 5에서 설명한 UL MU 과정에서 AP는 트리거 프레임을 통해 STA의 응답을 끌어낼 수 있고, 이때 AP는 도 6과 같은 포맷의 트리거 프레임을 전송할 수 있다. 도 6을 참조하면 트리거 프레임은 Frame Control, Duration, RA, TA, Common Info, 한개 이상의 User Info, Padding, FCS 필드를 가질 수 있다. 트리거 프레임의 RA 필드는 recipient STA의 주소일 수 있다. 만약 트리거 프레임이 한개의 User Info 필드를 갖는 경우, RA 필드는 그 STA의 MAC address일 수 있다. 트리거 프레임이 2개 이상의 User Info 필드를 갖는 경우, RA 필드는 broadcast address일 수 있다. 트리거 타입이 GCR MU-BAR인 경우, RA 필드는 reception status를 보내도록 요청되고 있는 그룹의 주소일 수 있다.

【0041】 또한 TA 필드는 트리거 프레임을 보내고 있는 STA의 주소일 수 있다. 일 실시예에 따르면 Multiple BSSID 기능을 사용하지 않는 경우 TA 필드는 이 트리거 프레임을 보내고 있는 AP의 MAC address일 수 있다. 또한 multiple BSSID 기능을 사용하고 있고, 이 트리거 프레임이 이 트리거 프레임을 보내는 AP와 communication하고 있는 STA들(또는 그 AP와 association된 STA들)에게 전송되는 경우, TA 필드는 그 AP의 MAC address일 수 있다. Multiple BSSID 기능을 사용하고 이 트리거 프레임이 multiple BSSID set의 2개 이상의 BSS와 communication하는 STA들에게 전송되는 경우, TA 필드는 transmitted BSSID일 수 있다.

【0042】Common Info 필드와 User Info 필드는 트리거 프레임에 응답하는데 필요한 정보를 포함할 수 있는데, Common Info 필드는 트리거 프레임의 수신자 모두에게 해당하는 정보이고 User Info 필드는 해당 User Info 필드의 수신자에게 해당하는 정보일 수 있다. Common Info 필드와 User Info 필드는 도 7과 같을 수 있다.

【0043】Padding 필드는 트리거 프레임을 수신하는 STA들이 응답을 준비하는데에 걸리는 시간을 확보하기 위해 프레임의 길이를 늘리는데에 사용될 수 있고, 길이는 수신자들의 capability에 따라 정해질 수 있다. 트리거 프레임의 수신자들 모두가 응답을 준비하기 위해 Padding 필드를 통한 추가 시간을 필요로하지 않는 경우 Padding 필드가 존재하지 않을 수도 있다. Padding 필드의 시작은 예를 들면 0xFFF와 같은 특정 값을 통해 알려질 수 있다. 즉, Padding 필드의 시작은 특정 값으로 셋팅되고 나머지 값들은 다른 비트들로 채워질 수 있다.

【0045】도 7은 본 발명의 일 실시예에 따른 트리거 프레임의 Common Info 필드와 User Info 필드를 나타낸 도면이다.

【0046】본 발명의 일 실시예에 따르면 도 6의 트리거 프레임에 포함되는 Common Info 필드와 User Info 필드는 각각 도 7(a)와 도 7(b)와 같을 수 있다. 일 실시예에 따르면 도 7(b)의 AID12 서브필드를 이용해서 트리거 프레임이 어느 STA로 address되는지를 지시할 수 있다. 예를 들면 AID12 서브필드를 STA의 AID의 12

LSBs로 셋팅할 수 있고, 그러한 경우 해당 STA가 트리거된 것으로 판단할 수 있다. 또한 AID12 서브필드를 특정 값으로 셋팅함으로써 이 User Info 필드가 가리키는 RU가 random access로 허용되는 RU임을 나타낼 수 있다. 더 구체적으로 AID12 서브필드를 특정 값으로 셋팅함으로써 이 User Info 필드가 가리키는 RU가 associated STA들을 위한 random access로 허용되는 RU임을 나타낼 수 있다. 또한 AID12 서브필드를 특정 값으로 셋팅함으로써 이 User Info 필드가 가리키는 RU가 unassociated STA들을 위한 random access로 허용되는 RU임을 나타낼 수 있다. 예를 들어 associated STA들을 위한 random access로 허용되는 RU임을 나타내기 위해 AID12 서브필드를 0으로 셋팅할 수 있다. 또한 unassociated STA들을 위한 random access로 허용되는 RU임을 나타내기 위해 AID12 서브필드를 2045로 셋팅할 수 있다. 또한 associated STA가 associated STA들을 위한 random access로 허용되는 RU임을 지시하고 있는 AID12 서브필드 또는 User Info 필드를 수신하면 random access 절차에 따라 RU 또는 채널에 엑세스할 수 있다. 또한 unassociated STA가 unassociated STA들을 위한 random access로 허용되는 RU임을 지시하고 있는 AID12 서브필드 또는 User Info 필드를 수신하면 random access 절차에 따라 RU 또는 채널에 엑세스할 수 있다. 일 실시예로 여기서 언급한 unassociated STA는 UL MU 동작을 지시한 AP와 association되지 않은 STA일 수 있다. 더 구체적인 실시예로 여기서 언급한 unassociated STA는 어떠한 AP와도 association되지 않은 STA일 수 있다. 또한 본 발명에서 random access로 허용되는 RU 또는 random access로 허용하는 RU를 random access RU라고 부를 수 있다.

【0047】 RU Allocation 서브필드는 AID12 서브필드로 identify되는 STA가 HE trigger-based PPDU로 응답할 때 어떤 RU를 사용할지를 나타낼 수 있다. 일 실시예에 따르면 RU Allocation 서브필드의 시그날링으로 RU를 명확히 지시할 수 있다. 따라서 해당 RU의 위치를 알기 위해 다른 필드를 참조할 필요 없을 수 있다.

【0049】 또한 앞서 설명한 것처럼 트리거 프레임을 수신하는 STA들이 응답을 준비하는데에 걸리는 시간이 필요할 수 있다. 그 시간을 MinTrigProcTime이라고 부를 수 있다. 트리거 프레임의 User Info 필드들이 모두 특정 사용자를 위한 것일 경우 모든 의도된 수신자의 MinTrigProcTime을 알 수 있지만 random access RU를 포함하는 경우엔 수신하는 STA들의 MinTrigProcTime을 알기 어렵다. 따라서 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때 MinTrigProcTime에 대한 고려를 하지 않으면 어떤 STA들은 random access가 제한될 수 있다.

【0050】 본 발명의 일 실시예로 random access RU를 지시하는 User Info 필드를 포함하지 않는 트리거 프레임을 송신할 때는 의도된 수신자 STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다. 예를 들면 random access RU를 지시하는 User Info 필드를 포함하지 않는 트리거 프레임을 송신할 때는 가장 마지막 User Info 필드로부터 의도된 수신자 STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다.

【0051】본 발명의 일 실시예로 associated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 모든 associated STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다. 예를 들면 associated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 associated STA를 위한 random access를 지시하는 User Info 필드 중 가장 마지막 User Info 필드로부터 모든 associated STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다.

【0052】(An AP transmitting a Trigger frame that contains a User Info field for random access shall ensure that a MinTrigProcTime corresponding to at least the largest value amongst all associated STAs passes from the last User Info field with AID12 subfield equal to 0.).

【0053】본 발명의 일 실시예로 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 가능한 가장 긴 MinTrigProcTime을 최소로 확보해줄 수 있다. 예를 들면 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 unassociated STA를 위한 random access를 지시하는 User Info 필드 중 가장 마지막 User Info 필드로부터 가능한 가장 긴 MinTrigProcTime을 최소로 확보해줄 수 있다. 가능한 가장 긴 MinTrigProcTime은 16us일 수 있다. (An AP transmitting a Trigger frame that contains a User Info field for random

access should ensure that a MinTrigProcTime of at least 16us from the last User Info field with AID12 subfield equal to 2045.)

【0054】일 실시예로 MinTrigProcTime의 확보는 트리거 프레임의 Padding field, A-MPDU padding, A-MPDU subframe, EOF padding, 다른 frame, frame의 남은 부분 등으로 만들어주는 것이 가능하다.

【0055】일 실시예로 random access RU를 지시하지 않는 User Info 필드들은 random access RU를 지시하는 User Info 필드들보다 앞에 있을 수 있다. 예를 들면 AID12 서브필드가 0이나 2045가 아닌 User Info 필드들은 AID12 서브필드가 0이나 2045인 User Info 필드들보다 앞에 있을 수 있다.

【0057】도 8은 본 발명의 일 실시예에 따른 랜덤 엑세스(random access) 과정을 나타낸 도면이다.

【0058】본 발명의 일 실시예에 따르면 STA는 랜덤 엑세스(random access)를 통해 채널에 접근할 수 있다. STA가 랜덤하게 AP가 할당한 RU를 선택하고 그 RU에서 프레임을 전송할 수 있다. 일 실시예로 랜덤 엑세스는 무선랜의 UL MU procedure 기반일 수 있다. 더 구체적으로 이 랜덤 엑세스는 UL OFDMA 기반일 수 있다. AP는 트리거 프레임을 통해 랜덤 엑세스로 허용한 RU를 지시할 수 있다. 예를 들면 AP는 트리거 프레임에서 어떤 RU에 대해 특정 STAID를 사용함으로써 랜덤 엑세스로 허용한 RU를 지시할 수 있다. 예를 들면 도 6,7의 트리거 프레임 포맷에

서 도 7(b)의 User Info 필드 중 AID12 서브필드를 특정 값으로 셋팅함으로써 그 User Info 필드가 지시하고 있는 RU가 랜덤 엑세스로 허용하는 RU임을 나타낼 수 있다. 이때 랜덤 엑세스로 허용하는 RU를 지시하기 위한 AID12 서브필드의 값은 0 또는 2045일 수 있다. 구체적으로는 random access RU를 용도나 대상별로 다르게 지시할 수 있다. Random access RU를 용도나 대상별로 다른 AID12 서브필드로 지시할 수 있다. 구체적으로는 associated STA를 위한 random access RU를 지시하기 위한 AID12 서브필드의 값은 0일 수 있다. 또한 트리거 프레임을 전송하는 AP와 associate 되어 있지 않은 STA(unassociated STA)를 위한 random access RU를 지시하기 위한 AID12 서브필드의 값은 2045일 수 있다.

【0060】본 발명의 일 실시예에 따르면 STA는 OBO(OFDMA backoff) counter 값을 갖고, 카운트다운하여 OBO counter가 0이 되었을 때 랜덤 엑세스 전송의 기회를 얻을 수 있다. 예를 들면 STA는 트리거 프레임을 수신했을 때 랜덤 엑세스로 허용하는 RU로 지시된 RU 개수만큼 OBO counter를 줄일 수 있다. 또한 이때 random access RU를 지시하는 User Info 필드 중 해당하는 User Info 필드에 대해서만 OBO counter를 줄일 수 있다. 즉, 앞선 실시예에 따르면 associated STA는 트리거 프레임을 수신했을 때 associated STA를 위한 random access RU를 지시하는 AID12 서브필드의 개수(혹은 associated STA를 위한 random access RU를 지시하는 AID12 서브필드를 포함하는 User Info 필드의 개수)만큼 OBO counter를 줄일 수 있다. 또한 unassociated STA는 트리거 프레임을 수신했을 때 unassociated STA를 위한 random

access RU를 지시하는 AID12 서브필드의 개수(혹은 unassociated STA를 위한 random access RU를 지시하는 AID12 서브필드를 포함하는 User Info 필드의 개수) 만큼 OBO counter를 줄일 수 있다. 이때 OBO counter가 0에 도달한 경우 랜덤 엑세스로 허용하는 RU에 전송할 기회를 얻을 수 있다.

【0061】또한 랜덤 엑세스로 허용하는 RU에 전송할 기회를 얻었을 때 랜덤 엑세스로 허용하는 RU 중에서 보낼 RU를 랜덤하게 선택할 수 있다. 이때 해당하는 random access RU 중에서만 보낼 RU를 랜덤하게 선택할 수 있다. 예를 들어 associated STA는 associated STA를 위한 random access RU 중에서 보낼 RU를 랜덤하게 선택할 수 있고, unassociated STA는 unassociated STA를 위한 random access RU 중에서 보낼 RU를 랜덤하게 선택할 수 있다. 만약 선택한 RU가 busy하면 랜덤 엑세스로 전송하지 않을 수 있고, 0의 OBO counter 값을 유지할 수 있다. 즉, 이러한 경우 랜덤 엑세스를 허용하는 다음 트리거 프레임에서 전송할 기회를 바로 획득할 수 있고 다음 트리거 프레임에서 해당하는 랜덤 엑세스로 허용된 RU 중에서 프레임을 전송할 RU를 랜덤하게 선택할 수 있다. 또한 여기서 RU가 busy하다는 것은 physical carrier sense와 virtual carrier sense 중 둘 중 하나만 busy여도 해당할 수 있고, physical carrier sense와 virtual carrier sense는 무선랜의 UL MU procedure의 CS mechanism 방법을 따를 수 있다.

【0062】또한 랜덤 엑세스를 통한 전송을 처음하는 경우나 랜덤 엑세스를 통한 프레임 전송이 성공한 경우에 STA는 AP로부터 RAPS element를 얻었을 때 혹은 OCWmin을 얻었을 때 얻은 OCWmin 값으로 OCW를 셋팅하고 OBO counter를 선택할 수

있다. 일 실시예로 associated STA들에게 이때의 AP는 STA가 association한 AP일 수 있다. 또한 unassociated STA들에게 이때의 AP는 STA가 전송하려는 프레임의 수신자인 AP일 수 있다. 또는 unassociated STA들에게 이때의 AP는 STA가 수신한 RAPS element를 송신한 AP 또는 STA가 수신한 트리거 프레임을 송신한 AP일 수 있다.

【0063】 또한 OBO counter는 0부터 OCW(OFDMA contention window) 범위의 정수에서 뽑을 수 있다. OCW 값의 초기값은 OCWmin 값일 수 있고, 랜덤 엑세스로 전송을 실패했을 때 OCW 값을 (2*OCW + 1)로 업데이트할 수 있다. 또한 랜덤 엑세스로 전송을 실패했을 때 OBO counter 값을 0부터 OCW 중의 정수로 뽑을 수 있다. OCW가 OCWmax에 도달한 경우에는 OCW 값을 OCWmax로 유지시킬 수 있다. 본 발명의 일 실시예에 따르면 OCWmin과 OCWmax 값은 AP가 STA에게 알려줄 수 있다. 일 실시예로 AP는 OCWmin과 OCWmax를 포함하는 element를 전송하여 값을 전달할 수 있는데, 이에 대해서는 도 9에서 더 설명한다.

【0065】 다음은 associated STA의 random access 과정을 나타낸 실시예이다. 도 8을 참조하면 STA1과 STA2는 각각 5와 1의 OBO counter를 가지고 있다. 이는 Beacon frame 또는 Probe Response frame을 수신했을 때 초기화한 값 또는 랜덤 엑세스 RU를 통한 전송 성공 또는 실패 후 다시 뽑은 값일 수 있다. 또는 앞선 트리거 프레임 랜덤 엑세스 RU에서 OBO counter를 decrement하고 남은 값일 수 있다. 또한 STA1과 STA2는 도면의 트리거 프레임을 전송한 AP 혹은 도면의 트리거 프레임

을 전송한 AP와 같은 multiple BSSID set에 속한 AP와 association 되어 있다. 그리고 AP는 트리거 프레임을 전송하는데 associated STA를 위한 랜덤 엑세스를 허용하는 RU를 2개로 지시하고 있다. 즉, AP는 AID12 서브필드가 0으로 셋팅된 User Info 필드가 2개 있는 트리거 프레임을 전송하였다. 이 트리거 프레임을 수신한 STA1과 STA2는 OBO counter를 2를 줄여 각각 3, 0의 OBO counter 값을 갖게 되었다. STA2의 OBO counter가 0이 되었으므로 랜덤 엑세스 RU를 통한 전송 기회를 획득하게 되고 associated STA를 위한 랜덤 엑세스로 허용한 RU 2개 중에서 랜덤하게 1개를 선택하여 그 RU를 이용하여 프레임을 전송한다. 이때 랜덤 엑세스를 UL OFDMA based로 하므로 STA2는 트리거 프레임을 포함한 PPDU에서 SIFS 뒤 HE trigger-based PPDU를 이용하여 트리거 프레임에서 지시한대로 프레임을 전송한다. HE trigger-based PPDU 다음에 AP가 Acknowledgment를 전송할 수 있다. STA2가 랜덤 엑세스를 통해 프레임을 전송한 뒤에는 OBO counter 값을 새로 뽑을 수 있다. 이때 값을 뽑는 범위는 0부터 OCW 중의 정수 값일 수 있다. 또한 이때의 OCW 값은 랜덤 엑세스를 통한 프레임 전송을 성공한 경우에는 OCWmin일 수 있고, 랜덤 엑세스를 통한 프레임 전송을 실패한 경우에는 더블링한 값, 즉 이전의 OCW로부터 (2*OCW + 1)로 계산한 값일 수 있다. 도면에서 STA2는 6의 OBO counter를 뽑았다. 도면에서 다음으로 AP는 associated STA를 위한 랜덤 엑세스를 허용하는 RU를 3개로 지시하고 있는 트리거 프레임을 전송하였다. 따라서 이를 수신한 STA1와 STA2는 OBO counter를 3만큼 줄일 수 있다. 따라서 트리거 프레임을 수신한 뒤에 STA1과 STA2의 OBO counter는 각각 0과 3이 된다. 이번에는 STA1의 OBO counter가 0이 되

어 STA1이 랜덤 엑세스를 통한 전송 기회를 획득하였고, STA1은 associated STA를 위한 랜덤 엑세스를 허용한 RU 3개 중에서 랜덤하게 선택하여 그 RU를 이용하여 프레임을 전송할 수 있다.

【0067】 다음은 unassociated STA의 random access 과정을 나타낸 실시예이다. STA1과 STA2는 각각 5와 1의 OBO counter를 가지고 있다. 이는 Beacon frame 또는 Probe Response frame을 수신했을 때 초기화한 값 또는 랜덤 엑세스 RU를 통한 전송 성공 또는 실패 후 다시 뽑은 값일 수 있다. 또는 앞선 트리거 프레임 랜덤 엑세스 RU에서 OBO counter를 decrement하고 남은 값일 수 있다. 혹은 RAPS element 수신 전에 default 값(default OCWmin, default OCWmax, default OCW 등)들을 기초로한 OBO counter 값일 수 있다. 또한 STA1과 STA2는 AP와 association 되어있지 않다. 그리고 AP는 트리거 프레임을 전송하는데 unassociated STA를 위한 랜덤 엑세스를 허용하는 RU를 2개로 지시하고 있다. 즉, AP는 AID12 서브필드가 2045으로 셋팅된 User Info 필드가 2개 있는 트리거 프레임을 전송하였다. 이 트리거 프레임을 수신한 STA1과 STA2는 OBO counter를 2를 줄여 각각 3, 0의 OBO counter 값을 갖게 되었다. STA2의 OBO counter가 0이 되었으므로 랜덤 엑세스 RU를 통한 전송 기회를 획득하게 되고 unassociated STA를 위한 랜덤 엑세스로 허용한 RU 2개 중에서 랜덤하게 1개를 선택하여 그 RU를 이용하여 프레임을 전송한다. 이때 랜덤 엑세스를 UL OFDMA based로 하므로 STA2는 트리거 프레임을 포함한 PPDU에서 SIFS 뒤 HE trigger-based PPDU를 이용하여 트리거 프레임에서 지시한대로 프

레임을 전송한다. HE trigger-based PPDU 다음에 AP가 Acknowledgment를 전송할 수 있다. STA2가 랜덤 엑세스를 통해 프레임을 전송한 뒤에는 OBO counter 값을 새로 뽑을 수 있다. 이때 값을 뽑는 범위는 0부터 OCW 중의 정수 값일 수 있다. 또한 이때의 OCW 값은 랜덤 엑세스를 통한 프레임 전송을 성공한 경우에는 OCWmin일 수 있고, 랜덤 엑세스를 통한 프레임 전송을 실패한 경우에는 더블링한 값, 즉 이전의 OCW로부터 (2*OCW + 1)로 계산한 값일 수 있다. 도면에서 STA2는 6의 OBO counter를 뽑았다. 도면에서 다음으로 AP는 unassociated STA를 위한 랜덤 엑세스를 허용하는 RU를 3개로 지시하고 있는 트리거 프레임을 전송하였다. 따라서 이를 수신한 STA1와 STA2는 OBO counter를 3만큼 줄일 수 있다. 따라서 트리거 프레임을 수신한 뒤에 STA1과 STA2의 OBO counter는 각각 0과 3이 된다. 이번에는 STA1의 OBO counter가 0이 되어 STA1이 랜덤 엑세스를 통한 전송 기회를 획득하였고, STA1은 unassociated STA를 위한 랜덤 엑세스를 허용한 RU 3개 중에서 랜덤하게 선택하여 그 RU를 이용하여 프레임을 전송할 수 있다.

【0069】도 9는 본 발명의 일 실시예에 따른 RAPS(OFDMA-based Random Access Parameter Set) element 포맷을 나타낸 도면이다.

【0070】본 발명의 일 실시예에 따르면 AP는 OCWmin과 OCWmax 값을 STA에 전달, 지시할 수 있고, 이 값은 도 8의 실시예에서 설명한 것과 같은 방법으로 사용될 수 있다. 예를 들면 AP는 Beacon frame 또는 Probe Response frame를 통해 OCWmin과 OCWmax 값을 전달, 지시할 수 있다. 본 발명의 일 실시예에 따르면 AP는

RAPS(OFDMA-based Random Access Parameter Set) element를 전송할 수 있고, 그 element 포맷은 도 9와 같을 수 있다. RAPS element는 Element ID, Length, Element ID Extension, OCW Range 필드 등을 포함할 수 있다. 이때 Element ID, Length, Element ID Extension 필드는 기존과 같은 필드일 수 있다. 또한 OCW Range 필드는 OCWmin와 OCWmax를 얻는데에 필요한 필드를 포함할 수 있다. 예를 들면 OCW Range 필드는 EOCWmin과 EOCWmax 필드를 포함할 수 있다. EOCWmin은 OCWmin을 얻는 데에 필요한 값일 수 있다. 예를 들면 OCWmin = 2^EOCWmin - 1의 관계를 가질 수 있다. 또한 EOCWmax는 OCWmax를 얻는 데에 필요한 값일 수 있다. 예를 들면 OCWmax = 2^EOCWmax - 1의 관계를 가질 수 있다. OCWmin은 OCW 값의 최소값을 나타낼 수 있고, OCWmax는 OCW 값의 최대값을 나타낼 수 있다.

【0071】또한 STA는 가장 최근에 받은 RAPS element로 지시된 OCWmin과 OCWmax 값을 사용할 수 있다. 이때 STA가 보내려고하는 access category와 상관없이 가장 최근에 수신한 RAPS element로 지시된 OCWmin과 OCWmax 값을 사용할 수 있다.

【0073】* PPDU format selection

【0074】다음에서는 PPDU format selection 에 대해 설명한다.

【0075】본 발명의 일 실시예를 따르면 HE STA는 non-HT, HT, 또는 VHT PPDU를 보낼 때 10.7 Multirate support 룰을 따를 수 있다. 또한 HE STA는 peer HE

STA에 HE SU PPDU를 보낼 수 있다.

【0076】또한 HE AP는 27.5.1 HE DL MU operation에 따라 HE MU PPDU를 전송할 수 있고, HE non-AP STA는 27.5.2 UL MU operation을 따라 HE trigger-based PPDU를 보낼 수 있다.

【0077】HE STA는 peer STA로부터 DCM Rx capable하다고 보고 받았거나 ER(extended range) SU Payload 수신 capable하다고 보고 받은 경우 242-tone의 HE ER SU PPDU를 그 peer STA에게 전송할 수 있다. 그렇지 않으면 242-tone HE ER SU PPDU를 그 peer에게 전송하지 않을 수 있다. ER SU Payload 수신 capable 여부는 242-tone HE ER SU PPDU 수신 가능 여부일 수 있다. 또한 HE STA는 peer STA로부터 HE ER SU PPDU Payload 수신 capable하다고 보고 받은 경우 106-tone HE ER SU PPDU를 그 peer STA에게 전송할 수 있다. 그렇지 않으면 106-tone HE ER SU PPDU를 그 peer에게 전송하지 않을 수 있다. HE ER SU PPDU Payload 수신 capable 여부는 106-tone HE ER SU PPDU 수신 가능 여부일 수 있다.

【0078】HE non-AP STA는 peer STA로부터 UL HE MU PPDU Support를 보고 받은 경우 그 peer STA에 HE MU PPDU를 전송할 수 있다. 그렇지 않으면 그 peer STA에 HE MU PPDU를 전송하지 않을 수 있다. UL HE MU PPDU Support는 HE MU PPDU 수신 가능 여부를 나타내는 것일 수 있다.

【0079】HE STA는 10.7.6 Rate selection for Control frames 룰을 따라서 Control frames를 전송할 수 있고, 아래와 같은 예외들이 있을 수 있다.

【0080】 STBC를 사용하는 HE ER SU PPDU 또는 STBC를 사용하는 HE SU PPDU에 대한 응답으로 전송하는 Control frame은 soliciting PPDU와 같은 format으로 전송될 수 있다.

【0081】 HE trigger-based PPDU에 대한 응답으로 전송되는 AP가 보내는 Control frame은 의도된 수신자가 수신 지원하는 어떤 PPDU format으로도 전송될 수 있다.

【0082】 MU RTS가 아닌 Trigger frame은 의도된 수신자가 수신 지원하는 어떤 PPDU format으로도 전송될 수 있다.

【0083】 MU RTS가 아닌 Trigger frame을 포함하는 PPDU 또는 UL MU Response Scheduling A-Control field를 포함하는 PPDU에 대한 응답으로 전송되는 Control frame은 HE trigger-based PPDU로 전송될 수 있다.

【0084】 FTM frame을 포함하는 HE ER SU PPDU 또는 FTM frame을 포함하는 HE SU PPDU에 대한 응답으로 전송되는 Ack frame은 soliciting PPDU과 같은 PPDU format으로 전송될 수 있지만 FTM frame이 HE SU PPDU로 전송되고 responding STA로부터 soliciting STA로 보내지는 association 후 가장 최근에 성공적으로 수신한 PPDU가 HE ER SU PPDU였던 경우에는 control frame은 HE ER SU PPDU로 전송된다 (An Ack frame sent as a response to an HE ER SU PPDU, HE SU PPDU, containing an FTM frame shall be sent in the same PPDU format as the soliciting PPDU except when the FTM frame is carried in HE SU PPDU and the most recent

successfully received PPDU sent by the responding STA to the soliciting STA after association was an HE ER SU PPDU in which case the control frame shall be carried in HE ER SU PPDU.).

【0085】Control frame이 soliciting HE ER SU PPDU에 대한 응답으로 보내지는 경우, 그 프레임은 HE ER SU PPDU로 전송될 수 있지만 responding STA로부터 soliciting STA로 전해지는 association 후 전해진 가장 최근 성공적으로 수신한 PPDU가 HE ER SU PPDU가 아닌 경우 그 control frame은 non-HE PPDU로 전해질 수 있다.

【0086】Control frame이 soliciting HE SU PPDU에 대한 응답으로 전해지는 경우 그 프레임은 non-HT PPDU 또는 non-HT duplicate PPDU로 전해질 수 있지만 responding STA로부터 soliciting STA로 전해지는 association 후 전해진 가장 최근 성공적으로 수신한 PPDU가 HE ER SU PPDU인 경우 그 control frame은 HE ER SU PPDU로 전해질 수 있다.

【0087】non-HT PPDU와 HE ER SU PPDU 간의 PPDU format switching은 subsequent TXOPs에서 발생할 수 있다. Responding STA로부터 control frame을 solicit하는 STA는 TXOP의 expected duration을 계산할 때 control frame의 PPDU format을 고려할 수 있다. Responding STA는 soliciting STA에게 보내진 가장 최근 PPDU에 대한 응답으로 soliciting STA로부터 immediate acknowledgment를 받은 경우 그 soliciting STA에게 보내진 가장 최근 PPDU가 성공적으로 수신되었다고 판단할 수 있다(The responding STA determines that the most recent PPDU sent to

the soliciting STA is successfully received if it receives an immediate acknowledgment by the soliciting STA in response to the PPDU.).

【0089】 * BSS Color

【0090】 다음에서는 BSS color에 대해 설명한다.

【0091】 BSS color는 BSS의 identifier 일 수 있다. 이를 이용해서 PPDU 또는 frame을 수신하는 STA는 그 PPDU 또는 frame이 어디서부터 온 것인지 판단할 수 있다. 더 구체적으로 BSS color를 이용해서 PPDU 또는 frame을 수신하는 STA는 그 PPDU 또는 frame이 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 있다.

【0092】 HE Operation element 또는 BSS Color Change Announcement element를 송신하는 HE STA는 그 HE Operation element의 BSS Color subfield 또는 그 BSS Color Change Announcement element의 New BSS Color subfield에 넣기 위한 값을 선택할 수 있고, 그 값의 범위는 1부터 63까지 값 중에서일 수 있다. 이때 그 HE STA가 non-AP STA일 때는 예외일 수 있다. 또한 non-AP STA는 HE AP로부터 수신한 BSS color 값을 HE Operation element의 BSS Color subfield에 사용할 수 있고, HE AP로부터 수신한 BSS color 값은 HE Operation element의 BSS Color subfield로부터 수신한 값일 수 있다.

【0093】HE Operation element를 보냈던 HE STA는 TXVECTOR parameter BSS_COLOR로 그 STA가 HE Operation element의 BSS Color subfield에 사용했던 값을 셋팅할 수 있다. TXVECTOR parameter BSS_COLOR 값은 HE-SIG-A의 BSS Color field에 쓰이는 값일 수 있다.

【0094】Active BSS color는 TXVECTOR parameter BSS_COLOR에 사용될 수 있다. Active BSS color는 HE STA가 peer HE STA로부터 HE Operation element를 수신할 때 그 HE Operation element의 BSS Color subfield에 있는 값일 수 있다. HE STA가 BSS Color Change Announcement element를 수신하고 BSS color change TBTT에 도달한 이후에는 active BSS color 값은 그 BSS Color Change Announcement element의 New BSS Color subfield로부터 수신한 값일 수 있다.

【0095】HE STA는 peer STA와 association 또는 TDLS link 또는 DLS link 또는 IBSS membership을 수립한 경우 그 peer STA에게 보내는 HE PPDU에서 TXVECTOR parameter BSS_COLOR를 active BSS color로 셋팅할 수 있다.

【0096】RXVECTOR parameter BSS_COLOR 값이 1부터 63중 하나인 HE PPDU를 수신하는 HE STA는 OBSS PD-based Spatial Reuse operation 룰을 따라 동작할 수 있다. RXVECTOR parameter BSS_COLOR 값이 0인 HE PPDU를 수신하는 HE STA는 OBSS PD-based Spatial Reuse operation 룰을 따라 동작하지 않을 수 있다.

【0098】일 실시예를 따르면 HE STA가 PPDU를 보낼 때 하나 이상의 intended recipient STAs가 보내는 HE STA의 BSS의 멤버가 아닐 때 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다. 더 구체적으로는 HE STA가 HE SU PPDU 또는 HE extended range SU PPDU를 보낼 때 하나 이상의 intended recipient STAs가 보내는 HE STA의 BSS의 멤버가 아닐 때 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다.

【0099】또한 RXVECTOR parameter BSS_COLOR가 0인 HE PPDU를 수신한 HE STA는 그 HE PPDU를 폐기하지(discard) 않을 수 있다. 더 구체적으로는 RXVECTOR parameter BSS_COLOR가 0인 HE SU PPDU 또는 HE extended range SU PPDU를 수신한 HE STA는 그 HE PPDU를 폐기하지(discard) 않을 수 있다.

【0100】위 설명한 실시예들에 따라 PPDU의 하나 이상의 intended recipient STAs가 PPDU를 보내는 STA와 같은 BSS의 멤버가 아닌 경우, 그 PPDU를 수신하는 STA는 그 PPDU를 폐기하지 않을 수 있다. 더 구체적으로는 HE SU PPDU 또는 HE extended range SU PPDU의 하나 이상의 intended recipient STAs가 PPDU를 보내는 STA와 같은 BSS의 멤버가 아닌 경우, 그 PPDU를 수신하는 STA는 그 PPDU를 폐기하지 않을 수 있다. 또한 이러한 PPDU에 대해 OBSS PD level을 적용해 CCA하지 않을 수 있다. 또는 이러한 PPDU에 대해 OBSS PD level을 적용해 channel을 idle한 것으로 판단하지 않을 수 있다.

【0102】어떤 multiple BSSID set의 멤버인 모든 AP 혹은 모든 BSS는 같은

BSS color를 사용할 수 있다.

【0104】 앞서 설명한 실시예들을 따르면 STA는 PPDU를 전송할 때 intended recipient STA(s)가 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA일 수 있고, 그때 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있는데, 이때 그 PPDU 또는 그 PPDU가 포함한 하나 이상의 A-MPDU가 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA에게 향하는 것일 수도 있고, PPDU가 포함한 하나 이상의 frame이 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA에게 향하는 것일 수도 있고, PPDU가 포함한 하나 이상의 frame의 일부가 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA에게 향하는 것일 수도 있다. 또한 어떤 경우엔 STA가 PPDU를 전송할 때 intended recipient STA(s) 중에 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA와 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속한 STA가 모두 있을 수 있다. 일 실시예로 AP는 Trigger frame을 전송할 때 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있다. 그러한 경우 그 User Info 필드는 프레임을 전송하는 STA의 BSS의 멤버가 아닌 STA가 intended recipient이므로 TXVECTOR parameter BSS_COLOR를 0으로 셋팅할 수 있다. 이러한 경우 발생할 수 있는 문제점 또는 단점에 대해 도 10, 11, 12에서 설명하겠다.

【0105】 도 10은 본 발명의 일 실시예에 따른 UL MU 동작 및 NAV 셋팅을 나타낸 도면이다.

【0107】* Intra-BSS and inter-BSS frame determination

【0108】본 발명의 일 실시예인 intra-BSS and inter-BSS frame determination에 대해서 설명한다.

【0109】본 발명의 일 실시예에 따르면 STA는 수신한 frame이 intra-BSS frame인지 inter-BSS frame인지 판단할 수 있다. 이때 판단을 위해 RXVECTOR parameters(예를 들면 BSS_COLOR, GROUP_ID와 PARTIAL_AID, SPATIAL_REUSE 등), MAC address, 수신한 PPDU 종류(수신한 PPDU 종류도 RXVECTOR parameter를 사용한 판단일 수 있다.) 등을 사용할 수 있다.

【0111】STA는 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 자신의 BSS의 BSS color와 일치하면 그 PPDU를 intra-BSS에서 온 것으로 판단하고, 일치하지 않으면 inter-BSS에서 온 것으로 판단할 수 있다.

【0112】STA는 수신한 frame의 MAC header의 address fields 중 하나가 자신의 BSS의 BSSID와 일치하거나 자신의 BSS의 BSSID가 속한 multiple BSSID set의 BSSID 중 하나와 일치하면 그 frame을 intra-BSS에서 온 것으로 판단할 수 있다. 그렇지 않으면 그 frame을 inter-BSS frame으로 판단할 수 있다.

【0113】STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 0일 때 RXVECTOR parameter PARTIAL_AID가 자신의 BSS의 BSSID 혹은 자신의 BSS의 BSSID가

속한 multiple BSSID set의 BSSID 중 하나의 비트 39에서 비트 47까지와 일치하면 그 PPDU를 intra-BSS에서 온 것으로 판단하고, 그렇지 않으면 inter-BSS에서 온 것으로 판단할 수 있다.

【0114】 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63일 때 RXVECTOR parameter PARTIAL_AID의 비트 5부터 비트 8이 자신의 BSS의 partial BSS color와 일치하면 그 PPDU를 intra-BSS에서 온 것으로 판단하고, 그렇지 않으면 inter-BSS에서 온 것으로 판단할 수 있다. Partial BSS color는 자신의 BSS의 BSS color의 4 LSBs일 수 있다. 또한 partial BSS color를 기반으로 한 판단 방법은 AP로부터 판단 허용을 지시받은 경우에 수행할 수도 있고, AP는 HE Operation의 Partial BSS Color field를 이용해 지시할 수 있다.

【0115】 STA는 수신한 frame의 TA field가 없고, RA field가 associate된 BSS의 저장된 TXOP holder address와 일치하는 경우 그 frame을 intra-BSS frame으로 판단할 수 있다. 또한 이 판단 방법은 control frame을 수신한 경우도 한정할 수도 있다.

【0116】 AP STA가 VHT MU PPDU 또는 UL/DL field를 DL로 셋팅한 HE MU PPDU를 수신한 경우 그 PPDU를 inter-BSS에서 온 것으로 판단할 수 있다.

【0118】 아래에서는 위에 설명한 intra-BSS, inter-BSS 판단 방법을 더 구체적으로 설명한다.

【0119】STA는 수신한 프레임이 다음 조건 중 하나를 만족시키면 그 프레임을 intra-BSS frame으로 판단할 수 있다.

【0120】- 그 frame을 나르는 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 그 STA의 BSS의 BSS color와 같다. 이 BSS color는 associated AP에 의해 알려진 값일 수도 있고, AP가 운영하는 BSS에 알리고 있는 BSS color 값일 수도 있다.

【0121】- 수신한 frame의 RA field 또는 TA field 또는 BSSID field를 Individual/Group bit를 0으로 바꾼 뒤의 값이 STA의 BSS의 BSSID와 같다.

【0122】- STA가 association된 AP(혹은 AP)가 2개 이상의 members가 있는 multiple BSSID set의 member이고, 수신한 frame의 RA field 또는 TA field 또는 BSSID field를 Individual/Group bit를 0으로 바꾼 뒤의 값이 그 multiple BSSID set의 any member의 BSSID와 같다.

【0123】- 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 0이고, RXVECTOR parameter PARTIAL_AID가 STA가 association된 AP(혹은 AP)의 BSSID[39:47]과 같다.

【0124】- STA가 속한 BSS의 가장 최근 HE Operation element의 Partial BSS Color field가 1이고, 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같다.

【0125】- 그 frame이 TA field를 갖지 않은 Control frame이고, RA field가 association된 BSS의 saved TXOP holder address와 같다.

【0127】STA는 수신한 프레임이 다음 조건 중 하나를 만족시키면 그 프레임을 inter-BSS frame으로 판단할 수 있다.

【0128】- 그 frame을 나르는 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 0이 아니고, 그 STA의 BSS의 BSS color와 같지 않다. 이 BSS color는 associated AP에 의해 알려진 값일 수도 있고, AP가 운영하는 BSS에 알리고 있는 BSS color 값일 수도 있다.

【0129】- 수신한 frame에 BSSID field가 있으면 BSSID field의 Individual/Group bit를 0으로 바꾼 뒤의 값이 STA가 association된 AP(혹은 AP)의 BSSID와 같지 않다. 이 판단 방법은 그 frame을 나르는 수신한 PPDU에 RXVECTOR parameter BSS_COLOR가 없는 경우로 한정하는 것도 가능하다.

【0130】- BSSID field가 없고, RA field와 TA field가 모두 존재할 때 address fields 값의 Individual/Group bit를 0으로 바꾼 값 중 어떤 것도 STA가 association된 AP(혹은 AP)의 BSSID와 일치하지 않는다. 이 판단 방법은 그 frame을 나르는 수신한 PPDU에 RXVECTOR parameter BSS_COLOR가 없는 경우로 한정하는 것도 가능하다.

【0131】- STA가 association된 AP(혹은 AP)가 2개 이상의 members가 있는 multiple BSSID set의 member이고, 수신한 frame에 BSSID field가 있는 경우, BSSID field를 Individual/Group bit를 0으로 바꾼 뒤의 값이 그 multiple BSSID

set의 any member의 BSSID와도 같지 않다.

【0132】- STA가 association된 AP(혹은 AP)가 2개 이상의 members가 있는 multiple BSSID set의 member이고, 수신한 frame에 BSSID field가 없고 RA field와 TA field가 있는 경우, address fields 중 어떤 것을 Individual/Group bit를 0으로 바꾼 뒤의 값이 그 multiple BSSID set의 any member의 BSSID와도 같지 않다.

【0133】- 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 0이고, RXVECTOR parameter PARTIAL_AID가 STA가 association된 AP(혹은 AP)의 BSSID[39:47]과 같지 않다.

【0134】- STA가 속한 BSS의 가장 최근 HE Operation element의 Partial BSS Color field가 1이고, 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같지 않다.

【0135】- 그 STA가 AP이고 VHT MU PPDU 또는 UL/DL field가 DL로 표시된 HE MU PPDU를 수신하였다.

【0137】Intra-BSS, inter-BSS를 판단할 때 MAC address에 의한 판단이 RXVECTOR parameter에 의한 판단보다 우선할 수 있다. 예를 들면 MAC address에 의한 판단이 RXVECTOR parameter BSS_COLOR에 의한 판단보다 우선할 수 있다. 또한 MAC address에 의한 판단이 RXVECTOR parameter GROUP_ID와 RXVECTOR parameter PARTIAL_AID에 의한 판단보다 우선할 수 있다. 또한 MAC address에 의한 판단이 수

신한 PPDU 종류에 의한 판단보다 우선할 수 있다. 또한 우선 조건은 수신한 frame이 위의 intra-BSS 조건과 inter-BSS 조건을 모두 만족시키는 경우에 사용할 수도 있다.

【0138】 또는 수신한 frame이 intra-BSS 조건과 inter-BSS 조건을 모두 만족시키는 경우 inter-BSS로 판단할 수 있다.

【0139】 또한 수신한 frame이 intra-BSS 조건과 inter-BSS 조건을 모두 만족시키지 않는 경우 그 frame은 intra-BSS로도, inter-BSS로두 판단할 수 없는 것일 수 있다.

【0141】 * Two NAVs

【0142】 본 발명의 일 실시예에 따르면 STA는 2개의 NAVs 혹은 2개의 NAV timers를 운영할 수 있다. 그리고 2개의 NAVs는 각각 intra-BSS NAV와 basic NAV일 수 있다. Intra-BSS NAV는 intra-BSS로부터 온 것으로 판단되는 frame 혹은 PPDU로부터 설정하는 NAV 값을 저장하기 위한 것일 수 있다. Basic NAV는 inter-BSS로부터 온 것으로 판단되거나 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 없는 frame 혹은 PPDU로부터 설정하는 NAV 값을 저장하기 위한 것일 수 있다. NAV를 설정하는 duration information은 MAC header의 Duration/ID field 혹은 HE-SIG-A의 TXOP Duration field 등으로부터 얻을 수 있다.

【0144】STA는 수신한 frame이 intra-BSS에서 온 것으로 판단되는 경우에 그 frame에 의해 지시된 duration information(MAC header의 duration information)에 기반하여 intra-BSS NAV를 업데이트할 수 있다. 또한 이 NAV 업데이트 동작은 이 STA가 그 frame 혹은 그 frame을 나르는 PPDU에 의해 immediate response가 solicit 되지 않은 경우에 수행될 수도 있다. 하지만 immediate response가 solicit되었지만 응답하지 않은 경우에도 업데이트가 수행될 수 있다. 또한 이 STA가 TXOP holder인 경우에는 이 STA가 solicit하지 않은 frame에 대해서만 업데이트 동작을 수행하는 것이 가능하다.

【0145】STA는 수신한 frame이 inter-BSS에서 온 것으로 판단된 경우 혹은 수신한 frame이 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 없는 경우에 그 frame에 의해 지시된 duration information(MAC header의 duration information)에 기반하여 basic NAV를 업데이트할 수 있다. 또한 이 NAV 업데이트 동작은 이 STA가 그 frame 혹은 그 frame을 나르는 PPDU에 의해 immediate response가 solicit 되지 않은 경우에 수행될 수도 있다. 하지만 immediate response가 solicit되었지만 응답하지 않은 경우에도 업데이트가 수행될 수 있다.

【0146】STA는 수신한 PPDU가 intra-BSS에서 온 것으로 판단된 경우 RXVECTOR parameter TXOP_DURATION에 의해 지시된 duration information에 기반하여 intra-BSS NAV를 업데이트할 수 있다. 또한 이 업데이트 동작은 RXVECTOR parameter TXOP_DURATION이 duration 정보를 나타내고 있는 경우로 한정할 수 있다. 예를 들면 RXVECTOR parameter TXOP_DURATION의 값이 모두 1로 셋팅되지 않

은 경우 업데이트를 수행할 수 있다. 또한 이 업데이트 동작은 이 PPDU로부터 Duration/ID field의 duration information을 수신하지 않은 경우에 수행될 수 있다. 또한 이 업데이트 동작은 이 RXVECTOR parameter의 duration information을 나른 PPDU가 이 STA에 의해 trigger된 HE trigger-based PPDU가 아닌 경우에 수행될 수도 있다.

【0147】 STA는 수신한 PPDU가 inter-BSS에서 온 것으로 판단된 경우 혹은 수신한 frame이 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 없는 경우에 RXVECTOR parameter TXOP_DURATION에 의해 지시된 duration information에 기반하여 basic NAV를 업데이트할 수 있다. 또한 이 업데이트 동작은 RXVECTOR parameter TXOP_DURATION이 duration 정보를 나타내고 있는 경우로 한정할 수 있다. 예를 들면 RXVECTOR parameter TXOP_DURATION의 값이 모두 1로 셋팅되지 않은 경우 업데이트를 수행할 수 있다. 또한 이 업데이트 동작은 이 PPDU로부터 Duration/ID field의 duration information을 수신하지 않은 경우에 수행될 수 있다.

【0149】 위 언급한 NAV 업데이트 동작은 현재 설정되어 있는 NAV보다 새로 수신한 duration information이 더 클 때 수행될 수 있다.

【0150】 또한 STA가 Duration/ID field와 RXVECTOR parameter TXOP_DURATION 둘 모두로부터 duration information을 수신한 경우 RXVECTOR parameter TXOP_DURATION에 의해 지시된 duration information은 무시될 수 있다.

【0152】* HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR 셋팅

【0153】본 발명의 일 실시예를 따르면 HE trigger-based PPDU를 전송하는 STA는 다음과 같이 TXVECTOR parameter BSS_COLOR 셋팅할 수 있다. 만약 이 HE trigger-based PPDU를 solicit한 Trigger frame을 BSS color를 포함한 PPDU, 예를 들면 HE PPDU를 통해 수신한 경우, 이 HE PPDU의 RXVECTOR parameter BSS_COLOR로 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 셋팅할 수 있다. 만약 이 HE trigger-based PPDU를 solicit한 Trigger frame을 BSS color를 포함하지 않는 PPDU, 예를 들면 non-HE PPDU를 통해 수신한 경우, 이 PPDU의 BSS로부터 가장 최근 수신한 HE Operation element의 BSS Color subfield 값(혹은 BSS color change announcement가 있었고 BSS color change TBTT에 도달한 경우 BSS Color Change Announcement element의 New BSS Color subfield 값)으로 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 셋팅할 수 있다.

【0155】앞서 설명한 것처럼 하나 이상의 intended recipient가 같은 BSS가 아닌 경우, 예를 들면 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame을 전송하는 경우 HE PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 셋팅될 수 있다. 이때 이 PPDU를 수신하는 STA가 설

명한 intra-BSS, inter-BSS 판단 방법을 따르면 STA가 RXVECTOR parameter BSS_COLOR를 수신했을 때 0으로 셋팅되어 있기 때문에 RXVECTOR parameter BSS_COLOR에 기반해서 intra-BSS, inter-BSS를 판단할 수 없다. 이 STA의 BSS의 BSS color는 1부터 63 중 한 값이므로 RXVECTOR parameter BSS_COLOR는 intra-BSS 조건을 만족시킬 수 없고, 수신한 RXVECTOR parameter BSS_COLOR가 0이므로 inter-BSS 조건을 만족시킬 수 없다. 따라서 PPDU를 수신한 STA가 duration information을 preamble로부터만 수신하는 경우에는 이 PPDU가 intra-BSS로부터 온 것인지 inter-BSS로부터 온 것인지 판단할 수 없게 되고, NAV 업데이트 룰을 따라 basic NAV를 셋팅할 수 있다. 이것은 이 STA가 PPDU를 보낸 STA와 같은 BSS인 경우에도 해당한다. 즉 이 STA는 실제로 같은 BSS에서 보낸 PPDU를 수신하고 basic NAV를 셋팅할 수 있다. 여기서 duration information을 preamble로부터만 수신하는 경우는 여러 가지가 있을 수 있다. 먼저 HE preamble 수신 결과 unsupported 값들로 셋팅되어있어서 MAC payload를 수신하지 못할 수 있다. 예를 들면 MCS, DCM, 코딩 종류 등에 따라 수신하는 STA가 수신을 지원하지 못할 수 있다. 또한 HE preamble 수신 후 MAC payload, frame 디코딩에 실패할 수도 있다. 또한 수신한 PPDU가 HE trigger-based PPDU인 경우에는 PPDU, PSDU가 어떻게 구성되어 있는지 모르므로 frame을 수신할 수 없다.

【0156】 또한 원래 intra-BSS NAV를 셋팅해야할 것을 basic NAV를 셋팅함으로써 다음과 같은 문제가 발생한다. 본 발명의 일 실시예를 따르면 STA가 AP에 의해 solicit 되었을 때 virtual CS를 고려해야 하지만 만약 NAV가 intra-BSS frame

에 의해 설정된 경우 virtual CS를 고려하지 않을 수 있다. 예를 들면 AP가 STA에게 Trigger frame으로 response를 solicit했을 때 STA의 NAV가 intra-BSS frame에 의해 설정된 경우 NAV가 0이 아님에도 불구하고 Trigger frame에 응답할 수 있다. 따라서 원래 intra-BSS NAV를 셋팅해야할 것을 basic NAV를 셋팅하게 되면 intra-BSS AP가 immediate response를 solicit해도 응답하지 못할 수 있다. 예를 들면 intra-BSS AP가 UL MU 동작에 따라 HE trigger-based PPDU를 solicit하는 경우에 응답하지 못할 수 있다.

【0158】도 10을 참조하면 BSS1에서 프레임 송수신이 일어날 수 있고, STA1과 STA2는 BSS1의 STA일 수 있다. 또한 BSS1에서 TXOP 안에서의 송수신이 일어날 수 있고, STA1와 STA2는 BSS1에서 전송되는 PPDU를 전부 혹은 일부 수신할 수 있다. BSS1의 AP는 TXVECTOR parameter BSS_COLOR를 0으로 설정하여 PPDU를 전송할 수 있다. 예를 들면 AP가 보내는 PPDU가 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame을 포함하기 때문에 BSS_COLOR를 0으로 설정할 수 있다. 이때 Trigger frame은 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드 외에 associated STA를 위한 User Info 필드(예를 들면 특정 STA를 scheduling하는 User Info 필드, associated STAs를 위한 random access RU를 지시하는 User Info 필드)를 포함할 수도 있고, 포함하지 않을 수도 있다. 그리고 STA1은 이 PPDU를 수신할 수 있다. 앞서 설명한 것처럼 STA1이 valid HE-SIG-A를 수신했다고 하더라도 HE-SIG-A에서 얻은 정보로

intra-BSS인지 inter-BSS인지 판단하지 못할 수 있다. 또한 HE-SIG-A가 나타내는 값이 이 STA가 지원하지 않는 것이어서 수신을 중단할 수 있고, 수신을 시도하더라도 채널 상황 등의 이유로 frame 수신을 실패할 수 있다. 이러한 경우 STA는 duration information을 RXVECTOR parameter TXOP_DURATION으로부터만 얻게 되고, intra-BSS, inter-BSS를 판단할 수 없으므로 basic NAV를 설정하게 된다.

【0159】 또한 Trigger frame에 응답하는 STA들은 HE trigger-based PPDU를 도 10에서 두번째 PPDU와 같이 전송하게 되는데, 이때 preceding Trigger frame이 HE PPDU에 전송되었으므로 preceding Trigger frame을 포함한 PPDU의 RXVECTOR parameter BSS_COLOR가 0인 이 실시예에서 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정하게 된다. 따라서 이 HE trigger-based PPDU를 수신하는 STA2는 HE-SIG-A를 통해 이 PPDU가 intra-BSS로부터 온 것인지 inter-BSS로부터 온 것인지 판단할 수 없고, preceding Trigger frame의 intended recipient가 아니었던 STA2는 HE trigger-based PPDU가 포함한 frame을 수신하지 못하고 duration information을 RXVECTOR parameter TXOP_DURATION으로부터 밖에 얻을 수 없다. 따라서 basic NAV를 설정하게 된다.

【0160】 따라서 도 10의 세번째 PPDU와 같이 STA1와 STA2에게서 immediate response를 solicit하는 Trigger frame을 STA1과 STA2가 수신했더라도 virtual CS 결과 busy하여 실제로 intra-BSS로부터의 PPDU가 NAV를 설정하고 intra-BSS AP가 UL MU response를 solicit한 경우인데도 응답하지 못하는 일이 발생할 수 있다.

【0162】도 11은 본 발명의 일 실시예에 따른 UL MU 동작 및 power save 동작을 나타낸 도면이다.

【0164】* intra-PPDU power save

【0165】본 발명의 일 실시예에 따르면 STA는 PPDU를 수신했을 때 이 PPDU 길이 동안 frame을 송신 또는 수신할 수 없음을 판단할 수 있고, 이때 power save 동작을 통해 doze state에 들어갈 수 있다. STA가 수신한 PPDU 길이 동안 frame을 송신 또는 수신할 수 없다는 것은 intra-BSS PPDU를 수신했고, 그 PPDU가 그 STA로 향한 것이 아닐 때일 수 있다. 이것은 그 PPDU는 그 STA를 위한 것이 아니고, 그 PPDU의 길이 동안 그 STA가 frame을 전송하더라도 peer STA가 그 PPDU를 송신 또는 수신하는 중이므로 전송 성공할 수 없기 때문이다. 이러한 power save 동작을 intra-PPDU power save라고 부를 수 있다.

【0166】Non-AP STA는 수신한 PPDU가 uplink일 때 그 PPDU가 자신에게 향하는 것이 아니라고 판단할 수 있다. 또는 non-AP STA가 수신한 PPDU가 포함한 frame의 RA field가 그 STA의 MAC address가 아닐 때 그 PPDU가 자신에게 향하는 것이 아니라고 판단할 수 있다. 또는 non-AP STA가 downlink PPDU를 수신했지만 그 PPDU의 preamble가 포함한 recipient identifiers가 그 STA를 나타내고 있지 않을 때, 예를 들면 UL/DL field가 DL로 설정된 HE MU PPDU를 수신했지만 HE-SIG-B가 그 STA의 AID를 포함하고 있지 않을 때 그 PPDU가 자신에게 향하는 것이 아니라고 판단할

수 있다.

【0167】Non-AP STA는 RXVECTOR parameter BSS_COLOR가 자신이 속한 BSS의 BSS color와 같을 때 수신한 PPDU가 intra-BSS라고 판단할 수 있다. 또한 non-AP STA는 수신한 frame의 MAC address 중 하나가 자신이 속한 BSS의 BSSID일 때 intra-BSS라고 판단할 수 있다.

【0168】다음에서 intra-PPDU power save 동작을 더 자세히 설명한다.

【0169】Non-AP STA는 다음 조건 중 하나를 만족시킬 때 수신하고 있는 PPDU의 끝까지 doze state로 들어갈 수 있다.

【0170】- 그 PPDU가 HE MU PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 association된 BSS의 BSS color이고, RXVECTOR parameter UL_FLAG(혹은 UPLINK_FLAG)가 downlink(0)을 나타내고 있고, RXVECTOR parameter STA_ID_LIST가 이 STA의 identifier나 이 STA에게 가는 broadcast identifier를 포함하고 있지 않다.

【0171】- 그 PPDU가 HE MU PPDU 또는 HE SU PPDU 또는 HE extended range SU PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 속한 BSS의 BSS color와 같고 RXVECTOR parameter UL_FLAG(혹은 UPLINK_FLAG)가 uplink(1)를 나타내고 있다.

【0172】- 그 PPDU가 HE MU PPDU 또는 HE SU PPDU 또는 HE extended range SU PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 속한 BSS의 BSS color와

같고 RXVECTOR parameter UL_FLAG(혹은 UPLINK_FLAG)가 downlink(0)를 나타내고 있고, PHY-RXEND.indication(UnsupportedRate) primitive를 받았다.

【0173】- 그 PPDU가 HE trigger-based PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 속한 BSS의 BSS color와 같다.

【0174】- 그 PPDU가 VHT PPDU이고, RXVECTOR parameter PARTIAL_AID가 그 STA가 속한 BSS의 BSSID의 BSSID[39:47]과 같고, RXVECTOR parameter GROUP_ID가 0이다.

【0175】- 그 PPDU가 포함한 MPDU가 그 STA가 속한 BSS의 BSSID 혹은 그 STA가 속한 BSS의 BSSID가 속한 multiple BSSID set의 BSSID와 일치하는 RA 또는 TA 또는 BSSID field를 포함하고 있고, RA field가 그 STA의 MAC address가 아니다.

【0177】앞서 설명한 것처럼 STA가 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 0으로 셋팅되는 경우가 발생할 수 있고, 그러한 경우 frame의 MAC header를 수신하지 않고서는 intra-PPDU power save 동작을 통해 doze state로 들어갈 수 없다.

【0179】도 11을 참조하면 BSS1에서 프레임 송, 수신이 일어날 수 있고, STA1은 BSS1에 속해있을 수 있다. BSS1의 AP는 Trigger frame을 포함해서 PPDU를 전송할 수 있는데 이때 unassociated STAs를 위한 random access RU를 지시하는

User Info 필드를 포함하는 경우에 TXVECTOR parameter BSS_COLOR를 0으로 설정하게 된다. 그리고 그 Trigger frame에 응답하는 STA는 응답하는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 preceding Trigger frame을 포함한 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR인 0으로 설정하게 된다. STA1이 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 0일 때 STA1은 그 PPDU가 실제로는 intra-BSS이고, STA1을 향한 PPDU가 아니어서 그 PPDU 동안 doze state로 들어가도 상관없음에도 불구하고 MAC header를 수신하지 않고서는 doze state로 들어갈 수 없다. 도 11의 첫번째 PPDU와 같은 Trigger frame을 포함한 DL PPDU를 수신하는 경우에는 frame을 수신하게 되면 MAC header의 address fields를 통해 doze state로 들어갈 가능성이 있지만 frame을 수신할 수 없거나 수신 실패한 경우에는 doze state로 들어갈 수 없다. 도 11의 두번째 PPDU와 같은 HE trigger-based PPDU를 수신한 경우에는 frame을 수신할 수 없으므로 doze state로 들어갈 수 없다.

【0181】 도 12는 본 발명의 일 실시예에 따른 UL MU 동작 및 채널 유휴 상태 판단을 나타낸 도면이다.

【0183】 본 발명의 일 실시예에 따르면 STA는 inter-BSS PPDU에 대해 기존의 CCA threshold 이상의 threshold를 사용하여 채널이 busy한지 idle한지 판단할 수 있다. 기존의 CCA threshold 이상의 threshold를 OBSS PD level이라고 할 수 있고, 이러한 채널 판단 동작을 OBSS PD-based Spatial Reuse(SR) 동작이라고 할 수

있다. STA는 수신한 PPDU가 inter-BSS인 경우 수신한 PPDU의 received power이 OBSS PD level보다 작으면 PHY-CCARESET.request primitive를 발행할 수 있고 그 PPDU로부터의 duration information에 기반하여 NAV를 업데이트하지 않을 수 있다. 예를 들면 PPDU의 received power는 legacy portion에서 측정할 수 있다.

【0184】 따라서 앞서 설명한 것처럼 RXVECTOR parameter BSS_COLOR가 0으로 설정된 PPDU를 수신하면 그 PPDU가 intra-BSS인지 inter-BSS인지 판단할 수 없고, MAC header를 수신하지 못하면 실제 그 PPDU가 inter-BSS이더라도 OBSS PD-based SR 동작을 수행하지 못할 수 있다.

【0186】 도 12를 참조하면 BSS1에서 프레임 송, 수신이 일어날 수 있고, BSS1과 다른 BSS인 BSS2에 속한 STA1이 있을 수 있다. BSS1의 AP는 Trigger frame을 포함해서 PPDU를 전송할 수 있는데 이때 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 포함하는 경우에 TXVECTOR parameter BSS_COLOR를 0으로 설정하게 된다. 그리고 그 Trigger frame에 응답하는 STA는 응답하는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 preceding Trigger frame을 포함한 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR인 0으로 설정하게 된다. 도 12의 첫번째 PPDU가 전송될 때 STA1은 이를 수신할 수 있고 HE-SIG-A를 수신할 때까지 채널 상황을 busy로 판단할 것이다. 그리고 HE-SIG-A를 통해 이 PPDU가 intra-BSS인지 inter-BSS인지 판단할 수 없으므로 바로 OBSS PD-based SR 동작을 수행할 수 없다. 만약 frame을 수신하는 경우에는 intra-BSS인지

inter-BSS인지 판단할 가능성이 있고, OBSS PD-based SR 동작을 수행할 수 있다. 도 12에서 두번째 PPDU가 전송될 때 STA1은 이를 수신할 수 있고 HE-SIG-A를 수신할 때까지 채널 상황을 busy로 판단할 것이다. 그리고 HE-SIG-A를 통해 이 PPDU가 intra-BSS인지 inter-BSS인지 판단할 수 없고, HE trigger-based PPDU로부터 frame을 수신할 수 없으므로 이 PPDU에서 OBSS PD-based SR 동작을 수행할 기회가 없다. 따라서 BSS1은 UL MU operation은 inter-BSS의 OBSS PD-based SR 동작으로부터 보호하는 결과를 가져왔다. 이를 악용하면 AP는 자신의 UL MU operation을 보호하기 위해 dummy하게 혹은 불필요하게 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 Trigger frame을 포함할 수 있다.

【0188】 도 10 내지 도 12를 통해 설명한 문제를 해결하기 위한 방법을 아래에서 설명한다.

【0189】 앞서 설명한 것처럼 하나 이상의 intended recipient STAs가 transmitting STA의 BSS의 member가 아니면 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있지만 설명한 문제를 해결하기 위해 예외 사항을 가질 수 있다.

【0190】 본 발명의 일 실시예를 따르면 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 또는 HE trigger-based PPDU를 solicit하는 frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 여기서 보내는 STA의 BSS의 BSS color 값은 그

BSS의 HE Operation element의 BSS Color subfield 값일 수 있다. 또한 BSS Color Change Annouce를 했고 BSS color change TBTT에 도달한 후에는 BSS Color Change Announcement element의 New BSS Color subfield 값일 수 있다.

【0191】더 구체적인 실시예로 unassociated STA를 solicit하는 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 예를 들면 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0192】더 구체적인 실시예로 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 일 실시예로 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame은 다른 frame일 수 있다. 예를 들면 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame이 MPDU aggregation되어 있는 A-MPDU를 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 또는 unassociated STA를 solicit하는 Trigger frame을 포함하는 PSDU와 associated STA에게 향하는 frame을 포함하는 PSDU를 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있

다. 또다른 실시예로 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame은 같은 frame일 수 있다. 즉, Trigger frame이 unassociated STA를 위한 User Info 필드를 포함하고, associated STA를 위한 User Info 필드(예를 들면 구체적인 하나의 associated STA를 Trigger하는 User Info 필드 혹은 associated STA를 위한 random access RU를 지시하는 User Info 필드)를 포함할 때 그 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0193】 본 발명의 또다른 실시예를 따르면 PPDU의 intended recipient STAs가 transmitting STA의 BSS의 member인 STA와 transmitting STA의 BSS의 member가 아닌 STA를 모두 포함할 때 그 PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0194】 본 발명의 또다른 실시예를 따르면 PPDU의 모든 intended recipient STAs가 transmitting STA의 BSS의 member가 아닐 때 BSS_COLOR를 0으로 설정하고, 그렇지 않은 경우 TXVECTOR parameter BSS_COLOR를 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0195】 위 실시예들과 같이 TXVECTOR parameter BSS_COLOR를 설정함으로써 intra-BSS로부터의 PPDU로부터 intra-BSS NAV를 설정할 수 있고, 그에 따라 intra-BSS AP가 UL MU response를 trigger할 때 적절히 응답할 수 있다. 또한 intra-BSS PPDU를 수신했을 때 RXVECTOR parameter BSS_COLOR를 기반으로 intra-PPDU power save 동작을 통해 doze state로 들어갈 수 있다. 또한 실시예의 설정을 사용한

PPDU를 보낸 STA와 다른 BSS의 STA가 이 PPDU를 보낸 BSS에서의 PPDU를 수신했을 때 OBSS PD-based SR 동작을 수행하게 할 수 있다.

【0196】본 발명의 일 실시예를 따르면 위 설명한 TXVECTOR parameter BSS_COLOR 설정에 따른 문제 상황과 솔루션은 그 PPDU가 HE SU PPDU 또는 HE extended range SU PPDU일 때일 수 있다.

【0198】도 13은 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면이다.

【0199】BSS1에서 보내는 PPDU는 Trigger frame을 포함할 수 있고, 이 Trigger frame은 unassociated STA를 위한 User Info 필드를 포함할 수 있다. 예를 들어 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있다. 예를 들면 User Info 필드의 AID12 subfield를 2045로 설정함으로써 이를 지시할 수 있다. 더불어서 Trigger frame은 associated STA를 위한 User Info 필드를 함께 포함할 수 있다. 이 Trigger frame을 포함한 PPDU 또는 이 Trigger frame이 solicit한 HE trigger-based PPDU를 수신한 STA들이 적절한 NAV 설정, intra-PPDU power save 동작, OBSS PD-based SR 동작을 수행하게 하기 위해 PPDU의 intended recipient STA에 PPDU를 보내는 STA의 BSS의 member가 아닌 STA가 있을지라도 TXVECTOR parameter BSS_COLOR를 0이 아닌 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0201】 도 14는 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면이다.

【0202】 앞서 설명한 것처럼 하나 이상의 intended recipient STAs가 transmitting STA의 BSS의 member가 아니면 PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다. 따라서 unassociated STA를 위한 User Info 필드를 포함하는 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다. 그러나 이 PPDU는 어떤 STA가 수신하더라도 unsupported parameters의 PPDU가 아닌 한 frame을 수신할 기회가 존재한다. 예를 들어 HE SU PPDU를 수신하는 경우 그 PPDU가 포함한 MAC header를 수신할 기회가 존재한다.

【0203】 그러나 앞선 실시예를 따르면 이에 대해 응답하는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR도 0으로 설정하게 되고 이 PPDU의 intended recipient가 아닌 STA들은 이 PPDU가 포함하는 frame을 수신할 수 없는 문제가 있다. Intended recipient가 아닌 STA들은 PPDU 또는 PSDU 또는 RU 구성을 알 수 없기 때문이다. 따라서 도 10 내지 도 12에서 설명한 문제를 해결하기 위해 이러한 HE trigger-based PPDU에 대해 TXVECTOR parameter BSS_COLOR 설정 방법을 제안한다.

【0204】 본 발명의 일 실시예를 따르면 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR는 항상 0이 아닌 값으로 설정할 수 있다. 또는 HE trigger-

based PPDU의 TXVECTOR parameter BSS_COLOR는 이 HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값으로 설정할 수 있다. HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 가장 최근 수신한 이 BSS의 HE Operation element의 BSS Color subfield 값일 수 있다. 만약 BSS Color Change Announce가 있었고, BSS color change TBTT에 도달한 경우, HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 이 BSS의 BSS Color Change Announcement element의 New BSS Color subfield 값일 수 있다. 또는 HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다. 또는 HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 그 BSS의 HE Operation element를 수신했던 STA에게는 HE Operation element의 BSS Color subfield 값이고, 그 BSS의 HE Operation element를 수신하지 않은 STA에게는 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다.

【0205】 또다른 실시예로 preceding Trigger frame을 포함한 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR가 0인 경우 HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR를 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color로 설정할 수 있다. 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 가장 최근 수신한 이 BSS의 HE Operation element의 BSS Color subfield 값일 수 있다. 만약 BSS Color Change Announce가 있었고, BSS color change TBTT에 도달한 경우, 그 preceding Trigger frame을 전송한 STA의 BSS의

BSS color 값은 이 BSS의 BSS Color Change Announcement element의 New BSS Color subfield 값일 수 있다. 또는 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다. 또는 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 그 BSS의 HE Operation element를 수신했던 STA에게는 HE Operation element의 BSS Color subfield 값이고, 그 BSS의 HE Operation element를 수신하지 않은 STA에게는 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다.

【0206】도 14를 참조하면 BSS1에서 UL MU 동작이 일어날 수 있다. Trigger frame을 포함한 PPDU의 TXVECTOR parameter BSS_COLOR 값이 0으로 설정될 수 있고, 이는 intended recipient STAs 중에 이 PPDU를 전송하는 STA의 BSS의 member가 아닌 STA가 포함되었기 때문일 수 있다. 따라서 이 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR가 0임에도 불구하고 HE trigger-based PPDU를 보낼 때 TXVECTOR parameter BSS_COLOR를 BSS1의 BSS color 값으로 설정할 수 있다.

【0208】도 15는 본 발명의 일 실시예에 따른 Trigger frame의 User Info 필드 포맷을 나타낸 도면이다.

【0209】HE trigger-based PPDU를 전송하는 STA가 TXVECTOR parameter BSS_COLOR를 설정하기 위한 값이 필요할 수 있다. 본 발명의 일 실시예를 따르면 더 빠른 random access 접속을 위해 어떤 BSS로부터 RAPS element 수신 또는

Beacon frame 수신 또는 Probe Response frame 수신 전에 그 BSS의 AP가 보내는 Trigger frame에 대해 random access 시도를 할 수 있다. 예를 들면 Trigger frame은 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있고, unassociated STA가 이 Trigger frame을 활용해 random access를 시도하고 HE trigger-based PPDU를 전송할 수 있다. 이때 이 random access가 RAPS element 수신 또는 Beacon frame 수신 또는 Probe Response frame 수신 전에 일어날 수 있다. 예를 들면 default 값의 RAPS element 관련 parameter들을 사용할 수 있다.

【0210】 이때 도 14와 같은 HE trigger-based PPDU를 보낼 때 TXVECTOR parameter BSS_COLOR 설정을 하기 위한 값이 필요할 수 있다. 또는 HE trigger-based PPDU를 전송할 때 preceding Trigger frame이 non-HE PPDU로 전송된 경우 앞서 설명한 "HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR 셋팅" 방법에 따라 TXVECTOR parameter BSS_COLOR를 설정하기 귀한 값이 필요할 수 있다. 그러나 STA가 그 BSS로부터 HE Operation element를 수신한적이 없을 수 있다. 예를 들면 RAPS element 수신 또는 Beacon frame 수신 또는 Probe Response frame 수신 전에 random access가 일어날 수 있기 때문이다.

【0211】 이를 해결하기 위한 일 실시예로 Trigger frame은 BSS color 값을 포함할 수 있다. 그리고 Trigger frame에 응답하는 STA는 HE trigger-based PPDU를 보낼 때 TXVECTOR parameter BSS_COLOR를 설정하기 위해 Trigger frame이 포함하는 BSS color 값을 참조할 수 있다.

【0212】일 실시예로 Trigger frame의 Common Info 필드는 BSS color 값을 포함할 수 있다. 예를 들면 Common Info 필드가 항상 BSS Color subfield를 포함할 수 있다. 또다른 예로 Trigger frame의 Trigger dependent Common Info 필드가 BSS Color subfield를 포함할 수 있고, 이것은 Trigger frame이 특정 type으로 설정되었을 때일 수 있다. Trigger frame이 특정 type으로 설정되었다는 것은 도 7의 Trigger Type subfield로 지시할 수 있다. 그리고 이렇게 BSS Color subfield를 포함하는 Trigger frame의 type은 unassociated STA를 위한 User Info 필드를 포함하는 Trigger frame임을 나타내는 것일 수 있다. 또는 이렇게 BSS Color subfield를 포함하는 Trigger frame의 type은 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame임을 나타내는 것일 수 있다. 바꿔 말하면 Trigger frame이 어떤 type으로 설정되었을 때 Trigger Dependent Common Info는 BSS Color subfield를 포함할 수 있다. 예를 들면 이 type으로 설정되었을 때 Trigger frame은 unassociated STA를 위한 User Info 필드 혹은 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있다.

【0213】또다른 실시예로 Trigger frame의 User Info 필드는 BSS color 값을 포함할 수 있다. 도 15 (a)에 나타낸 User Info field format은 도 7에서 설명한 User Info 필드이다. 예를 들면 unassociated STA를 위한 User Info 필드는 BSS Color subfield를 포함할 수 있다. Unassociated STA를 위한 User Info 필드는 AID12 subfield를 통해 지시될 수 있다. 또한 unassociated STA를 위한 User Info

필드의 예로 unassociated STA를 위한 random access RU를 지시하는 User Info 필드가 있을 수 있다. 예를 들면 AID12 subfield가 2045일 때 User Info 필드가 BSS Color subfield를 포함할 수 있다.

【0214】 일 실시예로 unassociated STA를 위한 User Info 필드는 도 15 (a)의 필드 중 일부를 BSS color를 나타내는데에 사용할 수 있다. 이때 BSS color를 나타내기 위해 사용되는 부분이 원래 나타내던 값에 해당하는 parameter로는 약속된 고정값을 사용할 수 있다. 예를 들면 unassociated STA를 위한 User Info 필드는 도 15 (b)에 나타낸 것 같이 도 15 (a)의 SS Allocation subfield를 BSS Color subfield로 대치하여 사용할 수 있다. 이때 SS Allocation subfield가 나타내던 parameter 값으로는 고정값을 사용할 수 있다. 예를 들면 STARTING_SS_NUM과 NUM_SS는 모두 1일 수 있다.

【0215】 일 실시예로 unassociated STA를 위한 User Info 필드는 도 15 (a)에 BSS Color subfield를 추가할 수 있다. 이러한 경우 도 15 (a)와 같은 associated STA를 위한 User Info 필드의 길이와 본 실시예에 따른 unassociated STA를 위한 User Info 필드의 길이는 다를 것이다. 하지만 Trigger frame을 수신하는 STA는 하나 이상의 User Info 필드들 중에서 AID12 subfield가 자신의 AID의 12 LSBs 값과 일치하는 것이 나올 때까지 AID12 subfield를 계속 확인할 것이므로 User Info 필드의 길이가 다르더라도 다음 User Info 필드를 바르게 찾을 수 있다. 또한 random access를 시도하는 STA라도 AID12 subfield를 통해 random access RU를 확인하므로 다음 User Info 필드를 바르게 찾을 수 있다.

【0216】Trigger frame의 unassociated STA를 위한 User Info 필드가 BSS color 값을 포함하는 실시예에서 STA가 HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR 설정에 대해 설명하겠다.

【0217】본 발명의 일 실시예를 따르면 associated STA는 HE Operation element의 BSS Color subfield 값으로 설정하고, unassociated STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하다. 또는 그 BSS로부터 HE Operation element를 수신했던 STA는 BSS Color subfield 값으로 설정하고, HE Operation element를 수신하지 못한 STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하다. 일 실시예로 이런 설정은 preceding Trigger frame이 BSS Color를 포함하지 않는 PPDU, 예를 들면 non-HE PPDU로 전송되었을 때로 한정하고, HE PPDU로 전송되었을 때는 preceding Trigger frame을 포함하는 PPDU의 RXVECTOR parameter BSS_COLOR 값으로 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 설정하는 것이 가능하다.

【0218】또는 도 14와 같은 동작을 위해 preceding Trigger frame을 포함한 PPDU format에 상관없이 associated STA는 HE Operation element의 BSS Color subfield 값으로 설정하고, unassociated STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하고, 또는 그 BSS로부터 HE Operation element를 수신했던 STA는 BSS Color subfield 값으로 설정하고, HE Operation element를 수신하지 못한 STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하다.

【0220】 * Partial BSS color

【0221】 VHT PPDU는 preamble에 Group ID field와 Partial AID field를 포함할 수 있다. 그리고 partial AID는 STA identifier일 수 있고, TXVECTOR parameter PARTIAL_AID를 통해 전달될 수 있고, VHT SU PPDU의 경우에 존재할 수 있다. 또한 partial AID는 9 bits로 나타내어질 수 있다. 또한 group ID는 TXVECTOR parameter GROUP_ID를 통해 전달될 수 있고, VHT SU PPDU를 보낼 때는 0 또는 63으로 설정될 수 있다.

【0223】 도 16은 본 발명의 일 실시예에 따른 VHT SU PPDU의 TXVECTOR parameters GROUP_ID와 PARTIAL_AID 설정 방법을 나타낸 도면이다.

【0224】 Condition(1st column)에 따른 GROUP_ID(2nd column)와 PARTIAL_AID(3rd column) 설정을 나타내고 있다. 여기서 BSSID[b:c]와 RA[b:c]는 각각 BSSID와 RA의 bits b to c를 나타낼 수 있고, bit 0은 Individual/Group bit를 나타내고 bit 47은 the last transmitted bit를 나타낼 수 있고, 또한 bit position b는 2^0으로 scale되고, bit position c는 2^(c-b)로 scale될 수 있다. AP는 PARTIAL_AID가 0이 나오도록 AID를 할당하지 않을 수 있다.

【0225】 또한 레거시 PPDU에 대해서도 preamble에서 intra-BSS, inter-BSS 판단을 하기 위해서 특별한 AID 할당 방법을 사용할 수 있다. 따라서 도 16의

PARTIAL_AID 혹은 PARTIAL_AID의 일부가 BSS의 identifier가 되도록 만들 수 있다. 예를 들면 AID의 bit 5부터 bit 8까지를 특정한 방법으로 할당할 수 있고, 그 예는 다음과 같다.

【0226】 AID[5:8] = bin[(BCB[0:3] - (BSSID[44:47] XOR BSSID[40:43])) mod 2^4,4]

【0227】 여기서 BCB[0:3]은 BSS의 partial BSS color를 나타낼 수 있다. 예를 들면 BSS color의 4 LSBs일 수 있다. 또한 bin[x, 4]는 decimal value x를 4비트의 binary vector로 나타낸 값일 수 있다. 또한 이러한 할당 방법은 Partial BSS Color field를 1로 셋팅했을 때 사용하는 것도 가능하다.

【0228】 그리고 도 10에서 설명한 것 같은 intra-BSS, inter-BSS 판단 방법을 사용하는 것이 가능하다. 특별한 AID 할당 방법을 사용함으로 인해 앞서 설명한 intra-BSS 조건과 inter-BSS 조건 중 GROUP_ID가 63일 때의 조건으로 판단하는 것이 가능해진다.

【0229】 그런데 도 16의 Otherwise로 설정되는 경우가 있기 때문에 GROUP_ID가 63이더라도 PARTIAL_AID가 BSS identifier로서의 역할을 하지 못하는 경우가 발생한다.

【0231】 도 17은 본 발명의 일 실시예에 따른 채널 유휴 상태 판단을 나타낸 도면이다.

【0232】도 17에서 BSS1의 AP가 VHT PPDU를 전송할 수 있다. 또한 BSS1의 partial BSS color는 0이 아닌 값일 수 있다. 이때 이 AP가 도 16의 Otherwise 케이스에 해당하게 VHT PPDU를 전송할 수 있다. 예를 들면 association 되어 있지 않은 STA가 수신하도록 VHT PPDU를 전송할 수 있다. 이 경우 이 VHT PPDU를 BSS1의 STA가 수신한 경우 앞서 설명한 inter-BSS 조건과 같이 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같지 않기 때문에 이 PPDU를 inter-BSS로 판단할 수 있다. 그러므로 OBSS PD-based SR 동작을 수행하는 것이 가능한데, 이 PPDU는 실제로는 intra-BSS AP가 전송한 것이기 때문에 이 PPDU를 방해하는 것이 바람직하지 않을 수 있고, 이 PPDU 동안 전송하더라도 AP가 PPDU 전송 중이기 때문에 전송한 PPDU를 AP가 수신할 수 없다. 따라서 이를 해결하기 위한 방법이 필요하다.

【0233】본 발명의 일 실시예를 따르면 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같지 않으면 그 PPDU를 inter-BSS에서 온 것으로 판단할 수 있다. 다시 말하면 STA는 수신한 VHT PPDU의 RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같지 않으면 그 PPDU를 inter-BSS에서 온 것으로 판단할 수 있다. 일 실시예로 이러한 판단 방법은 STA가 속한 BSS에서 수신한 가장 최근 HE Operation element의 Partial BSS Color field가 partial BSS color를 사

용해도 됨을 지시하고 있을 때(예를 들면 1로 셋팅되어 있을 때) 수행하는 것이 가능하다.

【0234】 또다른 문제로 partial BSS color가 0인 BSS1이 있을 수 있고, BSS1이 아닌 다른 BSS에서 도 16의 Otherwise 케이스에 해당하게 VHT PPDU를 전송할 수 있다. 예를 들면 BSS1이 아닌 다른 BSS에서 BSS1이 아닌 다른 BSS에 association 되어 있지 않은 STA가 수신하도록 VHT PPDU를 전송할 수 있다. 예를 들면 BSS color가 b110000 (decimal value 48), b010000 (decimal value 16)인 경우 등에서 partial BSS color가 0일 수 있다. 이 경우 BSS1의 STA가 이 VHT PPDU를 수신한 경우 앞서 설명한 intra-BSS 조건과 같이 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같기 때문에 이 PPDU를 intra-BSS로 판단할 수 있다. 판단 자체를 잘못하는 것도 문제이고 이에 따른 단점이 있을 수도 있다. 실제로는 OBSS PD-based SR 동작을 하는 것이 가능했던 PPDU에 대해 해당 동작을 못할 수도 있다. 따라서 이를 해결할 필요가 있다.

【0235】 본 발명의 일 실시예를 따르면 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같으면 그 PPDU를 intra-BSS에서 온 것으로 판단할 수 있다. 다시 말하면 STA는 수신한 VHT PPDU의 RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가

속한 BSS의 partial BSS color와 같으면 그 PPDU를 intra-BSS에서 온 것으로 판단할 수 있다. 일 실시예로 이러한 판단 방법은 STA가 속한 BSS에서 수신한 가장 최근 HE Operation element의 Partial BSS Color field가 partial BSS color를 사용해도 됨을 지시하고 있을 때(예를 들면 1로 셋팅되어 있을 때) 수행하는 것이 가능하다.

【0237】* TXOP_DURATION

【0238】STA는 HE preamble에 duration information을 포함시킬 수 있다. STA는 HE preamble에 TXOP Duration field를 포함할 수 있다. 따라서 TXOP Duration field를 포함하는 PPDU를 수신하는 STA는 여기서 얻는 duration information을 기반으로 NAV를 셋팅하는 것이 가능하다. 또한 TXOP Duration field의 값은 TXVECTOR parameter TXOP_DURATION 또는 RXVECTOR parameter TXOP_DURATION 등을 통해 전달될 수 있다. 또한 TXOP Duration field를 특정값으로 설정함으로써 TXOP Duration field가 duration information을 나타내지 않는다는 것을 나타낼 수 있다. 예를 들면 TXOP Duration field가 모두 1로 셋팅되는 것은 TXOP Duration field가 duration information을 나타내지 않는 것일 수 있다. TXOP Duration field는 7 bits로 구성될 수 있다. 따라서 MAC header의 Duration/ID field가 나타내는 duration information보다 resolution이 낮을 수 있다. 따라서 STA는 TXOP Duration field가 duration information을 나타내지 않게 함으로써 PPDU를 수신하는 STA가 MAC header의 Duration/ID field의 duration information을

사용하도록 유도할 수 있다.

【0239】또한 PS-Poll frame을 포함하는 PPDU를 전송할 때 STA는 TXOP Duration field는 duration information을 나타내지 않을 수 있다. 이것은 이 STA가 TXOP responder아 아닐 때일 수 있다.

【0240】또한 TXOP responder는 soliciting PPDU의 TXOP Duration field가 duration information을 나타내고 있지 않으면 전송하는 PPDU의 TXOP Duration field를 duration information을 나타내지 않도록 설정할 수 있다.

【0241】또한 TXOP responder는 soliciting PPDU의 TXOP Duration field가 duration information을 나타내지 않지 않으면 전송하는 PPDU의 TXOP Duration field를 duration information을 나타내지 않지 않도록 설정할 수 있다.

【0242】또한 TXOP responder는 soliciting PPDU가 TXOP Duration field를 포함하고 있지 않으면, 예를 들면 soliciting PPDU가 HE PPDU가 아니면 전송하는 PPDU의 TXOP Duration field를 duration information을 나타내지 않지 않도록 설정할 수 있다.

【0243】또한 AP는 BSS에 속한 STA들이 BSS color를 사용하지 않도록 지시할 수 있다. 예를 들면 BSS Color field 비트 수의 제한 때문에 inter-BSS와 같은 BSS color를 사용하는 경우가 발생할 수 있다. 그리고 이를 발견한 AP는 BSS color를 사용하지 않도록 지시할 수 있다. 이 지시는 HE Operation element의 BSS Color Disabled subfield를 이용해서 할 수 있다. 또한 NAV를 설정할 때 MAC header의 정

보를 이용할 수 있도록 할 수 있다. 예를 들면 BSS Colo Disabled를 BSS color를 사용하지 않도록 지시한 AP는 TXVECTOR parameter TXOP_DURATION을 duration information이 없는 것을 나타내는 값으로 설정할 수 있다.

【0244】 그러나 HE trigger-based PPDU의 TXOP Duration field가 duration information을 갖고 있지 않으면 이 PPDU를 수신하는 intended recipient가 아닌 STA는 이 PPDU 또는 이 PPDU가 포함한 frame으로부터 Duration information을 얻을 수 없다. HE trigger-based PPDU가 포함한 frame을 제대로 수신할 수 없기 때문이다.

【0246】 도 18은 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면이다.

【0247】 도 18을 참조하면 BSS1의 AP가 보내는 HE PPDU의 TXOP Duration field를 duration information이 없음을 나타내는 값으로 설정할 수 있다. 예를 들면 수신자가 MAC header의 duration information을 이용하도록 유도하는 것일 수 있다. 예를 들면 이 AP가 BSS Color Disabled를 BSS color를 사용하지 않도록 지시했기 때문일 수도 있다. 이 PPDU를 수신하는 STA1은 TXOP Duration field로부터 duration information을 얻지 못한다. STA1은 BSS1의 STA일 수도 있고 BSS1과 다른 BSS의 STA일 수도 있다. 하지만 이 HE PPDU는 HE SU PPDU 또는 HE extended range SU PPDU 또는 HE MU PPDU이므로 STA1이 이 PPDU 수신을 unsupported 하지 않는다면 PPDU가 포함하고 있는 frame을 수신할 수 있다. 따라서 frame으로부터 duration

information을 얻는 것이 가능하다.

【0248】또한 이러한 PPDU에 응답하는 STA는 soliciting PPDU의 TXOP Duration field가 duration information을 나타내고 있지 않으므로 앞서 설명한 룰에 따라 보내는 PPDU(도면에서 2번째 PPDU)의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내고 있지 않는 값으로 설정하게 된다. 이 HE trigger-based PPDU를 수신하는 STA1은 TXOP Duration field로부터 duration information을 얻지 못한다. 그러나 STA1은 이 HE trigger-based PPDU가 포함하는 frame을 수신할 수 없으므로 duration information을 이 PPDU로부터 전혀 얻지 못하게 된다. 따라서 이 BSS1의 TXOP을 적절히 보호하지 못할 가능성이 있다. STA1이도 18의 첫번째 PPDU를 수신하지 못한 경우, 두번째 PPDU가 끝났을 때 NAV 설정이 되어 있지 않을 수 있고, 그러면 BSS1의 TXOP 안에서 이어지는 시퀀스를 보호하지 못할 수 있다.

【0249】이 문제를 해결하기 위해 HE trigger-based PPDU의 TXOP Duration field는 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다. 예를 들어 HE trigger-based PPDU를 보내는 TXOP responder는 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다. HE trigger-based PPDU를 보내는 TXOP responder는 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내는 값으로 설정할 수 있다. 특히 HE trigger-based PPDU를 보내는 TXOP responder는 soliciting PPDU의 RXVECTOR parameter TXOP_DURATION이 duration information을 나타내지 않는 값으로 설정되

었더라도 HE trigger-based PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다.

【0250】 HE trigger-based PPDU를 보내는 TXOP responder는 soliciting PPDU의 RXVECTOR parameter TXOP_DURATION이 duration information을 나타내고 있든지, 나타내고 있지 않든지 그 HE trigger-based PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다. 다시 말하면 TXOP_DURATION이 duration information을 나타내고 있든지, 나타내고 있지 않든지 그 HE trigger-based PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내는 값으로 설정할 수 있다.

【0251】 또한 HE SU PPDU 또는 HE extended range SU PPDU를 보내는 TXOP responder는 soliciting PPDU의 RXVECTOR parameter TXOP_DURATION이 duration information을 나타내지 않는 값으로 설정되어 있을 때 그 보내는 PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정할 수 있다.

【0253】 도 19는 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면이다.

【0254】 도 19를 참조하면 BSS1의 AP가 보내는 HE PPDU의 TXOP Duration field를 duration information이 없음을 나타내는 값으로 설정할 수 있다. 예를 들

면 수신자가 MAC header의 duration information을 이용하도록 유도하는 것일 수 있다. 예를 들면 이 AP가 BSS Color Disabled를 BSS color를 사용하지 않도록 지시했기 때문일 수도 있다. 이 PPDU를 수신하는 STA1은 TXOP Duration field로부터 duration information을 얻지 못한다. STA1은 BSS1의 STA일 수도 있고 BSS1과 다른 BSS의 STA일 수도 있다. 하지만 이 HE PPDU는 HE SU PPDU 또는 HE extended range SU PPDU 또는 HE MU PPDU이므로 STA1이 이 PPDU 수신을 unsupported 하지 않는다면 PPDU가 포함하고 있는 frame을 수신할 수 있다. 따라서 frame으로부터 duration information을 얻는 것이 가능하다.

【0255】또한 도 19에서 HE trigger-based PPDU로 응답하는 STA는 TXOP Duration field를 duration information을 나타내어 보냈다. 따라서 이를 수신하는 STA1은 수신한 HE trigger-based PPDU의 RXVECTOR parameter TXOP_DURATION으로부터 얻은 duration information으로 NAV를 설정할 수 있다. 따라서 BSS1의 TXOP을 보호할 수 있게 된다. 이 HE trigger-based PPDU의 바로 앞 PPDU(도 19에서 첫번째 PPDU)를 수신하는 못하는 경우에도 HE trigger-based PPDU를 수신함으로써 BSS1의 TXOP을 보호하게 된다. 최소한 도 18의 경우보다는 BSS1의 TXOP을 보호할 수 있다. BSS1과 STA1이 속한 BSS가 BSS color collision이 발생한 경우라도 STA1은 intra-BSS NAV를 설정하게 되고, 도 18과 같이 NAV를 전혀 설정하지 못하는 케이스보다 TXOP을 보호할 수 있게 된다.

【0257】 상기와 같이 무선랜 통신을 예로 들어 본 발명을 설명하였지만, 본 발명은 이에 한정하지 않으며 셀룰러 통신 등 다른 통신 시스템에서도 동일하게 적용될 수 있다. 또한 본 발명의 방법, 장치 및 시스템은 특정 실시예와 관련하여 설명되었지만, 본 발명의 구성 요소, 동작의 일부 또는 전부는 범용 하드웨어 아키텍쳐를 갖는 컴퓨터 시스템을 사용하여 구현될 수 있다.

【0258】 전술한 본 발명의 설명은 예시를 위한 것이며, 본 발명이 속하는 기술분야의 통상의 지식을 가진 자는 본 발명의 기술적 사상이나 필수적인 특징을 변경하지 않고서 다른 구체적인 형태로 쉽게 변형이 가능하다는 것을 이해할 수 있을 것이다. 그러므로 이상에서 기술한 실시예들은 모든 면에서 예시적인 것이며 한정적인 것이 아는 것으로 해석해야 한다. 예를 들어, 단일형으로 설명되어 있는 각 구성 요소는 분산되어 실시될 수도 있으며, 마찬가지로 분산된 것으로 설명되어 있는 구성 요소들도 결합된 형태로 실시될 수 있다.

【0259】 본 발명의 범위는 상기 상세한 설명보다는 후술하는 특허청구범위에 의하여 나타내어지며, 특허청구범위의 의미 및 범위 그리고 그 균등 개념으로부터 도출되는 모든 변경 또는 변형된 형태가 본 발명의 범위에 포함되는 것으로 해석되어야 한다.

## 【특허청구범위】

### 【청구항 1】

무선랜을 위한 방법, 장치 및 시스템.

제출 일자 : 2017-04-14

# 【요약서】

## 【요약】

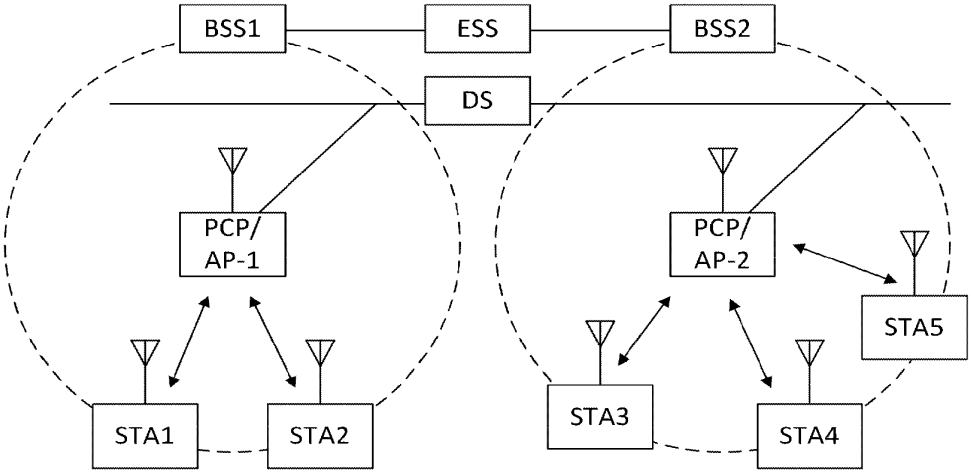
무선랜을 위한 장치, 시스템 및 무선랜 통신 방법이 게시 된다. 본 발명의 실시 예에 따르면 효율적인 BSS 판단과 NAV 설정을 위한 방법, 장치 및 시스템이 제공될 수 있다.

## 【대표도】

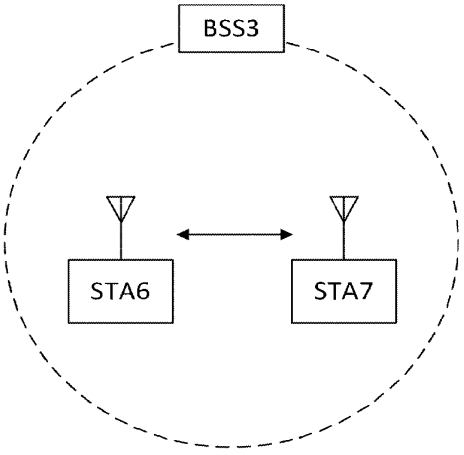
도 13

【도면】

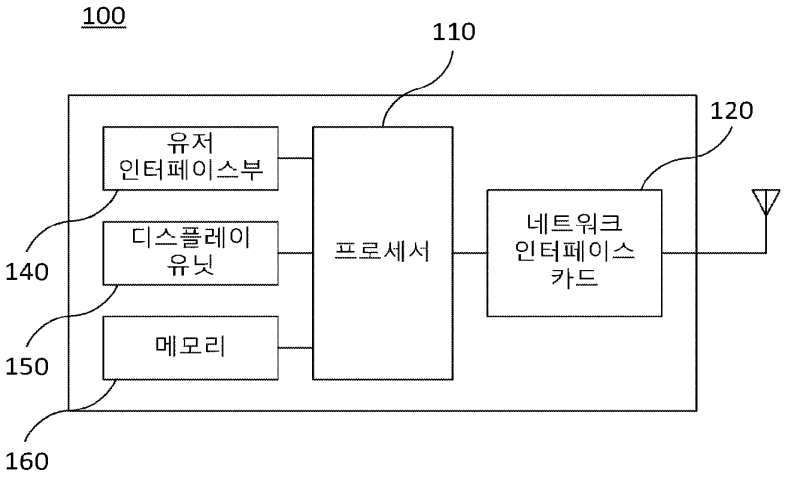
【도 1】


BSS1
ESS
BSS2
DS
PCP/
AP-1
PCP/
AP-2
STA5
STA1
STA2
STA3
STA4

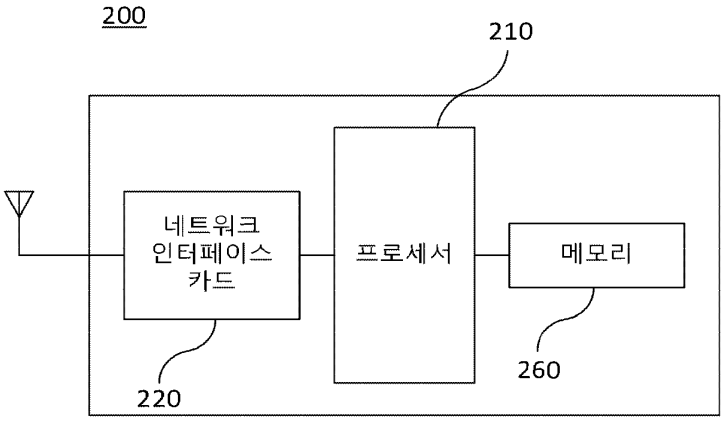
【도 2】


BSS3
STA6
STA7

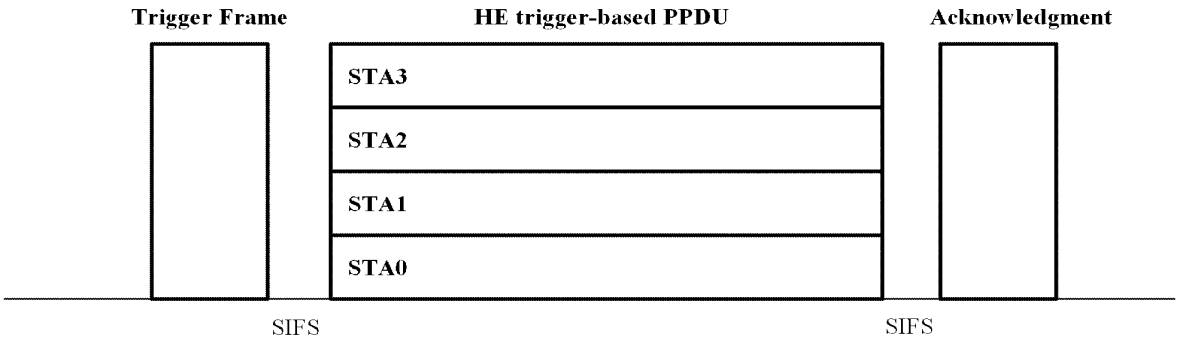
【도 3】


100
110
120
유저
인터페이스부
디스플레이
유닛
메모리
프로세서
네트워크
인터페이스
카드
140
150
160

【도 4】


200
210
네트워크
인터페이스
카드
프로세서
메모리
220
260

【도 5】




【도 6】

| | Frame Control | Duration | RA | TA | Common Info | User Info | ... | User Info | Padding | FCS |
|---|---|---|---|---|---|---|---|---|---|---|
| Octets: | 2 | 2 | 6 | 6 | 8 or more | 5 or more | | 5 or more | variable | 4 |

【도 7】

(a) Common Info

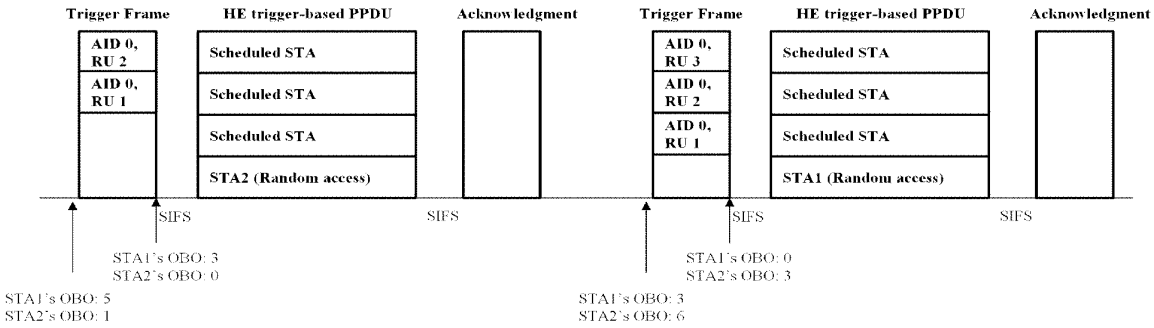
| | B0 B3 | B4 B15 | B16 | B17 | B18 B19 | B20 B21 | B22 | B23 B25 | B26 |
|---|---|---|---|---|---|---|---|---|---|
| | Trigger Type | Length | Cascade Indication | CS Required | BW | GI and LTF Type | MU-MIMO LTF Mode | Number of HE-LTF Symbols | STBC |
| Bits: | 4 | 12 | 1 | 1 | 2 | 2 | 1 | 3 | 1 |

| | B27 | B28 B33 | B34 B36 | B37 B52 | B53 | B54 B62 | B63 | |
|---|---|---|---|---|---|---|---|---|
| | LDPC Extra Symbol | AP TX Power | Packet Extension | Spatial Reuse | Doppler | HE-SIG-A Reserved | Reserved | Trigger Dependent Common Info |
| Bits: | 1 | 6 | 3 | 16 | 1 | 9 | 1 | variable |

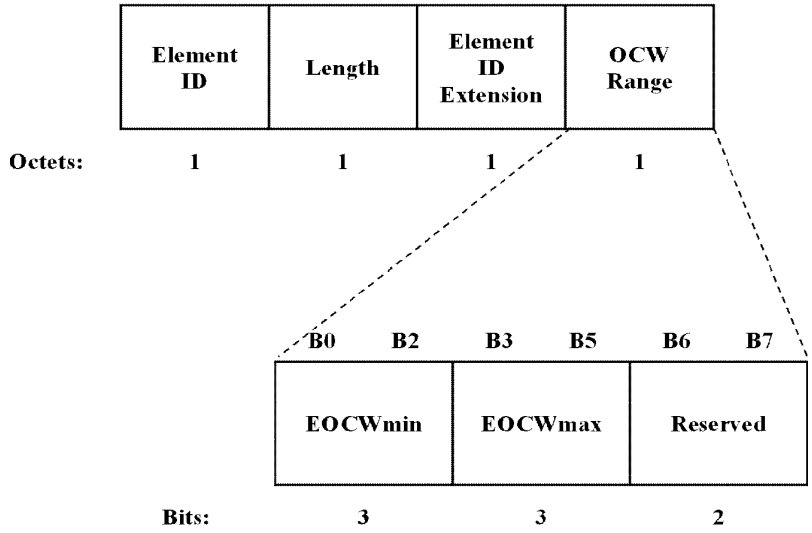
(b) User Info

| | B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|---|
| | AID12 | RU Allocation | Coding Type | MCS | DCM | SS Allocation | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: | 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

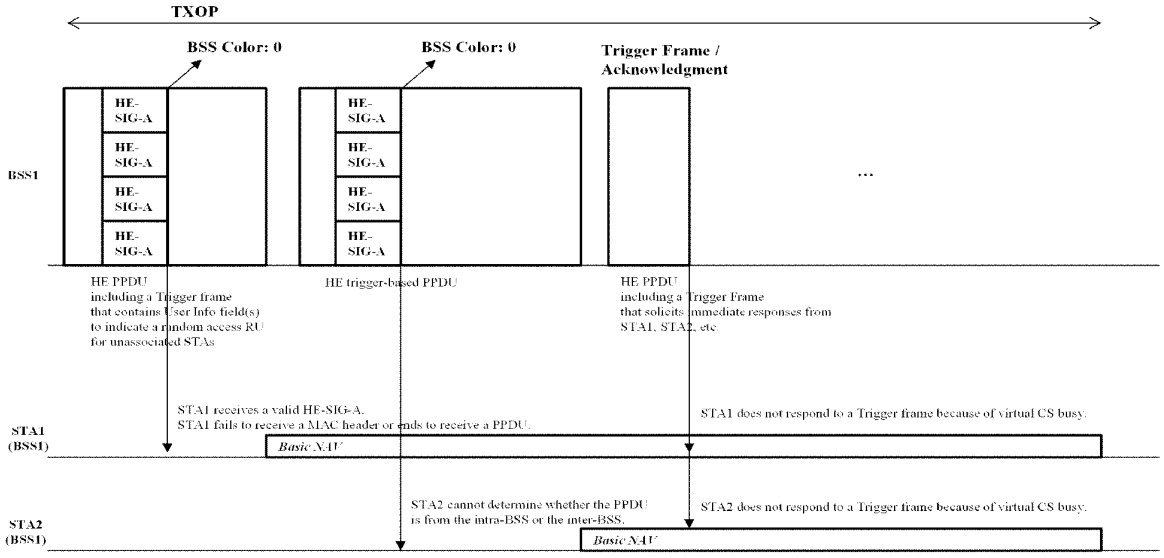
【도 8】


Trigger Frame
HE trigger-based PPDU
Acknowledgment
AID 0, RU 2
AID 0, RU 1
Scheduled STA
Scheduled STA
Scheduled STA
STA2 (Random access)
SIFS
SIFS
STA1's OBO: 3
STA2's OBO: 0
STA1's OBO: 5
STA2's OBO: 1
Trigger Frame
HE trigger-based PPDU
Acknowledgment
AID 0, RU 3
AID 0, RU 2
AID 0, RU 1
Scheduled STA
Scheduled STA
Scheduled STA
STA1 (Random access)
SIFS
SIFS
STA1's OBO: 0
STA2's OBO: 3
STA1's OBO: 3
STA2's OBO: 6

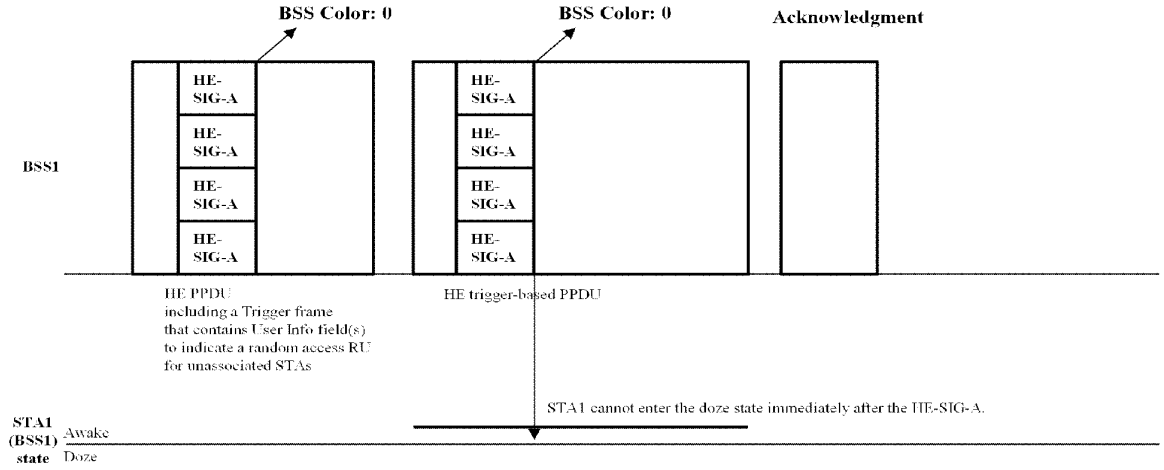
【도 9】


Element ID
Length
Element ID Extension
OCW Range
Octets:
1
1
1
1
B0
B2
B3
B5
B6
B7
EOCWmin
EOCWmax
Reserved
Bits:
3
3
2

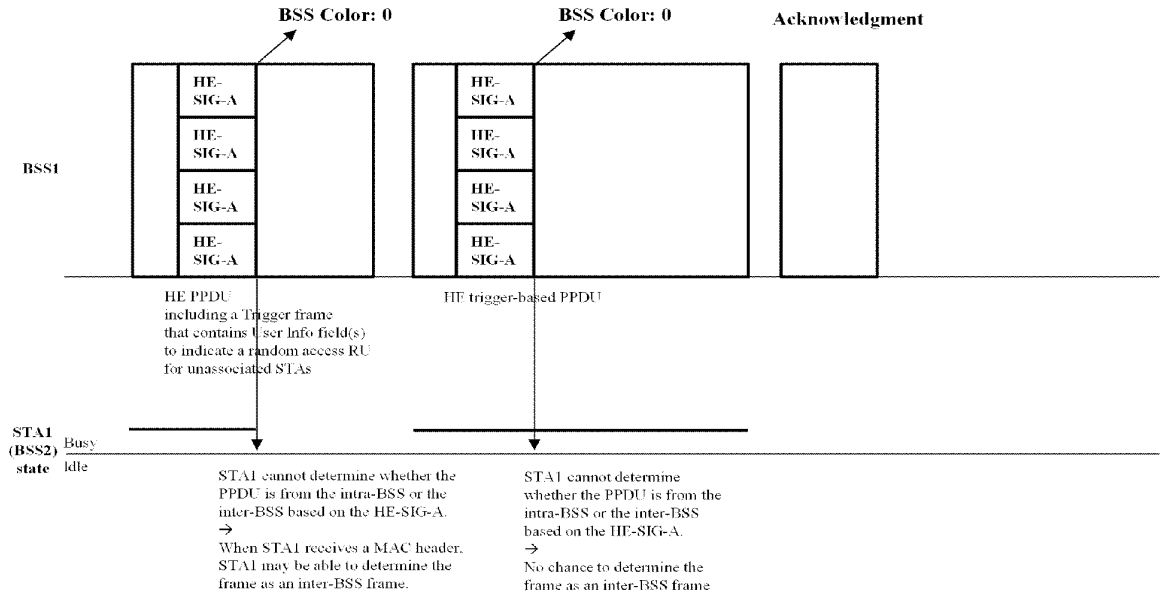
【도 10】


TXOP
BSS Color: 0
BSS Color: 0
Trigger Frame / Acknowledgment
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
...
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
HE PPDU including a Trigger Frame that solicits immediate responses from STA1, STA2, etc.
STA1 receives a valid HE-SIG-A.
STA1 fails to receive a MAC header or ends to receive a PPDU.
STA1 does not respond to a Trigger frame because of virtual CS busy.
STA1 (BSS1)
Basic NAV
STA2 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS.
STA2 does not respond to a Trigger frame because of virtual CS busy.
STA2 (BSS1)
Basic NAV

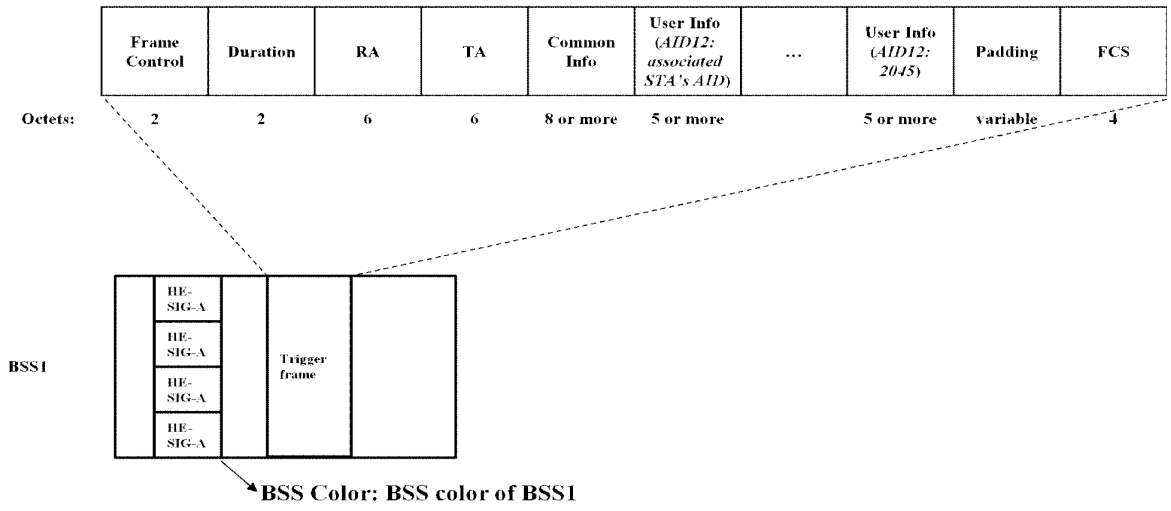
【도 11】


BSS Color: 0
BSS Color: 0
Acknowledgment
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
STA1 cannot enter the doze state immediately after the HE-SIG-A.
STA1 (BSS1) state
Awake
Doze

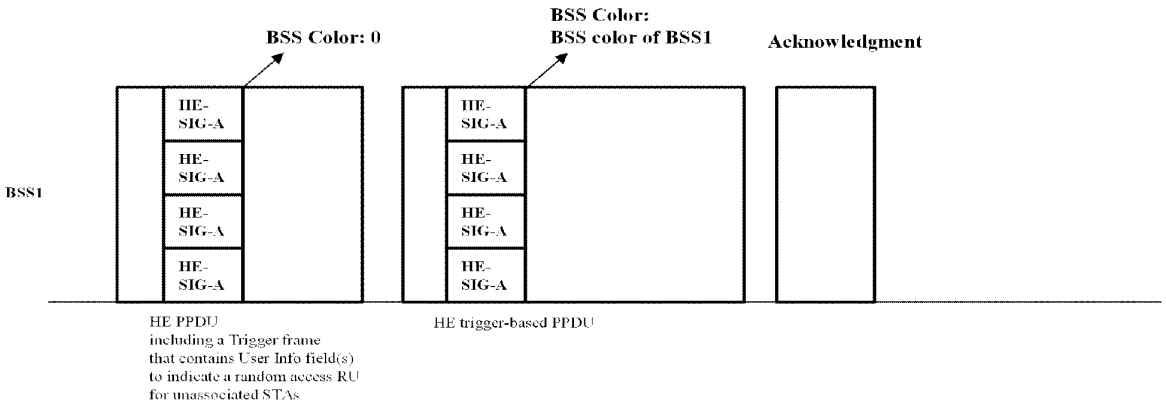
【도 12】


BSS Color: 0
BSS Color: 0
Acknowledgment
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
STA1 (BSS2) state
Busy
Idle
STA1 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS based on the HE-SIG-A.
→
When STA1 receives a MAC header, STA1 may be able to determine the frame as an inter-BSS frame.
STA1 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS based on the HE-SIG-A.
→
No chance to determine the frame as an inter-BSS frame

【도 13】


Frame Control
Duration
RA
TA
Common Info
User Info (AID12: associated STA's AID)
...
User Info (AID12: 2045)
Padding
FCS
Octets:
2
2
6
6
8 or more
5 or more
5 or more
variable
4
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
Trigger frame
BSS Color: BSS color of BSS1

【도 14】




【도 15】

**(a) User Info for the associated STA(s)**

| | B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|---|
| | AID12 | RU Allocation | Coding Type | MCS | DCM | SS Allocation | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: | 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

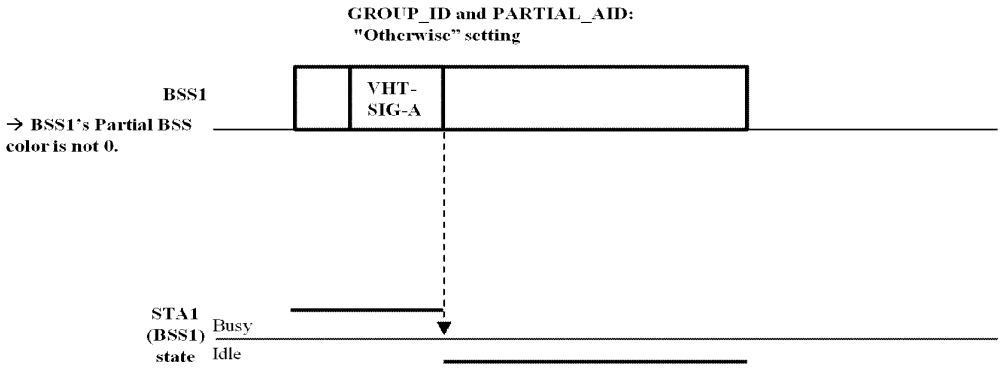
**(b) User Info not for the associated STA(s)**

| | B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|---|
| | AID12 | RU Allocation | Coding Type | MCS | DCM | BSS Color | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: | 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

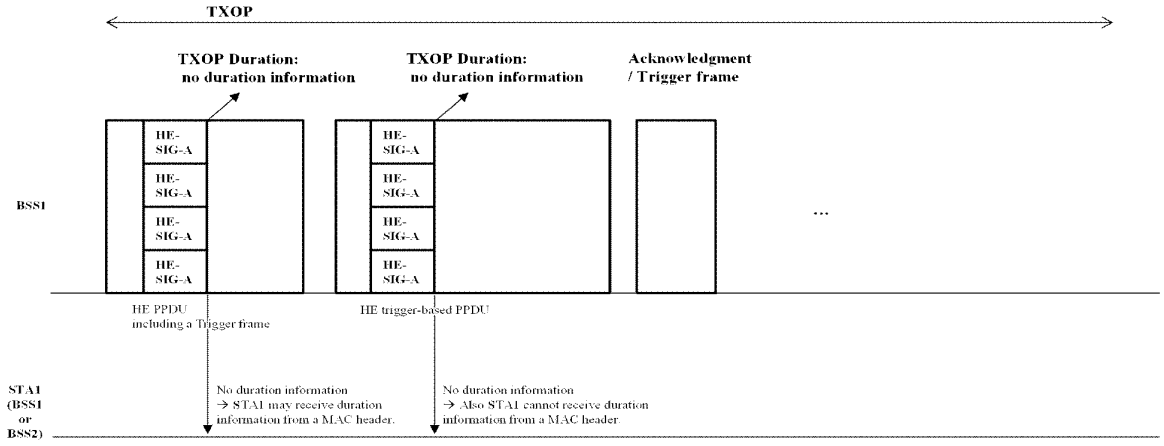
【도 16】

| Condition | GROUP_ID | PARTIAL_AID |
|---|---|---|
| Addressed to AP | 0 | BSSID[39:47] |
| Addressed to Mesh STA | 0 | RA[39:47] |
| Sent by an AP and addressed to a STA associated with that AP<br>or<br>Sent by a DLS or TDLS STA in a direct path t o a DLS or TDLS peer STA | 63 | (AID + (BSSID[44:47] XOR BSSID[40:43] * 2^5) mod 2^9 |
| Otherwise (see NOTE) | 63 | 0 |
| NOTE The last row covers the following cases:<br>- A PPDU sent to an IBSS STA<br>- A PPDU sent by an AP to a non associated STA<br>- Any other condition not explicitly listed elsewhere in the table | | |

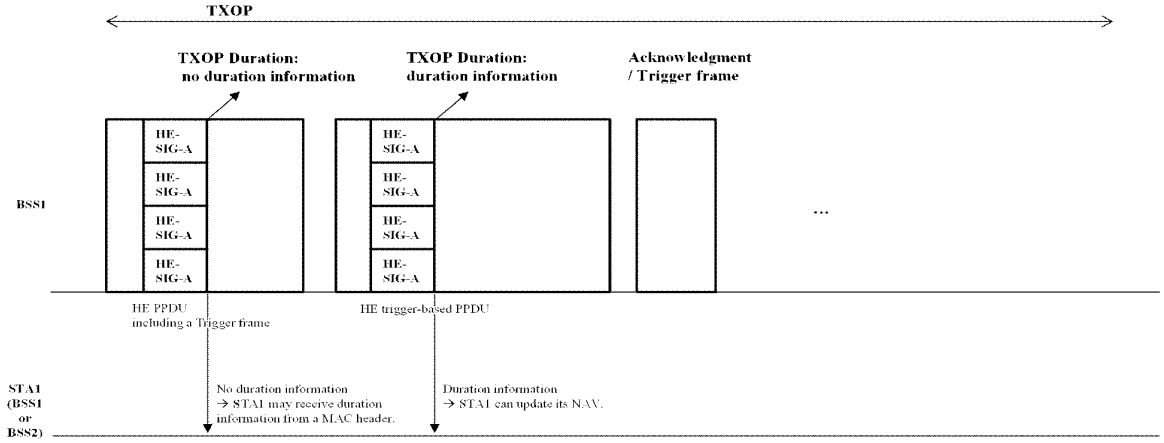
【도 17】



【도 18】


TXOP
TXOP Duration:
no duration information
TXOP Duration:
no duration information
Acknowledgment
/ Trigger frame
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
...
HE PPDU
including a Trigger frame
HE trigger-based PPDU
STA1
(BSS1
or
BSS2)
No duration information
→ STA1 may receive duration
information from a MAC header.
No duration information
→ Also STA1 cannot receive duration
information from a MAC header.

【도 19】


TXOP
TXOP Duration:
no duration information
TXOP Duration:
duration information
Acknowledgment
/ Trigger frame
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
...
HE PPDU
including a Trigger frame
HE trigger-based PPDU
STA1
(BSS1
or
BSS2)
No duration information
→ STA1 may receive duration
information from a MAC header.
Duration information
→ STA1 can update its NAV.

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Applicant(s) WILUS Institute of Standards and Technology Inc.

2022년 02월 17일

특 허 청
COMMISSIONER

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# 【서지사항】

【서류명】 특허출원서

【참조번호】 WILP170120KR

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【포괄위임등록번호】 2014-036557-3

【발명의 국문명칭】 효율적인 BSS 판단과 NAV 설정을 위한 방법, 장치 및 시스템

【발명의 영문명칭】 METHOD, APPARATUS, AND SYSTEM FOR EFFICIENT BSS DETERMINATION AND NAV SETTING

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【출원언어】 국어

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【수수료】

| | | | |
|---|---|---|---|
| 【출원료】 | 0 | 면 | 46,000 원 |
| 【가산출원료】 | 95 | 면 | 0 원 |
| 【우선권주장료】 | 0 | 건 | 0 원 |
| 【심사청구료】 | 0 | 항 | 0 원 |

【합계】 46,000 원

【감면사유】 소기업(70%감면)[1]

【감면후 수수료】 13,800 원

제출 일자 : 2017-05-02

# 【발명의 설명】

## 【발명의 명칭】

효율적인 BSS 판단과 NAV 설정을 위한 방법, 장치 및 시스템{METHOD, APPARATUS, AND SYSTEM FOR EFFICIENT BSS DETERMINATION AND NAV SETTING}

## 【기술분야】

【0001】 본 발명은 BSS 판단과 NAV 설정을 위한 방법으로서, 더욱 상세하게는 무선랜에서 BSS 판단과 NAV 설정을 효율적으로 하여 바람직한 MAC 동작을 하기 위한 다양한 방법, 장치 및 시스템에 관한 것이다.

## 【발명의 배경이 되는 기술】

【0002】 최근 모바일 기기의 보급이 확대됨에 따라 이들에게 빠른 무선 인터넷 서비스를 제공할 수 있는 무선랜(Wireless LAN) 기술이 많은 각광을 받고 있다. 무선랜 기술은 근거리에서 무선 통신 기술을 바탕으로 스마트 폰, 스마트 패드, 랩탑 컴퓨터, 휴대형 멀티미디어 플레이어, 임베디드 기기 등과 같은 모바일 기기들을 가정이나 기업 또는 특정 서비스 제공지역에서 무선으로 인터넷에 접속할 수 있도록 하는 기술이다.

【0003】 IEEE(Institute of Electrical and Electronics Engineers) 802.11은 2.4GHz 주파수를 이용한 초기의 무선랜 기술을 지원한 이래, 다양한 기술의 표준을 실용화 또는 개발 중에 있다. 먼저, IEEE 802.11b는 2.4GHz 밴드의 주파수를 사용하면서 최고 11Mbps의 통신 속도를 지원한다. IEEE 802.11b 이후에 상용화된

IEEE 802.11a는 2.4GHz 밴드가 아닌 5GHz 밴드의 주파수를 사용함으로써 상당히 혼잡한 2.4GHz 밴드의 주파수에 비해 간섭에 대한 영향을 줄였으며, OFDM 기술을 사용하여 통신 속도를 최대 54Mbps까지 향상시켰다. 그러나 IEEE 802.11a는 IEEE 802.11b에 비해 통신 거리가 짧은 단점이 있다. 그리고 IEEE 802.11g는 IEEE 802.11b와 마찬가지로 2.4GHz 밴드의 주파수를 사용하여 최대 54Mbps의 통신속도를 구현하며, 하위 호환성(backward compatibility)을 만족하고 있어 상당한 주목을 받았는데, 통신 거리에 있어서도 IEEE 802.11a보다 우위에 있다.

【0004】 그리고 무선랜에서 취약점으로 지적되어온 통신 속도에 대한 한계를 극복하기 위하여 제정된 기술 규격으로서 IEEE 802.11n이 있다. IEEE 802.11n은 네트워크의 속도와 신뢰성을 증가시키고, 무선 네트워크의 운영 거리를 확장하는데 목적을 두고 있다. 보다 구체적으로, IEEE 802.11n에서는 데이터 처리 속도가 최대 540Mbps 이상인 고처리율(High Throughput, HT)을 지원하며, 또한 전송 에러를 최소화하고 데이터 속도를 최적화하기 위해 송신부와 수신부 양단 모두에 다중 안테나를 사용하는 MIMO(Multiple Inputs and Multiple Outputs) 기술에 기반을 두고 있다. 또한, 이 규격은 데이터 신뢰성을 높이기 위해 중복되는 사본을 여러 개 전송하는 코딩 방식을 사용할 수 있다.

【0005】 무선랜의 보급이 활성화되고 또한 이를 이용한 어플리케이션이 다양화됨에 따라, IEEE 802.11n이 지원하는 데이터 처리 속도보다 더 높은 처리율(Very High Throughput, VHT)을 지원하기 위한 새로운 무선랜 시스템에 대한 필요성이 대두되었다. 이 중 IEEE 802.11ac는 5GHz 주파수에서 넓은 대역폭(80MHz~160MHz)을

지원한다. IEEE 802.11ac 표준은 5GHz 대역에서만 정의되어 있으나 기존 2.4GHz 대역 제품들과의 하위 호환성을 위해 초기 11ac 칩셋들은 2.4GHz 대역에서의 동작도 지원할 것이다. 이론적으로, 이 규격에 따르면 다중 스테이션의 무선랜 속도는 최소 1Gbps, 최대 단일 링크 속도는 최소 500Mbps까지 가능하게 된다. 이는 더 넓은 무선 주파수 대역폭(최대 160MHz), 더 많은 MIMO 공간적 스트림(최대 8개), 다중 사용자 MIMO, 그리고 높은 밀도의 변조(최대 256 QAM) 등 802.11n에서 받아들인 무선 인터페이스 개념을 확장하여 이루어진다. 또한, 기존 2.4GHz/5GHz 대신 60GHz 밴드를 사용해 데이터를 전송하는 방식으로 IEEE 802.11ad가 있다. IEEE 802.11ad는 빔포밍 기술을 이용하여 최대 7Gbps의 속도를 제공하는 전송규격으로서, 대용량의 데이터나 무압축 HD 비디오 등 높은 비트레이트 동영상 스트리밍에 적합하다. 하지만 60GHz 주파수 밴드는 장애물 통과가 어려워 근거리 공간에서의 디바이스들 간에만 이용이 가능한 단점이 있다.

【0006】 한편, 최근에는 802.11ac 및 802.11ad 이후의 차세대 무선랜 표준으로서, 고밀도 환경에서의 고효율 및 고성능의 무선랜 통신 기술을 제공하기 위한 논의가 계속해서 이루어지고 있다. 즉, 차세대 무선랜 환경에서는 고밀도의 스테이션과 AP(Access Point)의 존재 하에 실내/외에서 높은 주파수 효율의 통신이 제공되어야 하며, 이를 구현하기 위한 다양한 기술들이 필요하다.

**【발명의 내용】**

**【해결하고자 하는 과제】**

【0007】 본 발명은 전술한 바와 같이 고밀도 환경에서의 고효율/고성능의 무선랜 통신을 제공하기 위한 목적을 가지고 있다.

**【과제의 해결 수단】**

【0008】 본 발명의 실시 예에 따르면 무선랜을 위한 장치, 시스템 및 무선랜 통신 방법이 제공될 수 있다.

**【발명의 효과】**

【0009】 본 발명의 실시예에 따르면, 맥 헤더에 컨트롤 정보를 효율적으로 포함시킬 수 있는 방법을 제공한다. 본 발명은 무선랜을 이용하는 스테이션 내지 액세스 포인트, 셀룰러 통신을 이용하는 스테이션 내지 기지국 등 다양한 통신 디바이스에 사용 가능하다.

**【도면의 간단한 설명】**

【0010】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 나타낸 도면.

도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템을 나타낸 도면.

도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도.

도 4는 본 발명의 일 실시예에 따른 액세스 포인트의 구성을 나타낸 블록도.

도 5는 본 발명의 일 실시예에 따른 UL MU 과정을 나타낸 도면.

도 6은 본 발명의 일 실시예에 따른 트리거 프레임 포맷을 나타낸 도면.

도 7은 본 발명의 일 실시예에 따른 트리거 프레임의 Common Info 필드와 User Info 필드를 나타낸 도면.

도 8은 본 발명의 일 실시예에 따른 랜덤 엑세스(random access) 과정을 나타낸 도면.

도 9는 본 발명의 일 실시예에 따른 RAPS(OFDMA-based Random Access Parameter Set) element 포맷을 나타낸 도면.

도 10은 본 발명의 일 실시예에 따른 UL MU 동작 및 NAV 셋팅을 나타낸 도면.

도 11은 본 발명의 일 실시예에 따른 UL MU 동작 및 power save 동작을 나타낸 도면.

도 12는 본 발명의 일 실시예에 따른 UL MU 동작 및 채널 유휴 상태 판단을 나타낸 도면.

도 13은 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면.

도 14는 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면.

도 15는 본 발명의 일 실시예에 따른 Trigger frame의 User Info 필드 포맷을 나타낸 도면.

도 16은 본 발명의 일 실시예에 따른 VHT SU PPDU의 TXVECTOR parameters GROUP_ID와 PARTIAL_AID 설정 방법을 나타낸 도면.

도 17은 본 발명의 일 실시예에 따른 채널 유휴 상태 판단을 나타낸 도면.

도 18은 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면.

도 19는 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면.

도 20은 본 발명의 일 실시예에 따른 BSS color change 이벤트 후 UL MU operation을 나타낸 도면.

도 21은 본 발명의 일 실시예에 따른 BSS color change 이벤트 후 UL MU Operation을 나타낸 도면.

도 22는 본 발명의 일 실시예에 따른 unassociated STA의 UL MU Operation을 나타낸 도면.

도 23은 본 발명의 일 실시예에 따른 RU Allocation subfield의 인코딩을 나타낸 도면.

도 24는 본 발명의 일 실시예에 따른 unassociated STA의 UL MU operation을 나타낸 도면.

**【발명을 실시하기 위한 구체적인 내용】**

【0011】본 명세서에서 사용되는 용어는 본 발명에서의 기능을 고려하면서 가능한 현재 널리 사용되는 일반적인 용어를 선택하였으나, 이는 당 분야에 종사하는 기술자의 의도, 관례 또는 새로운 기술의 출현 등에 따라 달라질 수 있다. 또한 특정 경우는 출원인이 임의로 선정한 용어도 있으며, 이 경우 해당되는 발명의 설명 부분에서 그 의미를 기재할 것이다. 따라서 본 명세서에서 사용되는 용어는, 단순한 용어의 명칭이 아닌 그 용어가 가진 실질적인 의미와 본 명세서의 전반에

걸친 내용을 토대로 해석되어야 함을 밝혀두고자 한다.

【0012】 명세서 전체에서, 어떤 구성이 다른 구성과 “연결”되어 있다고 할 때, 이는 “직접적으로 연결”되어 있는 경우뿐 아니라, 그 중간에 다른 구성요소를 사이에 두고 “전기적으로 연결”되어 있는 경우도 포함한다. 또한 어떤 구성이 특정 구성요소를 “포함”한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다. 이에 더하여, 특정 임계값을 기준으로 “이상” 또는 “이하”라는 한정 사항은 실시예에 따라 각각 “초과” 또는 “미만”으로 적절하게 대체될 수 있다.

【0013】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다. 무선랜 시스템은 하나 또는 그 이상의 베이직 서비스 세트(Basic Service Set, BSS)를 포함하는데, BSS는 성공적으로 동기화를 이루어서 서로 통신할 수 있는 기기들의 집합을 나타낸다. 일반적으로 BSS는 인프라스트럭쳐 BSS(infrastructure BSS)와 독립 BSS(Independent BSS, IBSS)로 구분될 수 있으며, 도 1은 이 중 인프라스트럭쳐 BSS를 나타내고 있다.

【0014】 도 1에 도시된 바와 같이 인프라스트럭쳐 BSS(BSS1, BSS2)는 하나 또는 그 이상의 스테이션(STA-1, STA-2, STA-3, STA-4, STA-5), 분배 서비스(Distribution Service)를 제공하는 스테이션인 액세스 포인트(PCP/AP-1, PCP/AP-2), 및 다수의 액세스 포인트(PCP/AP-1, PCP/AP-2)를 연결시키는 분배 시스템(Distribution System, DS)을 포함한다.

【0015】 스테이션(Station, STA)은 IEEE 802.11 표준의 규정을 따르는 매체 접속 제어(Medium Access Control, MAC)와 무선 매체에 대한 물리층(Physical Layer) 인터페이스를 포함하는 임의의 디바이스로서, 광의로는 비 액세스 포인트(Non-AP) 스테이션뿐만 아니라 액세스 포인트(AP)를 모두 포함한다. 또한, 본 명세서에서는 스테이션과 AP 등의 무선랜 통신 디바이스를 모두 포함하는 개념으로서 '단말' 이라는 용어가 사용될 수 있다. 무선 통신을 위한 스테이션은 프로세서(Processor)와 트랜시버(transceiver)를 포함하고, 실시예에 따라 유저 인터페이스부와 디스플레이 유닛 등을 더 포함할 수 있다. 프로세서는 무선 네트워크를 통해 전송할 프레임을 생성하거나 또는 상기 무선 네트워크를 통해 수신된 프레임을 처리하며, 그 밖에 스테이션을 제어하기 위한 다양한 처리를 수행할 수 있다. 그리고, 트랜시버는 상기 프로세서와 기능적으로 연결되어 있으며 스테이션을 위하여 무선 네트워크를 통해 프레임을 송수신한다.

【0016】 액세스 포인트(Access Point, AP)는 자신에게 결합된(associated) 스테이션을 위하여 무선 매체를 경유하여 분배시스템(DS)에 대한 접속을 제공하는 개체이다. 인프라스트럭쳐 BSS에서 비 AP 스테이션들 사이의 통신은 AP를 경유하여 이루어지는 것이 원칙이지만, 다이렉트 링크가 설정된 경우에는 비AP 스테이션들 사이에서도 직접 통신이 가능하다. 한편, 본 발명에서 AP는 PCP(Personal BSS Coordination Point)를 포함하는 개념으로 사용되며, 광의적으로는 집중 제어기, 기지국(Base Station, BS), 노드-B, BTS(Base Transceiver System), 또는 사이트 제어기 등의 개념을 모두 포함할 수 있다.

【0017】 복수의 인프라스트럭쳐 BSS는 분배 시스템(DS)을 통해 상호 연결될 수 있다. 이때, 분배 시스템을 통하여 연결된 복수의 BSS를 확장 서비스 세트(Extended Service Set, ESS)라 한다.

【0018】 도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다. 도 2의 실시예에서 도 1의 실시예와 동일하거나 상응하는 부분은 중복적인 설명을 생략하도록 한다.

【0019】 도 2에 도시된 BSS-3는 독립 BSS이며 AP를 포함하지 않기 때문에, 모든 스테이션(STA-6, STA-7)이 AP와 접속되지 않은 상태이다. 독립 BSS는 분배 시스템으로의 접속이 허용되지 않으며, 자기 완비적 네트워크(self-contained network)를 이룬다. 독립 BSS에서 각각의 스테이션들(STA-6, STA-7)은 다이렉트로 서로 연결될 수 있다.

【0020】 도 3은 본 발명의 일 실시예에 따른 스테이션(100)의 구성을 나타낸 블록도이다.

【0021】 도시된 바와 같이, 본 발명의 실시예에 따른 스테이션(100)은 프로세서(110), 네트워크 인터페이스 카드(NIC, 120), 유저 인터페이스부(140), 디스플레이 유닛(150) 및 메모리(160)를 포함할 수 있다.

【0022】 먼저, 네트워크 인터페이스 카드(120)는 무선랜 접속을 수행하기 위한 모듈이며, 스테이션(100)을 위한 패킷 전송과 수신을 수행한다. 네트워크 인터페이스 카드(120)는 스테이션(100)에 내장되거나 외장으로 구비될 수 있으며, 실시

예에 따라 서로 다른 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 이를 테면, 상기 네트워크 인터페이스 카드는 2.4GHz, 5GHz 및 60GHz 등의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 일 실시예에 따르면, 스테이션(100)은 6GHz 이상의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈은 해당 네트워크 인터페이스 카드 모듈이 지원하는 주파수 밴드의 무선랜 규격에 따라 AP 또는 외부 스테이션과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드(120)는 스테이션(100)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈을 함께 동작시킬 수 있다. 스테이션(100)이 복수의 네트워크 인터페이스 카드 모듈을 포함할 경우, 각 네트워크 인터페이스 카드 모듈은 각각 독립된 형태로 구비될 수도 있으며, 하나의 칩으로 통합되어 구비될 수도 있다.

【0023】 다음으로, 유저 인터페이스부(140)는 스테이션(100)에 구비된 다양한 형태의 입/출력 수단을 포함한다. 즉, 유저 인터페이스부(140)는 다양한 입력 수단을 이용하여 유저의 입력을 수신할 수 있으며, 프로세서(110)는 수신된 유저 입력에 기초하여 스테이션(100)을 제어할 수 있다. 또한, 유저 인터페이스부(140)는 다양한 출력 수단을 이용하여 프로세서(110)의 명령에 기초한 출력을 수행할 수 있다.

【0024】 다음으로, 디스플레이 유닛(150)은 디스플레이 화면에 이미지를 출력한다. 상기 디스플레이 유닛(150)은 프로세서(110)에 의해 실행되는 컨텐츠 또는 프로세서(110)의 제어 명령에 기초한 유저 인터페이스 등의 다양한 디스플레이 오브젝트를 출력할 수 있다. 또한, 메모리(160)는 스테이션(100)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 스테이션(100)이 AP 또는 외부 스테이션과 접속을 수행하는데 필요한 접속 프로그램이 포함될 수 있다.

【0025】 본 발명의 프로세서(110)는 다양한 명령 또는 프로그램을 실행하고, 스테이션(100) 내부의 데이터를 프로세싱 할 수 있다. 또한, 상기 프로세서(110)는 상술한 스테이션(100)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(110)는 메모리(160)에 저장된 AP와의 접속을 위한 프로그램을 실행하고, AP가 전송한 통신 설정 메시지를 수신할 수 있다. 또한, 프로세서(110)는 통신 설정 메시지에 포함된 스테이션(100)의 우선 조건에 대한 정보를 판독하고, 스테이션(100)의 우선 조건에 대한 정보에 기초하여 AP에 대한 접속을 요청할 수 있다. 이에 대한 구체적인 실시예는 추후 기술하기로 한다.

【0026】 도 3에 도시된 스테이션(100)은 본 발명의 일 실시예에 따른 블록도로서, 분리하여 표시한 블록들은 디바이스의 엘리먼트들을 논리적으로 구별하여 도시한 것이다. 따라서 상술한 디바이스의 엘리먼트들은 디바이스의 설계에 따라 하나의 칩으로 또는 복수의 칩으로 장착될 수 있다. 또한, 본 발명의 실시예에서 상

기 스테이션(100)의 일부 구성들, 이를 테면 유저 인터페이스부(140) 및 디스플레이 유닛(150) 등은 스테이션(100)에 선택적으로 구비될 수 있다.

【0027】 도 4는 본 발명의 일 실시예에 따른 AP(200)의 구성을 나타낸 블록도이다.

【0028】 도시된 바와 같이, 본 발명의 실시예에 따른 AP(200)는 프로세서(210), 네트워크 인터페이스 카드(220) 및 메모리(260)를 포함할 수 있다. 도 4에서 AP(200)의 구성 중 도 3의 스테이션(100)의 구성과 동일하거나 상응하는 부분에 대해서는 중복적인 설명을 생략하도록 한다.

【0029】 도 4를 참조하면, 본 발명에 따른 AP(200)는 적어도 하나의 주파수 밴드에서 BSS를 운영하기 위한 네트워크 인터페이스 카드(220)를 구비한다. 도 3의 실시예에서 전술한 바와 같이, 상기 AP(200)의 네트워크 인터페이스 카드(220) 또한 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 즉, 본 발명의 실시예에 따른 AP(200)는 서로 다른 주파수 밴드, 이를 테면 2.4GHz, 5GHz, 60GHz 중 두 개 이상의 네트워크 인터페이스 카드 모듈을 함께 구비할 수 있다. 바람직하게는, AP(200)는 6GHz 이상의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈은 해당 네트워크 인터페이스 카드 모듈이 지원하는 주파수 밴드의 무선랜 규격에 따라 스테이션과 무선 통신을 수행할 수 있다. 상기 네트워크 인터페이스 카드(220)는 AP(200)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이

스 카드 모듈만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈을 함께 동작시킬 수 있다.

【0030】 다음으로, 메모리(260)는 AP(200)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 스테이션의 접속을 관리하는 접속 프로그램이 포함될 수 있다. 또한, 프로세서(210)는 AP(200)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(210)는 메모리(260)에 저장된 스테이션과의 접속을 위한 프로그램을 실행하고, 하나 이상의 스테이션에 대한 통신 설정 메시지를 전송할 수 있다. 이때, 통신 설정 메시지에는 각 스테이션의 접속 우선 조건에 대한 정보가 포함될 수 있다. 또한, 프로세서(210)는 스테이션의 접속 요청에 따라 접속 설정을 수행한다. 이에 대한 구체적인 실시예는 추후 기술하기로 한다.

【0032】 도 5는 본 발명의 일 실시예에 따른 UL MU 과정을 나타낸 도면이다.

【0033】 본 발명의 일 실시예에 따르면 UL MU 과정을 통해 하나 이상의 STA가 같은 시간에 전송할 수 있다. 여기서 STA는 non-AP STA일 수 있다. 예를 들면 UL MU 과정은 AP가 하나 이상의 STA로부터 simultaneous immediate response frames를 요청함(solicit)으로써 이루어질 수 있다. 도 5를 참조하면 AP가 트리거 프레임(Trigger Frame)을 통해 하나 이상의 STA로부터 simultaneous immediate response frames를 요청하였고, STA0, STA1, STA2, STA3는 그에 대한 응답으로 동시에 HE trigger-based PPDU를 전송하였다. HE trigger-based PPDU는 트리거 프레

임을 포함한 PPDU의 끝으로부터 SIFS 뒤에 전송될 수 있다. 또한 도 5에서는 HE Trigger-based PPDU를 통한 STA들의 전송 뒤에 AP가 Acknowledgment를 전송하고 있다.

【0034】AP는 UL MU 과정을 지시할 때 트리거 프레임을 이용할 수도 있고, 맥 헤더의 필드를 이용할 수 있다. 맥 헤더의 필드를 이용하는 경우 UL MU Response Scheduling A-Control 필드를 통해 지시할 수 있다. UL MU 과정에서 STA가 그 응답을 전송할 때는 HE trigger-based PPDU를 이용할 수 있고, 이때 UL OFDMA 또는 UL MU-MIMO가 사용될 수 있고, 둘 다 사용될 수 있다. 단, 트리거 프레임이 MU-RTS 타입일 때 STA는 HE trigger-based PPDU를 사용하는 것이 아니고, non-HT PPDU 포맷을 사용해서 응답할 수 있다. AP가 전송하는 트리거 프레임은 도 6과 같을 수 있다.

【0035】트리거 프레임을 통해 하나 이상의 STA로부터 HE trigger-based PPDU를 요청하는 경우, 하나 이상의 트리거 프레임이 하나 이상의 User Info 필드를 포함할 수 있고, User Info 필드가 recipient STAs에 address될 수 있다. User Info 필드가 recipient STAs에 address되었다는 것은 User Info 필드의 AID12 서브필드가 STA의 AID로 지시된 경우를 나타낼 수 있다. 또는 0으로 지시된 경우에 User Info 필드가 recipient STAs에 address된 것일 수 있다.

【0036】UL MU Response Scheduling A-Control 서브필드를 통해 HE trigger-based PPDU를 요청하는 경우, 이 UL MU Response Scheduling A-Control 서브필드를 포함하는 MPDU의 수신자가 이에 응답하여 HE trigger-based PPDU를 전송할 수

있다.

【0037】 본 발명의 일 실시예에 따르면 두개 이상의 트리거 프레임이 하나의 A-MPDU 안에 aggregation될 수 있으며, 이 경우에 트리거 프레임들의 내용은 같을 수 있다. 또한 하나의 A-MPDU 안에 어떤 STA에 address된 User Info 필드를 갖고 있는 트리거 프레임과 같은 STA에 address되고 UL MU Response Scheduling A-Control 서브필드를 포함하는 MPDU는 같이 있지 않을 수 있다.

【0039】 도 6은 본 발명의 일 실시예에 따른 트리거 프레임 포맷을 나타낸 도면이다.

【0040】 도 5에서 설명한 UL MU 과정에서 AP는 트리거 프레임을 통해 STA의 응답을 끌어낼 수 있고, 이때 AP는 도 6과 같은 포맷의 트리거 프레임을 전송할 수 있다. 도 6을 참조하면 트리거 프레임은 Frame Control, Duration, RA, TA, Common Info, 한개 이상의 User Info, Padding, FCS 필드를 가질 수 있다. 트리거 프레임의 RA 필드는 recipient STA의 주소일 수 있다. 만약 트리거 프레임이 한개의 User Info 필드를 갖는 경우, RA 필드는 그 STA의 MAC address일 수 있다. 트리거 프레임이 2개 이상의 User Info 필드를 갖는 경우, RA 필드는 broadcast address일 수 있다. 트리거 타입이 GCR MU-BAR인 경우, RA 필드는 reception status를 보내도록 요청되고 있는 그룹의 주소일 수 있다.

【0041】또한 TA 필드는 트리거 프레임을 보내고 있는 STA의 주소일 수 있다. 일 실시예에 따르면 Multiple BSSID 기능을 사용하지 않는 경우 TA 필드는 이 트리거 프레임을 보내고 있는 AP의 MAC address일 수 있다. 또한 multiple BSSID 기능을 사용하고 있고, 이 트리거 프레임이 이 트리거 프레임을 보내는 AP와 communication하고 있는 STA들(또는 그 AP와 association된 STA들)에게 전송되는 경우, TA 필드는 그 AP의 MAC address일 수 있다. Multiple BSSID 기능을 사용하고 이 트리거 프레임이 multiple BSSID set의 2개 이상의 BSS와 communication하는 STA들에게 전송되는 경우, TA 필드는 transmitted BSSID일 수 있다.

【0042】Common Info 필드와 User Info 필드는 트리거 프레임에 응답하는데 필요한 정보를 포함할 수 있는데, Common Info 필드는 트리거 프레임의 수신자 모두에게 해당하는 정보이고 User Info 필드는 해당 User Info 필드의 수신자에게 해당하는 정보일 수 있다. Common Info 필드와 User Info 필드는 도 7과 같을 수 있다.

【0043】Padding 필드는 트리거 프레임을 수신하는 STA들이 응답을 준비하는데에 걸리는 시간을 확보하기 위해 프레임의 길이를 늘리는데에 사용될 수 있고, 길이는 수신자들의 capability에 따라 정해질 수 있다. 트리거 프레임의 수신자들 모두가 응답을 준비하기 위해 Padding 필드를 통한 추가 시간을 필요로하지 않는 경우 Padding 필드가 존재하지 않을 수도 있다. Padding 필드의 시작은 예를 들면 0xFFF와 같은 특정 값을 통해 알려질 수 있다. 즉, Padding 필드의 시작은 특정 값으로 셋팅되고 나머지 값들은 다른 비트들로 채워질 수 있다.

【0045】 도 7은 본 발명의 일 실시예에 따른 트리거 프레임의 Common Info 필드와 User Info 필드를 나타낸 도면이다.

【0046】 본 발명의 일 실시예에 따르면 도 6의 트리거 프레임에 포함되는 Common Info 필드와 User Info 필드는 각각 도 7(a)와 도 7(b)와 같을 수 있다. 일 실시예에 따르면 도 7(b)의 AID12 서브필드를 이용해서 트리거 프레임이 어느 STA로 address되는지를 지시할 수 있다. 예를 들면 AID12 서브필드를 STA의 AID의 12 LSBs로 셋팅할 수 있고, 그러한 경우 해당 STA가 트리거된 것으로 판단할 수 있다. 또한 AID12 서브필드를 특정 값으로 셋팅함으로써 이 User Info 필드가 가리키는 RU가 random access로 허용되는 RU임을 나타낼 수 있다. 더 구체적으로 AID12 서브필드를 특정 값으로 셋팅함으로써 이 User Info 필드가 가리키는 RU가 associated STA들을 위한 random access로 허용되는 RU임을 나타낼 수 있다. 또한 AID12 서브필드를 특정 값으로 셋팅함으로써 이 User Info 필드가 가리키는 RU가 unassociated STA들을 위한 random access로 허용되는 RU임을 나타낼 수 있다. 예를 들어 associated STA들을 위한 random access로 허용되는 RU임을 나타내기 위해 AID12 서브필드를 0으로 셋팅할 수 있다. 또한 unassociated STA들을 위한 random access로 허용되는 RU임을 나타내기 위해 AID12 서브필드를 2045로 셋팅할 수 있다. 또한 associated STA가 associated STA들을 위한 random access로 허용되는 RU임을 지시하고 있는 AID12 서브필드 또는 User Info 필드를 수신하면 random access 절차에 따라 RU 또는 채널에 엑세스할 수 있다. 또한 unassociated STA가

unassociated STA들을 위한 random access로 허용되는 RU임을 지시하고 있는 AID12 서브필드 또는 User Info 필드를 수신하면 random access 절차에 따라 RU 또는 채널에 엑세스할 수 있다. 일 실시예로 여기서 언급한 unassociated STA는 UL MU 동작을 지시한 AP와 association되지 않은 STA일 수 있다. 더 구체적인 실시예로 여기서 언급한 unassociated STA는 어떠한 AP와도 association되지 않은 STA일 수 있다. 또한 본 발명에서 random access로 허용되는 RU 또는 random access로 허용하는 RU를 random access RU라고 부를 수 있다.

【0047】 RU Allocation 서브필드는 AID12 서브필드로 identify되는 STA가 HE trigger-based PPDU로 응답할 때 어떤 RU를 사용할지를 나타낼 수 있다. 일 실시예에 따르면 RU Allocation 서브필드의 시그날링으로 RU를 명확히 지시할 수 있다. 따라서 해당 RU의 위치를 알기 위해 다른 필드를 참조할 필요 없을 수 있다.

【0049】 또한 앞서 설명한 것처럼 트리거 프레임을 수신하는 STA들이 응답을 준비하는데에 걸리는 시간이 필요할 수 있다. 그 시간을 MinTrigProcTime이라고 부를 수 있다. 트리거 프레임의 User Info 필드들이 모두 특정 사용자를 위한 것일 경우 모든 의도된 수신자의 MinTrigProcTime을 알 수 있지만 random access RU를 포함하는 경우엔 수신하는 STA들의 MinTrigProcTime을 알기 어렵다. 따라서 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때 MinTrigProcTime에 대한 고려를 하지 않으면 어떤 STA들은 random access가 제한될 수 있다.

【0050】본 발명의 일 실시예로 random access RU를 지시하는 User Info 필드를 포함하지 않는 트리거 프레임을 송신할 때는 의도된 수신자 STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다. 예를 들면 random access RU를 지시하는 User Info 필드를 포함하지 않는 트리거 프레임을 송신할 때는 가장 마지막 User Info 필드로부터 의도된 수신자 STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다.

【0051】본 발명의 일 실시예로 associated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 모든 associated STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다. 예를 들면 associated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 associated STA를 위한 random access를 지시하는 User Info 필드 중 가장 마지막 User Info 필드로부터 모든 associated STA들 중 가장 긴 MinTrigProcTime을 요구하는 STA의 MinTrigProcTime을 최소로 확보해줄 수 있다.

【0052】(An AP transmitting a Trigger frame that contains a User Info field for random access shall ensure that a MinTrigProcTime corresponding to at least the largest value amongst all associated STAs passes from the last User Info field with AID12 subfield equal to 0.).

【0053】본 발명의 일 실시예로 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 가능한 가장 긴 MinTrigProcTime을 최소로 확보해줄 수 있다. 예를 들면 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 트리거 프레임을 송신할 때는 unassociated STA를 위한 random access를 지시하는 User Info 필드 중 가장 마지막 User Info 필드로부터 가능한 가장 긴 MinTrigProcTime을 최소로 확보해줄 수 있다. 가능한 가장 긴 MinTrigProcTime은 16us일 수 있다. (An AP transmitting a Trigger frame that contains a User Info field for random access should ensure that a MinTrigProcTime of at least 16us from the last User Info field with AID12 subfield equal to 2045.)

【0054】일 실시예로 MinTrigProcTime의 확보는 트리거 프레임의 Padding field, A-MPDU padding, A-MPDU subframe, EOF padding, 다른 frame, frame의 남은 부분 등으로 만들어주는 것이 가능하다.

【0055】일 실시예로 random access RU를 지시하지 않는 User Info 필드들은 random access RU를 지시하는 User Info 필드들보다 앞에 있을 수 있다. 예를 들면 AID12 서브필드가 0이나 2045가 아닌 User Info 필드들은 AID12 서브필드가 0이나 2045인 User Info 필드들보다 앞에 있을 수 있다.

【0057】 도 8은 본 발명의 일 실시예에 따른 랜덤 엑세스(random access) 과정을 나타낸 도면이다.

【0058】 본 발명의 일 실시예에 따르면 STA는 랜덤 엑세스(random access)를 통해 채널에 접근할 수 있다. STA가 랜덤하게 AP가 할당한 RU를 선택하고 그 RU에서 프레임을 전송할 수 있다. 일 실시예로 랜덤 엑세스는 무선랜의 UL MU procedure 기반일 수 있다. 더 구체적으로 이 랜덤 엑세스는 UL OFDMA 기반일 수 있다. AP는 트리거 프레임을 통해 랜덤 엑세스로 허용한 RU를 지시할 수 있다. 예를 들면 AP는 트리거 프레임에서 어떤 RU에 대해 특정 STAID를 사용함으로써 랜덤 엑세스로 허용한 RU를 지시할 수 있다. 예를 들면 도 6,7의 트리거 프레임 포맷에서 도 7(b)의 User Info 필드 중 AID12 서브필드를 특정 값으로 셋팅함으로써 그 User Info 필드가 지시하고 있는 RU가 랜덤 엑세스로 허용하는 RU임을 나타낼 수 있다. 이때 랜덤 엑세스로 허용하는 RU를 지시하기 위한 AID12 서브필드의 값은 0 또는 2045일 수 있다. 구체적으로는 random access RU를 용도나 대상별로 다르게 지시할 수 있다. Random access RU를 용도나 대상별로 다른 AID12 서브필드로 지시할 수 있다. 구체적으로는 associated STA를 위한 random access RU를 지시하기 위한 AID12 서브필드의 값은 0일 수 있다. 또한 트리거 프레임을 전송하는 AP와 associate 되어 있지 않은 STA(unassociated STA)를 위한 random access RU를 지시하기 위한 AID12 서브필드의 값은 2045일 수 있다.

【0060】본 발명의 일 실시예에 따르면 STA는 OBO(OFDMA backoff) counter 값을 갖고, 카운트다운하여 OBO counter가 0이 되었을 때 랜덤 엑세스 전송의 기회를 얻을 수 있다. 예를 들면 STA는 트리거 프레임을 수신했을 때 랜덤 엑세스로 허용하는 RU로 지시된 RU 개수만큼 OBO counter를 줄일 수 있다. 또한 이때 random access RU를 지시하는 User Info 필드 중 해당하는 User Info 필드에 대해서만 OBO counter를 줄일 수 있다. 즉, 앞선 실시예에 따르면 associated STA는 트리거 프레임을 수신했을 때 associated STA를 위한 random access RU를 지시하는 AID12 서브필드의 개수(혹은 associated STA를 위한 random access RU를 지시하는 AID12 서브필드를 포함하는 User Info 필드의 개수)만큼 OBO counter를 줄일 수 있다. 또한 unassociated STA는 트리거 프레임을 수신했을 때 unassociated STA를 위한 random access RU를 지시하는 AID12 서브필드의 개수(혹은 unassociated STA를 위한 random access RU를 지시하는 AID12 서브필드를 포함하는 User Info 필드의 개수)만큼 OBO counter를 줄일 수 있다. 이때 OBO counter가 0에 도달한 경우 랜덤 엑세스로 허용하는 RU에 전송할 기회를 얻을 수 있다.

【0061】또한 랜덤 엑세스로 허용하는 RU에 전송할 기회를 얻었을 때 랜덤 엑세스로 허용하는 RU 중에서 보낼 RU를 랜덤하게 선택할 수 있다. 이때 해당하는 random access RU 중에서만 보낼 RU를 랜덤하게 선택할 수 있다. 예를 들어 associated STA는 associated STA를 위한 random access RU 중에서 보낼 RU를 랜덤하게 선택할 수 있고, unassociated STA는 unassociated STA를 위한 random access RU 중에서 보낼 RU를 랜덤하게 선택할 수 있다. 만약 선택한 RU가 busy하면 랜덤

엑세스로 전송하지 않을 수 있고, 0의 OBO counter 값을 유지할 수 있다. 즉, 이러한 경우 랜덤 엑세스를 허용하는 다음 트리거 프레임에서 전송할 기회를 바로 획득할 수 있고 다음 트리거 프레임에서 해당하는 랜덤 엑세스로 허용된 RU 중에서 프레임을 전송할 RU를 랜덤하게 선택할 수 있다. 또한 여기서 RU가 busy하다는 것은 physical carrier sense와 virtual carrier sense 중 둘 중 하나만 busy여도 해당할 수 있고, physical carrier sense와 virtual carrier sense는 무선랜의 UL MU procedure의 CS mechanism 방법을 따를 수 있다.

【0062】 또한 랜덤 엑세스를 통한 전송을 처음하는 경우나 랜덤 엑세스를 통한 프레임 전송이 성공한 경우에 STA는 AP로부터 RAPS element를 얻었을 때 혹은 OCWmin을 얻었을 때 얻은 OCWmin 값으로 OCW를 셋팅하고 OBO counter를 선택할 수 있다. 일 실시예로 associated STA들에게 이때의 AP는 STA가 association한 AP일 수 있다. 또한 unassociated STA들에게 이때의 AP는 STA가 전송하려는 프레임의 수신자인 AP일 수 있다. 또는 unassociated STA들에게 이때의 AP는 STA가 수신한 RAPS element를 송신한 AP 또는 STA가 수신한 트리거 프레임을 송신한 AP일 수 있다.

【0063】 또한 OBO counter는 0부터 OCW(OFDMA contention window) 범위의 정수에서 뽑을 수 있다. OCW 값의 초기값은 OCWmin 값일 수 있고, 랜덤 엑세스로 전송을 실패했을 때 OCW 값을 (2*OCW + 1)로 업데이트할 수 있다. 또한 랜덤 엑세스로 전송을 실패했을 때 OBO counter 값을 0부터 OCW 중의 정수로 뽑을 수 있다. OCW가 OCWmax에 도달한 경우에는 OCW 값을 OCWmax로 유지시킬 수 있다. 본 발명의

일 실시예에 따르면 OCWmin과 OCWmax 값은 AP가 STA에게 알려줄 수 있다. 일 실시예로 AP는 OCWmin과 OCWmax를 포함하는 element를 전송하여 값을 전달할 수 있는데, 이에 대해서는 도 9에서 더 설명한다.

【0065】 다음은 associated STA의 random access 과정을 나타낸 실시예이다. 도 8을 참조하면 STA1과 STA2는 각각 5와 1의 OBO counter를 가지고 있다. 이는 Beacon frame 또는 Probe Response frame을 수신했을 때 초기화한 값 또는 랜덤 엑세스 RU를 통한 전송 성공 또는 실패 후 다시 뽑은 값일 수 있다. 또는 앞선 트리거 프레임 랜덤 엑세스 RU에서 OBO counter를 decrement하고 남은 값일 수 있다. 또한 STA1과 STA2는 도면의 트리거 프레임을 전송한 AP 혹은 도면의 트리거 프레임을 전송한 AP와 같은 multiple BSSID set에 속한 AP와 association 되어 있다. 그리고 AP는 트리거 프레임을 전송하는데 associated STA를 위한 랜덤 엑세스를 허용하는 RU를 2개로 지시하고 있다. 즉, AP는 AID12 서브필드가 0으로 셋팅된 User Info 필드가 2개 있는 트리거 프레임을 전송하였다. 이 트리거 프레임을 수신한 STA1과 STA2는 OBO counter를 2를 줄여 각각 3, 0의 OBO counter 값을 갖게 되었다. STA2의 OBO counter가 0이 되었으므로 랜덤 엑세스 RU를 통한 전송 기회를 획득하게 되고 associated STA를 위한 랜덤 엑세스로 허용한 RU 2개 중에서 랜덤하게 1개를 선택하여 그 RU를 이용하여 프레임을 전송한다. 이때 랜덤 엑세스를 UL OFDMA based로 하므로 STA2는 트리거 프레임을 포함한 PPDU에서 SIFS 뒤 HE trigger-based PPDU를 이용하여 트리거 프레임에서 지시한대로 프레임을 전송한다.

HE trigger-based PPDU 다음에 AP가 Acknowledgment를 전송할 수 있다. STA2가 랜덤 엑세스를 통해 프레임을 전송한 뒤에는 OBO counter 값을 새로 뽑을 수 있다. 이때 값을 뽑는 범위는 0부터 OCW 중의 정수 값일 수 있다. 또한 이때의 OCW 값은 랜덤 엑세스를 통한 프레임 전송을 성공한 경우에는 OCWmin일 수 있고, 랜덤 엑세스를 통한 프레임 전송을 실패한 경우에는 더블링한 값, 즉 이전의 OCW로부터 (2*OCW + 1)로 계산한 값일 수 있다. 도면에서 STA2는 6의 OBO counter를 뽑았다. 도면에서 다음으로 AP는 associated STA를 위한 랜덤 엑세스를 허용하는 RU를 3개로 지시하고 있는 트리거 프레임을 전송하였다. 따라서 이를 수신한 STA1와 STA2는 OBO counter를 3만큼 줄일 수 있다. 따라서 트리거 프레임을 수신한 뒤에 STA1과 STA2의 OBO counter는 각각 0과 3이 된다. 이번에는 STA1의 OBO counter가 0이 되어 STA1이 랜덤 엑세스를 통한 전송 기회를 획득하였고, STA1은 associated STA를 위한 랜덤 엑세스를 허용한 RU 3개 중에서 랜덤하게 선택하여 그 RU를 이용하여 프레임을 전송할 수 있다.

【0067】 다음은 unassociated STA의 random access 과정을 나타낸 실시예이다. STA1과 STA2는 각각 5와 1의 OBO counter를 가지고 있다. 이는 Beacon frame 또는 Probe Response frame을 수신했을 때 초기화한 값 또는 랜덤 엑세스 RU를 통한 전송 성공 또는 실패 후 다시 뽑은 값일 수 있다. 또는 앞선 트리거 프레임 랜덤 엑세스 RU에서 OBO counter를 decrement하고 남은 값일 수 있다. 혹은 RAPS element 수신 전에 default 값(default OCWmin, default OCWmax, default OCW 등)

들을 기초로한 OBO counter 값일 수 있다. 또한 STA1과 STA2는 AP와 association 되어있지 않다. 그리고 AP는 트리거 프레임을 전송하는데 unassociated STA를 위한 랜덤 엑세스를 허용하는 RU를 2개로 지시하고 있다. 즉, AP는 AID12 서브필드가 2045으로 셋팅된 User Info 필드가 2개 있는 트리거 프레임을 전송하였다. 이 트리거 프레임을 수신한 STA1과 STA2는 OBO counter를 2를 줄여 각각 3, 0의 OBO counter 값을 갖게 되었다. STA2의 OBO counter가 0이 되었으므로 랜덤 엑세스 RU를 통한 전송 기회를 획득하게 되고 unassociated STA를 위한 랜덤 엑세스로 허용한 RU 2개 중에서 랜덤하게 1개를 선택하여 그 RU를 이용하여 프레임을 전송한다. 이때 랜덤 엑세스를 UL OFDMA based로 하므로 STA2는 트리거 프레임을 포함한 PPDU에서 SIFS 뒤 HE trigger-based PPDU를 이용하여 트리거 프레임에서 지시한대로 프레임을 전송한다. HE trigger-based PPDU 다음에 AP가 Acknowledgment를 전송할 수 있다. STA2가 랜덤 엑세스를 통해 프레임을 전송한 뒤에는 OBO counter 값을 새로 뽑을 수 있다. 이때 값을 뽑는 범위는 0부터 OCW 중의 정수 값일 수 있다. 또한 이때의 OCW 값은 랜덤 엑세스를 통한 프레임 전송을 성공한 경우에는 OCWmin일 수 있고, 랜덤 엑세스를 통한 프레임 전송을 실패한 경우에는 더블링한 값, 즉 이전의 OCW로부터 (2*OCW + 1)로 계산한 값일 수 있다. 도면에서 STA2는 6의 OBO counter를 뽑았다. 도면에서 다음으로 AP는 unassociated STA를 위한 랜덤 엑세스를 허용하는 RU를 3개로 지시하고 있는 트리거 프레임을 전송하였다. 따라서 이를 수신한 STA1와 STA2는 OBO counter를 3만큼 줄일 수 있다. 따라서 트리거 프레임을 수신한 뒤에 STA1과 STA2의 OBO counter는 각각 0과 3이 된다. 이번에는 STA1의 OBO

counter가 0이 되어 STA1이 랜덤 엑세스를 통한 전송 기회를 획득하였고, STA1은 unassociated STA를 위한 랜덤 엑세스를 허용한 RU 3개 중에서 랜덤하게 선택하여 그 RU를 이용하여 프레임을 전송할 수 있다.

【0069】도 9는 본 발명의 일 실시예에 따른 RAPS(OFDMA-based Random Access Parameter Set) element 포맷을 나타낸 도면이다.

【0070】본 발명의 일 실시예에 따르면 AP는 OCWmin과 OCWmax 값을 STA에 전달, 지시할 수 있고, 이 값은 도 8의 실시예에서 설명한 것과 같은 방법으로 사용될 수 있다. 예를 들면 AP는 Beacon frame 또는 Probe Response frame를 통해 OCWmin과 OCWmax 값을 전달, 지시할 수 있다. 본 발명의 일 실시예에 따르면 AP는 RAPS(OFDMA-based Random Access Parameter Set) element를 전송할 수 있고, 그 element 포맷은 도 9와 같을 수 있다. RAPS element는 Element ID, Length, Element ID Extension, OCW Range 필드 등을 포함할 수 있다. 이때 Element ID, Length, Element ID Extension 필드는 기존과 같은 필드일 수 있다. 또한 OCW Range 필드는 OCWmin와 OCWmax를 얻는데에 필요한 필드를 포함할 수 있다. 예를 들면 OCW Range 필드는 EOCWmin과 EOCWmax 필드를 포함할 수 있다. EOCWmin은 OCWmin을 얻는 데에 필요한 값일 수 있다. 예를 들면 OCWmin = 2^EOCWmin - 1의 관계를 가질 수 있다. 또한 EOCWmax는 OCWmax를 얻는 데에 필요한 값일 수 있다. 예를 들면 OCWmax = 2^EOCWmax - 1의 관계를 가질 수 있다. OCWmin은 OCW 값의 최소값을 나타낼 수 있고, OCWmax는 OCW 값의 최대값을 나타낼 수 있다.

【0071】또한 STA는 가장 최근에 받은 RAPS element로 지시된 OCWmin과 OCWmax 값을 사용할 수 있다. 이때 STA가 보내려고하는 access category와 상관없이 가장 최근에 수신한 RAPS element로 지시된 OCWmin과 OCWmax 값을 사용할 수 있다.

【0073】* PPDU format selection

【0074】다음에서는 PPDU format selection 에 대해 설명한다.

【0075】본 발명의 일 실시예를 따르면 HE STA는 non-HT, HT, 또는 VHT PPDU를 보낼 때 10.7 Multirate support 룰을 따를 수 있다. 또한 HE STA는 peer HE STA에 HE SU PPDU를 보낼 수 있다.

【0076】또한 HE AP는 27.5.1 HE DL MU operation에 따라 HE MU PPDU를 전송할 수 있고, HE non-AP STA는 27.5.2 UL MU operation을 따라 HE trigger-based PPDU를 보낼 수 있다.

【0077】HE STA는 peer STA로부터 DCM Rx capable하다고 보고 받았거나 ER(extended range) SU Payload 수신 capable하다고 보고 받은 경우 242-tone의 HE ER SU PPDU를 그 peer STA에게 전송할 수 있다. 그렇지 않으면 242-tone HE ER SU PPDU를 그 peer에게 전송하지 않을 수 있다. ER SU Payload 수신 capable 여부는 242-tone HE ER SU PPDU 수신 가능 여부일 수 있다. 또한 HE STA는 peer STA로부터 HE ER SU PPDU Payload 수신 capable하다고 보고 받은 경우 106-tone HE ER SU

PPDU를 그 peer STA에게 전송할 수 있다. 그렇지 않으면 106-tone HE ER SU PPDU를 그 peer에게 전송하지 않을 수 있다. HE ER SU PPDU Payload 수신 capable 여부는 106-tone HE ER SU PPDU 수신 가능 여부일 수 있다.

【0078】 HE non-AP STA는 peer STA로부터 UL HE MU PPDU Support를 보고 받은 경우 그 peer STA에 HE MU PPDU를 전송할 수 있다. 그렇지 않으면 그 peer STA에 HE MU PPDU를 전송하지 않을 수 있다. UL HE MU PPDU Support는 HE MU PPDU 수신 가능 여부를 나타내는 것일 수 있다.

【0079】 HE STA는 10.7.6 Rate selection for Control frames 룰을 따라서 Control frames를 전송할 수 있고, 아래와 같은 예외들이 있을 수 있다.

【0080】 STBC를 사용하는 HE ER SU PPDU 또는 STBC를 사용하는 HE SU PPDU에 대한 응답으로 전송하는 Control frame은 soliciting PPDU와 같은 format으로 전송될 수 있다.

【0081】 HE trigger-based PPDU에 대한 응답으로 전송되는 AP가 보내는 Control frame은 의도된 수신자가 수신 지원하는 어떤 PPDU format으로도 전송될 수 있다.

【0082】 MU RTS가 아닌 Trigger frame은 의도된 수신자가 수신 지원하는 어떤 PPDU format으로도 전송될 수 있다.

【0083】 MU RTS가 아닌 Trigger frame을 포함하는 PPDU 또는 UL MU Response Scheduling A-Control field를 포함하는 PPDU에 대한 응답으로 전송되는 Control

frame은 HE trigger-based PPDU로 전송될 수 있다.

【0084】FTM frame을 포함하는 HE ER SU PPDU 또는 FTM frame을 포함하는 HE SU PPDU에 대한 응답으로 전송되는 Ack frame은 soliciting PPDU과 같은 PPDU format으로 전송될 수 있지만 FTM frame이 HE SU PPDU로 전송되고 responding STA로부터 soliciting STA로 보내지는 association 후 가장 최근에 성공적으로 수신한 PPDU가 HE ER SU PPDU였던 경우에는 control frame은 HE ER SU PPDU로 전송된다(An Ack frame sent as a response to an HE ER SU PPDU, HE SU PPDU, containing an FTM frame shall be sent in the same PPDU format as the soliciting PPDU except when the FTM frame is carried in HE SU PPDU and the most recent successfully received PPDU sent by the responding STA to the soliciting STA after association was an HE ER SU PPDU in which case the control frame shall be carried in HE ER SU PPDU.).

【0085】Control frame이 soliciting HE ER SU PPDU에 대한 응답으로 보내지는 경우, 그 프레임은 HE ER SU PPDU로 전송될 수 있지만 responding STA로부터 soliciting STA로 전해지는 association 후 전해진 가장 최근 성공적으로 수신한 PPDU가 HE ER SU PPDU가 아닌 경우 그 control frame은 non-HE PPDU로 전해질 수 있다.

【0086】Control frame이 soliciting HE SU PPDU에 대한 응답으로 전해지는 경우 그 프레임은 non-HT PPDU 또는 non-HT duplicate PPDU로 전해질 수 있지만 responding STA로부터 soliciting STA로 전해지는 association 후 전해진 가장 최

근 성공적으로 수신한 PPDU가 HE ER SU PPDU인 경우 그 control frame은 HE ER SU PPDU로 전해질 수 있다.

【0087】non-HT PPDU와 HE ER SU PPDU 간의 PPDU format switching은 subsequent TXOPs에서 발생할 수 있다. Responding STA로부터 control frame을 solicit하는 STA는 TXOP의 expected duration을 계산할 때 control frame의 PPDU format을 고려할 수 있다. Responding STA는 soliciting STA에게 보내진 가장 최근 PPDU에 대한 응답으로 soliciting STA로부터 immediate acknowledgment를 받은 경우 그 soliciting STA에게 보내진 가장 최근 PPDU가 성공적으로 수신되었다고 판단할 수 있다(The responding STA determines that the most recent PPDU sent to the soliciting STA is successfully received if it receives an immediate acknowledgment by the soliciting STA in response to the PPDU.).

【0089】* BSS Color

【0090】다음에서는 BSS color에 대해 설명한다.

【0091】BSS color는 BSS의 identifier 일 수 있다. 이를 이용해서 PPDU 또는 frame을 수신하는 STA는 그 PPDU 또는 frame이 어디서부터 온 것인지 판단할 수 있다. 더 구체적으로 BSS color를 이용해서 PPDU 또는 frame을 수신하는 STA는 그 PPDU 또는 frame이 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 있다.

【0092】HE Operation element 또는 BSS Color Change Announcement element를 송신하는 HE STA는 그 HE Operation element의 BSS Color subfield 또는 그 BSS Color Change Announcement element의 New BSS Color subfield에 넣기 위한 값을 선택할 수 있고, 그 값의 범위는 1부터 63까지 값 중에서일 수 있다. 이때 그 HE STA가 non-AP STA일 때는 예외일 수 있다. 또한 non-AP STA는 HE AP로부터 수신한 BSS color 값을 HE Operation element의 BSS Color subfield에 사용할 수 있고, HE AP로부터 수신한 BSS color 값은 HE Operation element의 BSS Color subfield로부터 수신한 값일 수 있다.

【0093】HE Operation element를 보냈던 HE STA는 TXVECTOR parameter BSS_COLOR로 그 STA가 HE Operation element의 BSS Color subfield에 사용했던 값을 셋팅할 수 있다. TXVECTOR parameter BSS_COLOR 값은 HE-SIG-A의 BSS Color field에 쓰이는 값일 수 있다.

【0094】Active BSS color는 TXVECTOR parameter BSS_COLOR에 사용될 수 있다. Active BSS color는 HE STA가 peer HE STA로부터 HE Operation element를 수신할 때 그 HE Operation element의 BSS Color subfield에 있는 값일 수 있다. HE STA가 BSS Color Change Announcement element를 수신하고 BSS color change TBTT에 도달한 이후에는 active BSS color 값은 그 BSS Color Change Announcement element의 New BSS Color subfield로부터 수신한 값일 수 있다.

【0095】HE STA는 peer STA와 association 또는 TDLS link 또는 DLS link 또는 IBSS membership을 수립한 경우 그 peer STA에게 보내는 HE PPDU에서 TXVECTOR

parameter BSS_COLOR를 active BSS color로 셋팅할 수 있다.

【0096】RXVECTOR parameter BSS_COLOR 값이 1부터 63중 하나인 HE PPDU를 수신하는 HE STA는 OBSS PD-based Spatial Reuse operation 룰을 따라 동작할 수 있다. RXVECTOR parameter BSS_COLOR 값이 0인 HE PPDU를 수신하는 HE STA는 OBSS PD-based Spatial Reuse operation 룰을 따라 동작하지 않을 수 있다.

【0098】일 실시예를 따르면 HE STA가 PPDU를 보낼 때 하나 이상의 intended recipient STAs가 보내는 HE STA의 BSS의 멤버가 아닐 때 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다. 더 구체적으로는 HE STA가 HE SU PPDU 또는 HE extended range SU PPDU를 보낼 때 하나 이상의 intended recipient STAs가 보내는 HE STA의 BSS의 멤버가 아닐 때 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다.

【0099】또한 RXVECTOR parameter BSS_COLOR가 0인 HE PPDU를 수신한 HE STA는 그 HE PPDU를 폐기하지(discard) 않을 수 있다. 더 구체적으로는 RXVECTOR parameter BSS_COLOR가 0인 HE SU PPDU 또는 HE extended range SU PPDU를 수신한 HE STA는 그 HE PPDU를 폐기하지(discard) 않을 수 있다.

【0100】위 설명한 실시예들에 따라 PPDU의 하나 이상의 intended recipient STAs가 PPDU를 보내는 STA와 같은 BSS의 멤버가 아닌 경우, 그 PPDU를 수신하는 STA는 그 PPDU를 폐기하지 않을 수 있다. 더 구체적으로는 HE SU PPDU 또는 HE

extended range SU PPDU의 하나 이상의 intended recipient STAs가 PPDU를 보내는 STA와 같은 BSS의 멤버가 아닌 경우, 그 PPDU를 수신하는 STA는 그 PPDU를 폐기하지 않을 수 있다. 또한 이러한 PPDU에 대해 OBSS PD level을 적용해 CCA하지 않을 수 있다. 또는 이러한 PPDU에 대해 OBSS PD level을 적용해 channel을 idle한 것으로 판단하지 않을 수 있다.

【0102】 어떤 multiple BSSID set의 멤버인 모든 AP 혹은 모든 BSS는 같은 BSS color를 사용할 수 있다.

【0104】 앞서 설명한 실시예들을 따르면 STA는 PPDU를 전송할 때 intended recipient STA(s)가 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA일 수 있고, 그때 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있는데, 이때 그 PPDU 또는 그 PPDU가 포함한 하나 이상의 A-MPDU가 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA에게 향하는 것일 수도 있고, PPDU가 포함한 하나 이상의 frame이 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA에게 향하는 것일 수도 있고, PPDU가 포함한 하나 이상의 frame의 일부가 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA에게 향하는 것일 수도 있다. 또한 어떤 경우엔 STA가 PPDU를 전송할 때 intended recipient STA(s) 중에 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속하지 않은 STA와 이 PPDU를 보내는 STA의 BSS와 같은 BSS에 속한 STA가 모두 있을 수 있다. 일 실시예로 AP는 Trigger frame을 전송할 때

unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있다. 그러한 경우 그 User Info 필드는 프레임을 전송하는 STA의 BSS의 멤버가 아닌 STA가 intended recipient이므로 TXVECTOR parameter BSS_COLOR를 0으로 셋팅할 수 있다. 이러한 경우 발생할 수 있는 문제점 또는 단점에 대해 도 10, 11, 12에서 설명하겠다.

【0105】 도 10은 본 발명의 일 실시예에 따른 UL MU 동작 및 NAV 셋팅을 나타낸 도면이다.

【0107】 * Intra-BSS and inter-BSS frame determination

【0108】 본 발명의 일 실시예인 intra-BSS and inter-BSS frame determination에 대해서 설명한다.

【0109】 본 발명의 일 실시예에 따르면 STA는 수신한 frame이 intra-BSS frame인지 inter-BSS frame인지 판단할 수 있다. 이때 판단을 위해 RXVECTOR parameters(예를 들면 BSS_COLOR, GROUP_ID와 PARTIAL_AID, SPATIAL_REUSE 등), MAC address, 수신한 PPDU 종류(수신한 PPDU 종류도 RXVECTOR parameter를 사용한 판단일 수 있다.) 등을 사용할 수 있다.

【0111】 STA는 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 자신의 BSS의 BSS color와 일치하면 그 PPDU를 intra-BSS에서 온 것으로 판단하고, 일치하지 않

으면 inter-BSS에서 온 것으로 판단할 수 있다.

【0112】 STA는 수신한 frame의 MAC header의 address fields 중 하나가 자신의 BSS의 BSSID와 일치하거나 자신의 BSS의 BSSID가 속한 multiple BSSID set의 BSSID 중 하나와 일치하면 그 frame을 intra-BSS에서 온 것으로 판단할 수 있다. 그렇지 않으면 그 frame을 inter-BSS frame으로 판단할 수 있다.

【0113】 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 0일 때 RXVECTOR parameter PARTIAL_AID가 자신의 BSS의 BSSID 혹은 자신의 BSS의 BSSID가 속한 multiple BSSID set의 BSSID 중 하나의 비트 39에서 비트 47까지와 일치하면 그 PPDU를 intra-BSS에서 온 것으로 판단하고, 그렇지 않으면 inter-BSS에서 온 것으로 판단할 수 있다.

【0114】 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63일 때 RXVECTOR parameter PARTIAL_AID의 비트 5부터 비트 8이 자신의 BSS의 partial BSS color와 일치하면 그 PPDU를 intra-BSS에서 온 것으로 판단하고, 그렇지 않으면 inter-BSS에서 온 것으로 판단할 수 있다. Partial BSS color는 자신의 BSS의 BSS color의 4 LSBs일 수 있다. 또한 partial BSS color를 기반으로 한 판단 방법은 AP로부터 판단 허용을 지시받은 경우에 수행할 수도 있고, AP는 HE Operation의 Partial BSS Color field를 이용해 지시할 수 있다.

【0115】 STA는 수신한 frame의 TA field가 없고, RA field가 associate된 BSS의 저장된 TXOP holder address와 일치하는 경우 그 frame을 intra-BSS frame으로 판단할 수 있다. 또한 이 판단 방법은 control frame을 수신한 경우도 한정할

수도 있다.

【0116】AP STA가 VHT MU PPDU 또는 UL/DL field를 DL로 셋팅한 HE MU PPDU를 수신한 경우 그 PPDU를 inter-BSS에서 온 것으로 판단할 수 있다.

【0118】아래에서는 위에 설명한 intra-BSS, inter-BSS 판단 방법을 더 구체적으로 설명한다.

【0119】STA는 수신한 프레임이 다음 조건 중 하나를 만족시키면 그 프레임을 intra-BSS frame으로 판단할 수 있다.

【0120】- 그 frame을 나르는 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 그 STA의 BSS의 BSS color와 같다. 이 BSS color는 associated AP에 의해 알려진 값일 수도 있고, AP가 운영하는 BSS에 알리고 있는 BSS color 값일 수도 있다.

【0121】- 수신한 frame의 RA field 또는 TA field 또는 BSSID field를 Individual/Group bit를 0으로 바꾼 뒤의 값이 STA의 BSS의 BSSID와 같다.

【0122】- STA가 association된 AP(혹은 AP)가 2개 이상의 members가 있는 multiple BSSID set의 member이고, 수신한 frame의 RA field 또는 TA field 또는 BSSID field를 Individual/Group bit를 0으로 바꾼 뒤의 값이 그 multiple BSSID set의 any member의 BSSID와 같다.

【0123】- 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 0이고, RXVECTOR parameter PARTIAL_AID가 STA가 association된 AP(혹은 AP)의

BSSID[39:47]과 같다.

【0124】- STA가 속한 BSS의 가장 최근 HE Operation element의 Partial BSS Color field가 1이고, 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같다.

【0125】- 그 frame이 TA field를 갖지 않은 Control frame이고, RA field가 association된 BSS의 saved TXOP holder address와 같다.

【0127】STA는 수신한 프레임이 다음 조건 중 하나를 만족시키면 그 프레임을 inter-BSS frame으로 판단할 수 있다.

【0128】- 그 frame을 나르는 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 0이 아니고, 그 STA의 BSS의 BSS color와 같지 않다. 이 BSS color는 associated AP에 의해 알려진 값일 수도 있고, AP가 운영하는 BSS에 알리고 있는 BSS color 값일 수도 있다.

【0129】- 수신한 frame에 BSSID field가 있으면 BSSID field의 Individual/Group bit를 0으로 바꾼 뒤의 값이 STA가 association된 AP(혹은 AP)의 BSSID와 같지 않다. 이 판단 방법은 그 frame을 나르는 수신한 PPDU에 RXVECTOR parameter BSS_COLOR가 없는 경우로 한정하는 것도 가능하다.

【0130】- BSSID field가 없고, RA field와 TA field가 모두 존재할 때 address fields 값의 Individual/Group bit를 0으로 바꾼 값 중 어떤 것도 STA가

association된 AP(혹은 AP)의 BSSID와 일치하지 않는다. 이 판단 방법은 그 frame을 나르는 수신한 PPDU에 RXVECTOR parameter BSS_COLOR가 없는 경우로 한정하는 것도 가능하다.

【0131】- STA가 association된 AP(혹은 AP)가 2개 이상의 members가 있는 multiple BSSID set의 member이고, 수신한 frame에 BSSID field가 있는 경우, BSSID field를 Individual/Group bit를 0으로 바꾼 뒤의 값이 그 multiple BSSID set의 any member의 BSSID와도 같지 않다.

【0132】- STA가 association된 AP(혹은 AP)가 2개 이상의 members가 있는 multiple BSSID set의 member이고, 수신한 frame에 BSSID field가 없고 RA field와 TA field가 있는 경우, address fields 중 어떤 것을 Individual/Group bit를 0으로 바꾼 뒤의 값이 그 multiple BSSID set의 any member의 BSSID와도 같지 않다.

【0133】- 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 0이고, RXVECTOR parameter PARTIAL_AID가 STA가 association된 AP(혹은 AP)의 BSSID[39:47]과 같지 않다.

【0134】- STA가 속한 BSS의 가장 최근 HE Operation element의 Partial BSS Color field가 1이고, 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같지 않다.

【0135】- 그 STA가 AP이고 VHT MU PPDU 또는 UL/DL field가 DL로 표시된 HE MU PPDU를 수신하였다.

【0137】 Intra-BSS, inter-BSS를 판단할 때 MAC address에 의한 판단이 RXVECTOR parameter에 의한 판단보다 우선할 수 있다. 예를 들면 MAC address에 의한 판단이 RXVECTOR parameter BSS_COLOR에 의한 판단보다 우선할 수 있다. 또한 MAC address에 의한 판단이 RXVECTOR parameter GROUP_ID와 RXVECTOR parameter PARTIAL_AID에 의한 판단보다 우선할 수 있다. 또한 MAC address에 의한 판단이 수신한 PPDU 종류에 의한 판단보다 우선할 수 있다. 또한 우선 조건은 수신한 frame이 위의 intra-BSS 조건과 inter-BSS 조건을 모두 만족시키는 경우에 사용할 수도 있다.

【0138】 또는 수신한 frame이 intra-BSS 조건과 inter-BSS 조건을 모두 만족시키는 경우 inter-BSS로 판단할 수 있다.

【0139】 또한 수신한 frame이 intra-BSS 조건과 inter-BSS 조건을 모두 만족시키지 않는 경우 그 frame은 intra-BSS로도, inter-BSS로두 판단할 수 없는 것일 수 있다.

【0141】 * Two NAVs

【0142】 본 발명의 일 실시예에 따르면 STA는 2개의 NAVs 혹은 2개의 NAV timers를 운영할 수 있다. 그리고 2개의 NAVs는 각각 intra-BSS NAV와 basic NAV일 수 있다. Intra-BSS NAV는 intra-BSS로부터 온 것으로 판단되는 frame 혹은 PPDU로

부터 설정하는 NAV 값을 저장하기 위한 것일 수 있다. Basic NAV는 inter-BSS로부터 온 것으로 판단되거나 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 없는 frame 혹은 PPDU로부터 설정하는 NAV 값을 저장하기 위한 것일 수 있다. NAV를 설정하는 duration information은 MAC header의 Duration/ID field 혹은 HE-SIG-A의 TXOP Duration field 등으로부터 얻을 수 있다.

【0144】 STA는 수신한 frame이 intra-BSS에서 온 것으로 판단되는 경우에 그 frame에 의해 지시된 duration information(MAC header의 duration information)에 기반하여 intra-BSS NAV를 업데이트할 수 있다. 또한 이 NAV 업데이트 동작은 이 STA가 그 frame 혹은 그 frame을 나르는 PPDU에 의해 immediate response가 solicit 되지 않은 경우에 수행될 수도 있다. 하지만 immediate response가 solicit되었지만 응답하지 않은 경우에도 업데이트가 수행될 수 있다. 또한 이 STA가 TXOP holder인 경우에는 이 STA가 solicit하지 않은 frame에 대해서만 업데이트 동작을 수행하는 것이 가능하다.

【0145】 STA는 수신한 frame이 inter-BSS에서 온 것으로 판단된 경우 혹은 수신한 frame이 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 없는 경우에 그 frame에 의해 지시된 duration information(MAC header의 duration information)에 기반하여 basic NAV를 업데이트할 수 있다. 또한 이 NAV 업데이트 동작은 이 STA가 그 frame 혹은 그 frame을 나르는 PPDU에 의해 immediate response가 solicit 되지 않은 경우에 수행될 수도 있다. 하지만 immediate

response가 solicit되었지만 응답하지 않은 경우에도 업데이트가 수행될 수 있다.

【0146】STA는 수신한 PPDU가 intra-BSS에서 온 것으로 판단된 경우 RXVECTOR parameter TXOP_DURATION에 의해 지시된 duration information에 기반하여 intra-BSS NAV를 업데이트할 수 있다. 또한 이 업데이트 동작은 RXVECTOR parameter TXOP_DURATION이 duration 정보를 나타내고 있는 경우로 한정할 수 있다. 예를 들면 RXVECTOR parameter TXOP_DURATION의 값이 모두 1로 셋팅되지 않은 경우 업데이트를 수행할 수 있다. 또한 이 업데이트 동작은 이 PPDU로부터 Duration/ID field의 duration information을 수신하지 않은 경우에 수행될 수 있다. 또한 이 업데이트 동작은 이 RXVECTOR parameter의 duration information을 나른 PPDU가 이 STA에 의해 trigger된 HE trigger-based PPDU가 아닌 경우에 수행될 수도 있다.

【0147】STA는 수신한 PPDU가 inter-BSS에서 온 것으로 판단된 경우 혹은 수신한 frame이 intra-BSS에서 온 것인지 inter-BSS에서 온 것인지 판단할 수 없는 경우에 RXVECTOR parameter TXOP_DURATION에 의해 지시된 duration information에 기반하여 basic NAV를 업데이트할 수 있다. 또한 이 업데이트 동작은 RXVECTOR parameter TXOP_DURATION이 duration 정보를 나타내고 있는 경우로 한정할 수 있다. 예를 들면 RXVECTOR parameter TXOP_DURATION의 값이 모두 1로 셋팅되지 않은 경우 업데이트를 수행할 수 있다. 또한 이 업데이트 동작은 이 PPDU로부터 Duration/ID field의 duration information을 수신하지 않은 경우에 수행될 수 있다.

【0149】위 언급한 NAV 업데이트 동작은 현재 설정되어 있는 NAV보다 새로 수신한 duration information이 더 클 때 수행될 수 있다.

【0150】또한 STA가 Duration/ID field와 RXVECTOR parameter TXOP_DURATION 둘 모두로부터 duration information을 수신한 경우 RXVECTOR parameter TXOP_DURATION에 의해 지시된 duration information은 무시될 수 있다.

【0152】* HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR 셋팅

【0153】본 발명의 일 실시예를 따르면 HE trigger-based PPDU를 전송하는 STA는 다음과 같이 TXVECTOR parameter BSS_COLOR 셋팅할 수 있다. 만약 이 HE trigger-based PPDU를 solicit한 Trigger frame을 BSS color를 포함한 PPDU, 예를 들면 HE PPDU를 통해 수신한 경우, 이 HE PPDU의 RXVECTOR parameter BSS_COLOR로 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 셋팅할 수 있다. 만약 이 HE trigger-based PPDU를 solicit한 Trigger frame을 BSS color를 포함하지 않는 PPDU, 예를 들면 non-HE PPDU를 통해 수신한 경우, 이 PPDU의 BSS로부터 가장 최근 수신한 HE Operation element의 BSS Color subfield 값(혹은 BSS color change announcement가 있었고 BSS color change TBTT에 도달한 경우 BSS Color Change Announcement element의 New BSS Color subfield 값)으로 HE trigger-based

PPDU의 TXVECTOR parameter BSS_COLOR를 셋팅할 수 있다.

【0155】 앞서 설명한 것처럼 하나 이상의 intended recipient가 같은 BSS가 아닌 경우, 예를 들면 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame을 전송하는 경우 HE PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 셋팅될 수 있다. 이때 이 PPDU를 수신하는 STA가 설명한 intra-BSS, inter-BSS 판단 방법을 따르면 STA가 RXVECTOR parameter BSS_COLOR를 수신했을 때 0으로 셋팅되어 있기 때문에 RXVECTOR parameter BSS_COLOR에 기반해서 intra-BSS, inter-BSS를 판단할 수 없다. 이 STA의 BSS의 BSS color는 1부터 63 중 한 값이므로 RXVECTOR parameter BSS_COLOR는 intra-BSS 조건을 만족시킬 수 없고, 수신한 RXVECTOR parameter BSS_COLOR가 0이므로 inter-BSS 조건을 만족시킬 수 없다. 따라서 PPDU를 수신한 STA가 duration information을 preamble로부터만 수신하는 경우에는 이 PPDU가 intra-BSS로부터 온 것인지 inter-BSS로부터 온 것인지 판단할 수 없게 되고, NAV 업데이트 룰을 따라 basic NAV를 셋팅할 수 있다. 이것은 이 STA가 PPDU를 보낸 STA와 같은 BSS인 경우에도 해당한다. 즉 이 STA는 실제로 같은 BSS에서 보낸 PPDU를 수신하고 basic NAV를 셋팅할 수 있다. 여기서 duration information을 preamble로부터만 수신하는 경우는 여러 가지가 있을 수 있다. 먼저 HE preamble 수신 결과 unsupported 값들로 셋팅되어있어서 MAC payload를 수신하지 못할 수 있다. 예를 들면 MCS, DCM, 코딩 종류 등에 따라 수신하는 STA가 수신을 지원하지 못할 수 있다. 또한 HE preamble 수신

후 MAC payload, frame 디코딩에 실패할 수도 있다. 또한 수신한 PPDU가 HE trigger-based PPDU인 경우에는 PPDU, PSDU가 어떻게 구성되어 있는지 모르므로 frame을 수신할 수 없다.

【0156】 또한 원래 intra-BSS NAV를 셋팅해야할 것을 basic NAV를 셋팅함으로써 다음과 같은 문제가 발생한다. 본 발명의 일 실시예를 따르면 STA가 AP에 의해 solicit 되었을 때 virtual CS를 고려해야 하지만 만약 NAV가 intra-BSS frame에 의해 설정된 경우 virtual CS를 고려하지 않을 수 있다. 예를 들면 AP가 STA에게 Trigger frame으로 response를 solicit했을 때 STA의 NAV가 intra-BSS frame에 의해 설정된 경우 NAV가 0이 아님에도 불구하고 Trigger frame에 응답할 수 있다. 따라서 원래 intra-BSS NAV를 셋팅해야할 것을 basic NAV를 셋팅하게 되면 intra-BSS AP가 immediate response를 solicit해도 응답하지 못할 수 있다. 예를 들면 intra-BSS AP가 UL MU 동작에 따라 HE trigger-based PPDU를 solicit하는 경우에 응답하지 못할 수 있다.

【0158】 도 10을 참조하면 BSS1에서 프레임 송수신이 일어날 수 있고, STA1과 STA2는 BSS1의 STA일 수 있다. 또한 BSS1에서 TXOP 안에서의 송수신이 일어날 수 있고, STA1와 STA2는 BSS1에서 전송되는 PPDU를 전부 혹은 일부 수신할 수 있다. BSS1의 AP는 TXVECTOR parameter BSS_COLOR를 0으로 설정하여 PPDU를 전송할 수 있다. 예를 들면 AP가 보내는 PPDU가 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame을 포함하기 때문에

BSS_COLOR를 0으로 설정할 수 있다. 이때 Trigger frame은 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드 외에 associated STA를 위한 User Info 필드(예를 들면 특정 STA를 scheduling하는 User Info 필드, associated STAs를 위한 random access RU를 지시하는 User Info 필드)를 포함할 수도 있고, 포함하지 않을 수도 있다. 그리고 STA1은 이 PPDU를 수신할 수 있다. 앞서 설명한 것처럼 STA1이 valid HE-SIG-A를 수신했다고 하더라도 HE-SIG-A에서 얻은 정보로 intra-BSS인지 inter-BSS인지 판단하지 못할 수 있다. 또한 HE-SIG-A가 나타내는 값이 이 STA가 지원하지 않는 것이어서 수신을 중단할 수 있고, 수신을 시도하더라도 채널 상황 등의 이유로 frame 수신을 실패할 수 있다. 이러한 경우 STA는 duration information을 RXVECTOR parameter TXOP_DURATION으로부터만 얻게 되고, intra-BSS, inter-BSS를 판단할 수 없으므로 basic NAV를 설정하게 된다.

【0159】또한 Trigger frame에 응답하는 STA들은 HE trigger-based PPDU를 도 10에서 두번째 PPDU와 같이 전송하게 되는데, 이때 preceding Trigger frame이 HE PPDU에 전송되었으므로 preceding Trigger frame을 포함한 PPDU의 RXVECTOR parameter BSS_COLOR가 0인 이 실시예에서 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정하게 된다. 따라서 이 HE trigger-based PPDU를 수신하는 STA2는 HE-SIG-A를 통해 이 PPDU가 intra-BSS로부터 온 것인지 inter-BSS로부터 온 것인지 판단할 수 없고, preceding Trigger frame의 intended recipient가 아니었던 STA2는 HE trigger-based PPDU가 포함한 frame을 수신하지 못하고 duration information을 RXVECTOR parameter TXOP_DURATION으로부터 밖에 얻을 수

없다. 따라서 basic NAV를 설정하게 된다.

【0160】 따라서 도 10의 세번째 PPDU와 같이 STA1와 STA2에게서 immediate response를 solicit하는 Trigger frame을 STA1과 STA2가 수신했더라도 virtual CS 결과 busy하여 실제로 intra-BSS로부터의 PPDU가 NAV를 설정하고 intra-BSS AP가 UL MU response를 solicit한 경우인데도 응답하지 못하는 일이 발생할 수 있다.

【0162】 도 11은 본 발명의 일 실시예에 따른 UL MU 동작 및 power save 동작을 나타낸 도면이다.

【0164】 * intra-PPDU power save

【0165】 본 발명의 일 실시예에 따르면 STA는 PPDU를 수신했을 때 이 PPDU 길이 동안 frame을 송신 또는 수신할 수 없음을 판단할 수 있고, 이때 power save 동작을 통해 doze state에 들어갈 수 있다. STA가 수신한 PPDU 길이 동안 frame을 송신 또는 수신할 수 없다는 것은 intra-BSS PPDU를 수신했고, 그 PPDU가 그 STA로 향한 것이 아닐 때일 수 있다. 이것은 그 PPDU는 그 STA를 위한 것이 아니고, 그 PPDU의 길이 동안 그 STA가 frame을 전송하더라도 peer STA가 그 PPDU를 송신 또는 수신하는 중이므로 전송 성공할 수 없기 때문이다. 이러한 power save 동작을 intra-PPDU power save라고 부를 수 있다.

【0166】Non-AP STA는 수신한 PPDU가 uplink일 때 그 PPDU가 자신에게 향하는 것이 아니라고 판단할 수 있다. 또는 non-AP STA가 수신한 PPDU가 포함한 frame의 RA field가 그 STA의 MAC address가 아닐 때 그 PPDU가 자신에게 향하는 것이 아니라고 판단할 수 있다. 또는 non-AP STA가 downlink PPDU를 수신했지만 그 PPDU의 preamble가 포함한 recipient identifiers가 그 STA를 나타내고 있지 않을 때, 예를 들면 UL/DL field가 DL로 설정된 HE MU PPDU를 수신했지만 HE-SIG-B가 그 STA의 AID를 포함하고 있지 않을 때 그 PPDU가 자신에게 향하는 것이 아니라고 판단할 수 있다.

【0167】Non-AP STA는 RXVECTOR parameter BSS_COLOR가 자신이 속한 BSS의 BSS color와 같을 때 수신한 PPDU가 intra-BSS라고 판단할 수 있다. 또한 non-AP STA는 수신한 frame의 MAC address 중 하나가 자신이 속한 BSS의 BSSID일 때 intra-BSS라고 판단할 수 있다.

【0168】다음에서 intra-PPDU power save 동작을 더 자세히 설명한다.

【0169】Non-AP STA는 다음 조건 중 하나를 만족시킬 때 수신하고 있는 PPDU의 끝까지 doze state로 들어갈 수 있다.

【0170】- 그 PPDU가 HE MU PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 association된 BSS의 BSS color이고, RXVECTOR parameter UL_FLAG(혹은 UPLINK_FLAG)가 downlink(0)을 나타내고 있고, RXVECTOR parameter STA_ID_LIST가 이 STA의 identifier나 이 STA에게 가는 broadcast identifier를 포함하고 있지 않

다.

【0171】- 그 PPDU가 HE MU PPDU 또는 HE SU PPDU 또는 HE extended range SU PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 속한 BSS의 BSS color와 같고 RXVECTOR parameter UL_FLAG(혹은 UPLINK_FLAG)가 uplink(1)를 나타내고 있다.

【0172】- 그 PPDU가 HE MU PPDU 또는 HE SU PPDU 또는 HE extended range SU PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 속한 BSS의 BSS color와 같고 RXVECTOR parameter UL_FLAG(혹은 UPLINK_FLAG)가 downlink(0)를 나타내고 있고, PHY-RXEND.indication(UnsupportedRate) primitive를 받았다.

【0173】- 그 PPDU가 HE trigger-based PPDU이고, RXVECTOR parameter BSS_COLOR가 그 STA가 속한 BSS의 BSS color와 같다.

【0174】- 그 PPDU가 VHT PPDU이고, RXVECTOR parameter PARTIAL_AID가 그 STA가 속한 BSS의 BSSID의 BSSID[39:47]과 같고, RXVECTOR parameter GROUP_ID가 0이다.

【0175】- 그 PPDU가 포함한 MPDU가 그 STA가 속한 BSS의 BSSID 혹은 그 STA가 속한 BSS의 BSSID가 속한 multiple BSSID set의 BSSID와 일치하는 RA 또는 TA 또는 BSSID field를 포함하고 있고, RA field가 그 STA의 MAC address가 아니다.

【0177】앞서 설명한 것처럼 STA가 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 0으로 셋팅되는 경우가 발생할 수 있고, 그러한 경우 frame의 MAC header를 수신하지 않고서는 intra-PPDU power save 동작을 통해 doze state로 들어갈 수 없다.

【0179】도 11을 참조하면 BSS1에서 프레임 송, 수신이 일어날 수 있고, STA1은 BSS1에 속해있을 수 있다. BSS1의 AP는 Trigger frame을 포함해서 PPDU를 전송할 수 있는데 이때 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 포함하는 경우에 TXVECTOR parameter BSS_COLOR를 0으로 설정하게 된다. 그리고 그 Trigger frame에 응답하는 STA는 응답하는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 preceding Trigger frame을 포함한 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR인 0으로 설정하게 된다. STA1이 수신한 PPDU의 RXVECTOR parameter BSS_COLOR가 0일 때 STA1은 그 PPDU가 실제로는 intra-BSS이고, STA1을 향한 PPDU가 아니어서 그 PPDU 동안 doze state로 들어가도 상관없음에도 불구하고 MAC header를 수신하지 않고서는 doze state로 들어갈 수 없다. 도 11의 첫번째 PPDU와 같은 Trigger frame을 포함한 DL PPDU를 수신하는 경우에는 frame을 수신하게 되면 MAC header의 address fields를 통해 doze state로 들어갈 가능성이 있지만 frame을 수신할 수 없거나 수신 실패한 경우에는 doze state로 들어갈 수 없다. 도 11의 두번째 PPDU와 같은 HE trigger-based PPDU를 수신한 경우에는 frame을 수신할 수 없으므로 doze state로 들어갈 수 없다.

【0181】 도 12는 본 발명의 일 실시예에 따른 UL MU 동작 및 채널 유휴 상태 판단을 나타낸 도면이다.

【0183】 본 발명의 일 실시예에 따르면 STA는 inter-BSS PPDU에 대해 기존의 CCA threshold 이상의 threshold를 사용하여 채널이 busy한지 idle한지 판단할 수 있다. 기존의 CCA threshold 이상의 threshold를 OBSS PD level이라고 할 수 있고, 이러한 채널 판단 동작을 OBSS PD-based Spatial Reuse(SR) 동작이라고 할 수 있다. STA는 수신한 PPDU가 inter-BSS인 경우 수신한 PPDU의 received power이 OBSS PD level보다 작으면 PHY-CCARESET.request primitive를 발행할 수 있고 그 PPDU로부터의 duration information에 기반하여 NAV를 업데이트하지 않을 수 있다. 예를 들면 PPDU의 received power는 legacy portion에서 측정할 수 있다.

【0184】 따라서 앞서 설명한 것처럼 RXVECTOR parameter BSS_COLOR가 0으로 설정된 PPDU를 수신하면 그 PPDU가 intra-BSS인지 inter-BSS인지 판단할 수 없고, MAC header를 수신하지 못하면 실제 그 PPDU가 inter-BSS이더라도 OBSS PD-based SR 동작을 수행하지 못할 수 있다.

【0186】 도 12를 참조하면 BSS1에서 프레임 송, 수신이 일어날 수 있고, BSS1과 다른 BSS인 BSS2에 속한 STA1이 있을 수 있다. BSS1의 AP는 Trigger frame

을 포함해서 PPDU를 전송할 수 있는데 이때 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 포함하는 경우에 TXVECTOR parameter BSS_COLOR를 0으로 설정하게 된다. 그리고 그 Trigger frame에 응답하는 STA는 응답하는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 preceding Trigger frame을 포함한 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR인 0으로 설정하게 된다. 도 12의 첫번째 PPDU가 전송될 때 STA1은 이를 수신할 수 있고 HE-SIG-A를 수신할 때까지 채널 상황을 busy로 판단할 것이다. 그리고 HE-SIG-A를 통해 이 PPDU가 intra-BSS인지 inter-BSS인지 판단할 수 없으므로 바로 OBSS PD-based SR 동작을 수행할 수 없다. 만약 frame을 수신하는 경우에는 intra-BSS인지 inter-BSS인지 판단할 가능성이 있고, OBSS PD-based SR 동작을 수행할 수 있다. 도 12에서 두번째 PPDU가 전송될 때 STA1은 이를 수신할 수 있고 HE-SIG-A를 수신할 때까지 채널 상황을 busy로 판단할 것이다. 그리고 HE-SIG-A를 통해 이 PPDU가 intra-BSS인지 inter-BSS인지 판단할 수 없고, HE trigger-based PPDU로부터 frame을 수신할 수 없으므로 이 PPDU에서 OBSS PD-based SR 동작을 수행할 기회가 없다. 따라서 BSS1은 UL MU operation은 inter-BSS의 OBSS PD-based SR 동작으로부터 보호하는 결과를 가져왔다. 이를 악용하면 AP는 자신의 UL MU operation을 보호하기 위해 dummy하게 혹은 불필요하게 unassociated STAs를 위한 random access RU를 지시하는 User Info 필드를 Trigger frame을 포함할 수 있다.

【0188】 도 10 내지 도 12를 통해 설명한 문제를 해결하기 위한 방법을 아래에서 설명한다.

【0189】 앞서 설명한 것처럼 하나 이상의 intended recipient STAs가 transmitting STA의 BSS의 member가 아니면 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있지만 설명한 문제를 해결하기 위해 예외 사항을 가질 수 있다.

【0190】 본 발명의 일 실시예를 따르면 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 또는 HE trigger-based PPDU를 solicit하는 frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 여기서 보내는 STA의 BSS의 BSS color 값은 그 BSS의 HE Operation element의 BSS Color subfield 값일 수 있다. 또한 BSS Color Change Annouce를 했고 BSS color change TBTT에 도달한 후에는 BSS Color Change Announcement element의 New BSS Color subfield 값일 수 있다.

【0191】 더 구체적인 실시예로 unassociated STA를 solicit하는 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 예를 들면 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0192】 더 구체적인 실시예로 unassociated STA를 solicit하는 Trigger

frame과 associated STA에게 향하는 frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 일 실시예로 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame은 다른 frame일 수 있다. 예를 들면 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame이 MPDU aggregation되어 있는 A-MPDU를 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 또는 unassociated STA를 solicit하는 Trigger frame을 포함하는 PSDU와 associated STA에게 향하는 frame을 포함하는 PSDU를 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다. 또다른 실시예로 unassociated STA를 solicit하는 Trigger frame과 associated STA에게 향하는 frame은 같은 frame일 수 있다. 즉, Trigger frame이 unassociated STA를 위한 User Info 필드를 포함하고, associated STA를 위한 User Info 필드(예를 들면 구체적인 하나의 associated STA를 Trigger하는 User Info 필드 혹은 associated STA를 위한 random access RU를 지시하는 User Info 필드)를 포함할 때 그 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR는 0으로 설정하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0193】 본 발명의 또다른 실시예를 따르면 PPDU의 intended recipient STAs가 transmitting STA의 BSS의 member인 STA와 transmitting STA의 BSS의 member가 아닌 STA를 모두 포함할 때 그 PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정

하지 않고, 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0194】 본 발명의 또다른 실시예를 따르면 PPDU의 모든 intended recipient STAs가 transmitting STA의 BSS의 member가 아닐 때 BSS_COLOR를 0으로 설정하고, 그렇지 않은 경우 TXVECTOR parameter BSS_COLOR를 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0195】 위 실시예들과 같이 TXVECTOR parameter BSS_COLOR를 설정함으로써 intra-BSS로부터의 PPDU로부터 intra-BSS NAV를 설정할 수 있고, 그에 따라 intra-BSS AP가 UL MU response를 trigger할 때 적절히 응답할 수 있다. 또한 intra-BSS PPDU를 수신했을 때 RXVECTOR parameter BSS_COLOR를 기반으로 intra-PPDU power save 동작을 통해 doze state로 들어갈 수 있다. 또한 실시예의 설정을 사용한 PPDU를 보낸 STA와 다른 BSS의 STA가 이 PPDU를 보낸 BSS에서의 PPDU를 수신했을 때 OBSS PD-based SR 동작을 수행하게 할 수 있다.

【0196】 본 발명의 일 실시예를 따르면 위 설명한 TXVECTOR parameter BSS_COLOR 설정에 따른 문제 상황과 솔루션은 그 PPDU가 HE SU PPDU 또는 HE extended range SU PPDU일 때일 수 있다.

【0198】 도 13은 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면이다.

【0199】BSS1에서 보내는 PPDU는 Trigger frame을 포함할 수 있고, 이 Trigger frame은 unassociated STA를 위한 User Info 필드를 포함할 수 있다. 예를 들어 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있다. 예를 들면 User Info 필드의 AID12 subfield를 2045로 설정함으로써 이를 지시할 수 있다. 더불어서 Trigger frame은 associated STA를 위한 User Info 필드를 함께 포함할 수 있다. 이 Trigger frame을 포함한 PPDU 또는 이 Trigger frame이 solicit한 HE trigger-based PPDU를 수신한 STA들이 적절한 NAV 설정, intra-PPDU power save 동작, OBSS PD-based SR 동작을 수행하게 하기 위해 PPDU의 intended recipient STA에 PPDU를 보내는 STA의 BSS의 member가 아닌 STA가 있을지라도 TXVECTOR parameter BSS_COLOR를 0이 아닌 보내는 STA의 BSS의 BSS color로 설정할 수 있다.

【0201】도 14는 본 발명의 일 실시예에 따른 BSS Color 셋팅을 나타낸 도면이다.

【0202】앞서 설명한 것처럼 하나 이상의 intended recipient STAs가 transmitting STA의 BSS의 member가 아니면 PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다. 따라서 unassociated STA를 위한 User Info 필드를 포함하는 Trigger frame을 포함하는 PPDU의 TXVECTOR parameter BSS_COLOR를 0으로 설정할 수 있다. 그러나 이 PPDU는 어떤 STA가 수신하더라도 unsupported parameters의 PPDU가 아닌 한 frame을 수신할 기회가 존재한다. 예를 들어 HE SU PPDU를 수신

하는 경우 그 PPDU가 포함한 MAC header를 수신할 기회가 존재한다.

【0203】 그러나 앞선 실시예를 따르면 이에 대해 응답하는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR도 0으로 설정하게 되고 이 PPDU의 intended recipient가 아닌 STA들은 이 PPDU가 포함하는 frame을 수신할 수 없는 문제가 있다. Intended recipient가 아닌 STA들은 PPDU 또는 PSDU 또는 RU 구성을 알 수 없기 때문이다. 따라서 도 10 내지 도 12에서 설명한 문제를 해결하기 위해 이러한 HE trigger-based PPDU에 대해 TXVECTOR parameter BSS_COLOR 설정 방법을 제안한다.

【0204】 본 발명의 일 실시예를 따르면 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR는 항상 0이 아닌 값으로 설정할 수 있다. 또는 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR는 이 HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값으로 설정할 수 있다. HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 가장 최근 수신한 이 BSS의 HE Operation element의 BSS Color subfield 값일 수 있다. 만약 BSS Color Change Announce가 있었고, BSS color change TBTT에 도달한 경우, HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 이 BSS의 BSS Color Change Announcement element의 New BSS Color subfield 값일 수 있다. 또는 HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다. 또는 HE trigger-based PPDU를 solicit한 STA의 BSS의 BSS color 값은 그 BSS의 HE Operation element를 수신

했던 STA에게는 HE Operation element의 BSS Color subfield 값이고, 그 BSS의 HE Operation element를 수신하지 않은 STA에게는 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다.

【0205】 또다른 실시예로 preceding Trigger frame을 포함한 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR가 0인 경우 HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR를 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color로 설정할 수 있다. 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 가장 최근 수신한 이 BSS의 HE Operation element의 BSS Color subfield 값일 수 있다. 만약 BSS Color Change Announce가 있었고, BSS color change TBTT에 도달한 경우, 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 이 BSS의 BSS Color Change Announcement element의 New BSS Color subfield 값일 수 있다. 또는 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다. 또는 그 preceding Trigger frame을 전송한 STA의 BSS의 BSS color 값은 그 BSS의 HE Operation element를 수신했던 STA에게는 HE Operation element의 BSS Color subfield 값이고, 그 BSS의 HE Operation element를 수신하지 않은 STA에게는 도 15에서 설명할 Trigger frame이 포함하는 BSS Color subfield 값일 수 있다.

【0206】 도 14를 참조하면 BSS1에서 UL MU 동작이 일어날 수 있다. Trigger frame을 포함한 PPDU의 TXVECTOR parameter BSS_COLOR 값이 0으로 설정될 수 있고,

이는 intended recipient STAs 중에 이 PPDU를 전송하는 STA의 BSS의 member가 아닌 STA가 포함되었기 때문일 수 있다. 따라서 이 PPDU를 수신할 때 RXVECTOR parameter BSS_COLOR가 0임에도 불구하고 HE trigger-based PPDU를 보낼 때 TXVECTOR parameter BSS_COLOR를 BSS1의 BSS color 값으로 설정할 수 있다.

【0208】도 15는 본 발명의 일 실시예에 따른 Trigger frame의 User Info 필드 포맷을 나타낸 도면이다.

【0209】HE trigger-based PPDU를 전송하는 STA가 TXVECTOR parameter BSS_COLOR를 설정하기 위한 값이 필요할 수 있다. 본 발명의 일 실시예를 따르면 더 빠른 random access 접속을 위해 어떤 BSS로부터 RAPS element 수신 또는 Beacon frame 수신 또는 Probe Response frame 수신 전에 그 BSS의 AP가 보내는 Trigger frame에 대해 random access 시도를 할 수 있다. 예를 들면 Trigger frame은 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있고, unassociated STA가 이 Trigger frame을 활용해 random access를 시도하고 HE trigger-based PPDU를 전송할 수 있다. 이때 이 random access가 RAPS element 수신 또는 Beacon frame 수신 또는 Probe Response frame 수신 전에 일어날 수 있다. 예를 들면 default 값의 RAPS element 관련 parameter들을 사용할 수 있다.

【0210】이때 도 14와 같은 HE trigger-based PPDU를 보낼 때 TXVECTOR parameter BSS_COLOR 설정을 하기 위한 값이 필요할 수 있다. 또는 HE trigger-based PPDU를 전송할 때 preceding Trigger frame이 non-HE PPDU로 전송된 경우 앞서 설명한 "HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR 셋팅" 방법에 따라 TXVECTOR parameter BSS_COLOR를 설정하기 귀한 값이 필요할 수 있다. 그러나 STA가 그 BSS로부터 HE Operation element를 수신한적이 없을 수 있다. 예를 들면 RAPS element 수신 또는 Beacon frame 수신 또는 Probe Response frame 수신 전에 random access가 일어날 수 있기 때문이다.

【0211】이를 해결하기 위한 일 실시예로 Trigger frame은 BSS color 값을 포함할 수 있다. 그리고 Trigger frame에 응답하는 STA는 HE trigger-based PPDU를 보낼 때 TXVECTOR parameter BSS_COLOR를 설정하기 위해 Trigger frame이 포함하는 BSS color 값을 참조할 수 있다.

【0212】일 실시예로 Trigger frame의 Common Info 필드는 BSS color 값을 포함할 수 있다. 예를 들면 Common Info 필드가 항상 BSS Color subfield를 포함할 수 있다. 또다른 예로 Trigger frame의 Trigger dependent Common Info 필드가 BSS Color subfield를 포함할 수 있고, 이것은 Trigger frame이 특정 type으로 설정되었을 때일 수 있다. Trigger frame이 특정 type으로 설정되었다는 것은 도 7의 Trigger Type subfield로 지시할 수 있다. 그리고 이렇게 BSS Color subfield를 포함하는 Trigger frame의 type은 unassociated STA를 위한 User Info 필드를 포함하는 Trigger frame임을 나타내는 것일 수 있다. 또는 이렇게 BSS Color subfield를

포함하는 Trigger frame의 type은 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함하는 Trigger frame임을 나타내는 것일 수 있다. 바꿔 말하면 Trigger frame이 어떤 type으로 설정되었을 때 Trigger Dependent Common Info는 BSS Color subfield를 포함할 수 있다. 예를 들면 이 type으로 설정되었을 때 Trigger frame은 unassociated STA를 위한 User Info 필드 혹은 unassociated STA를 위한 random access RU를 지시하는 User Info 필드를 포함할 수 있다.

【0213】 또다른 실시예로 Trigger frame의 User Info 필드는 BSS color 값을 포함할 수 있다. 도 15 (a)에 나타낸 User Info field format은 도 7에서 설명한 User Info 필드이다. 예를 들면 unassociated STA를 위한 User Info 필드는 BSS Color subfield를 포함할 수 있다. Unassociated STA를 위한 User Info 필드는 AID12 subfield를 통해 지시될 수 있다. 또한 unassociated STA를 위한 User Info 필드의 예로 unassociated STA를 위한 random access RU를 지시하는 User Info 필드가 있을 수 있다. 예를 들면 AID12 subfield가 2045일 때 User Info 필드가 BSS Color subfield를 포함할 수 있다.

【0214】 일 실시예로 unassociated STA를 위한 User Info 필드는 도 15 (a)의 필드 중 일부를 BSS color를 나타내는데에 사용할 수 있다. 이때 BSS color를 나타내기 위해 사용되는 부분이 원래 나타내던 값에 해당하는 parameter로는 약속된 고정값을 사용할 수 있다. 예를 들면 unassociated STA를 위한 User Info 필드는 도 15 (b)에 나타낸 것 같이 도 15 (a)의 SS Allocation subfield를 BSS Color

subfield로 대치하여 사용할 수 있다. 이때 SS Allocation subfield가 나타내던 parameter 값으로는 고정값을 사용할 수 있다. 예를 들면 STARTING_SS_NUM과 NUM_SS는 모두 1일 수 있다.

【0215】일 실시예로 unassociated STA를 위한 User Info 필드는 도 15 (a)에 BSS Color subfield를 추가할 수 있다. 이러한 경우 도 15 (a)와 같은 associated STA를 위한 User Info 필드의 길이와 본 실시예에 따른 unassociated STA를 위한 User Info 필드의 길이는 다를 것이다. 하지만 Trigger frame을 수신하는 STA는 하나 이상의 User Info 필드들 중에서 AID12 subfield가 자신의 AID의 12 LSBs 값과 일치하는 것이 나올 때까지 AID12 subfield를 계속 확인할 것이므로 User Info 필드의 길이가 다르더라도 다음 User Info 필드를 바르게 찾을 수 있다. 또한 random access를 시도하는 STA라도 AID12 subfield를 통해 random access RU를 확인하므로 다음 User Info 필드를 바르게 찾을 수 있다.

【0216】Trigger frame의 unassociated STA를 위한 User Info 필드가 BSS color 값을 포함하는 실시예에서 STA가 HE trigger-based PPDU를 전송할 때 TXVECTOR parameter BSS_COLOR 설정에 대해 설명하겠다.

【0217】본 발명의 일 실시예를 따르면 associated STA는 HE Operation element의 BSS Color subfield 값으로 설정하고, unassociated STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하다. 또는 그 BSS로부터 HE Operation element를 수신했던 STA는 BSS Color subfield 값으로 설정하고, HE Operation element를 수신하지 못한 STA는 User Info 필드가 포함한 BSS color 값

으로 설정하는 것이 가능하다. 일 실시예로 이런 설정은 preceding Trigger frame이 BSS Color를 포함하지 않는 PPDU, 예를 들면 non-HE PPDU로 전송되었을 때로 한정하고, HE PPDU로 전송되었을 때는 preceding Trigger frame을 포함하는 PPDU의 RXVECTOR parameter BSS_COLOR 값으로 HE trigger-based PPDU의 TXVECTOR parameter BSS_COLOR를 설정하는 것이 가능하다.

【0218】 또는 도 14와 같은 동작을 위해 preceding Trigger frame을 포함한 PPDU format에 상관없이 associated STA는 HE Operation element의 BSS Color subfield 값으로 설정하고, unassociated STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하고, 또는 그 BSS로부터 HE Operation element를 수신했던 STA는 BSS Color subfield 값으로 설정하고, HE Operation element를 수신하지 못한 STA는 User Info 필드가 포함한 BSS color 값으로 설정하는 것이 가능하다.

【0220】 * Partial BSS color

【0221】 VHT PPDU는 preamble에 Group ID field와 Partial AID field를 포함할 수 있다. 그리고 partial AID는 STA identifier일 수 있고, TXVECTOR parameter PARTIAL_AID를 통해 전달될 수 있고, VHT SU PPDU의 경우에 존재할 수 있다. 또한 partial AID는 9 bits로 나타내어질 수 있다. 또한 group ID는 TXVECTOR parameter GROUP_ID를 통해 전달될 수 있고, VHT SU PPDU를 보낼 때는 0 또는 63으로 설정될 수 있다.

【0223】도 16은 본 발명의 일 실시예에 따른 VHT SU PPDU의 TXVECTOR parameters GROUP_ID와 PARTIAL_AID 설정 방법을 나타낸 도면이다.

【0224】Condition(1st column)에 따른 GROUP_ID(2nd column)와 PARTIAL_AID(3rd column) 설정을 나타내고 있다. 여기서 BSSID[b:c]와 RA[b:c]는 각각 BSSID와 RA의 bits b to c를 나타낼 수 있고, bit 0은 Individual/Group bit를 나타내고 bit 47은 the last transmitted bit를 나타낼 수 있고, 또한 bit position b는 2^0으로 scale되고, bit position c는 2^(c-b)로 scale될 수 있다. AP는 PARTIAL_AID가 0이 나오도록 AID를 할당하지 않을 수 있다.

【0225】또한 레거시 PPDU에 대해서도 preamble에서 intra-BSS, inter-BSS 판단을 하기 위해서 특별한 AID 할당 방법을 사용할 수 있다. 따라서 도 16의 PARTIAL_AID 혹은 PARTIAL_AID의 일부가 BSS의 identifier가 되도록 만들 수 있다. 예를 들면 AID의 bit 5부터 bit 8까지를 특정한 방법으로 할당할 수 있고, 그 예는 다음과 같다.

【0226】AID[5:8] = bin[(BCB[0:3] - (BSSID[44:47] XOR BSSID[40:43])) mod 2^4,4]

【0227】여기서 BCB[0:3]은 BSS의 partial BSS color를 나타낼 수 있다. 예를 들면 BSS color의 4 LSBs일 수 있다. 또한 bin[x, 4]는 decimal value x를 4비트의 binary vector로 나타낸 값일 수 있다. 또한 이러한 할당 방법은 Partial BSS

Color field를 1로 셋팅했을 때 사용하는 것도 가능하다.

【0228】 그리고 도 10에서 설명한 것 같은 intra-BSS, inter-BSS 판단 방법을 사용하는 것이 가능하다. 특별한 AID 할당 방법을 사용함으로 인해 앞서 설명한 intra-BSS 조건과 inter-BSS 조건 중 GROUP_ID가 63일 때의 조건으로 판단하는 것이 가능해진다.

【0229】 그런데 도 16의 Otherwise로 설정되는 경우가 있기 때문에 GROUP_ID가 63이더라도 PARTIAL_AID가 BSS identifier로서의 역할을 하지 못하는 경우가 발생한다.

【0231】 도 17은 본 발명의 일 실시예에 따른 채널 유휴 상태 판단을 나타낸 도면이다.

【0232】 도 17에서 BSS1의 AP가 VHT PPDU를 전송할 수 있다. 또한 BSS1의 partial BSS color는 0이 아닌 값일 수 있다. 이때 이 AP가 도 16의 Otherwise 케이스에 해당하게 VHT PPDU를 전송할 수 있다. 예를 들면 association 되어 있지 않은 STA가 수신하도록 VHT PPDU를 전송할 수 있다. 이 경우 이 VHT PPDU를 BSS1의 STA가 수신한 경우 앞서 설명한 inter-BSS 조건과 같이 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같지 않기 때문에 이 PPDU를 inter-BSS로 판단할 수 있다. 그러므로 OBSS PD-based SR 동작을 수행하는 것이 가능한데, 이 PPDU는 실제로

는 intra-BSS AP가 전송한 것이기 때문에 이 PPDU를 방해하는 것이 바람직하지 않을 수 있고, 이 PPDU 동안 전송하더라도 AP가 PPDU 전송 중이기 때문에 전송한 PPDU를 AP가 수신할 수 없다. 따라서 이를 해결하기 위한 방법이 필요하다.

【0233】본 발명의 일 실시예를 따르면 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같지 않으면 그 PPDU를 inter-BSS에서 온 것으로 판단할 수 있다. 다시 말하면 STA는 수신한 VHT PPDU의 RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같지 않으면 그 PPDU를 inter-BSS에서 온 것으로 판단할 수 있다. 일 실시예로 이러한 판단 방법은 STA가 속한 BSS에서 수신한 가장 최근 HE Operation element의 Partial BSS Color field가 partial BSS color를 사용해도 됨을 지시하고 있을 때(예를 들면 1로 셋팅되어 있을 때) 수행하는 것이 가능하다.

【0234】또다른 문제로 partial BSS color가 0인 BSS1이 있을 수 있고, BSS1이 아닌 다른 BSS에서 도 16의 Otherwise 케이스에 해당하게 VHT PPDU를 전송할 수 있다. 예를 들면 BSS1이 아닌 다른 BSS에서 BSS1이 아닌 다른 BSS에 association 되어 있지 않은 STA가 수신하도록 VHT PPDU를 전송할 수 있다. 예를 들면 BSS color가 b110000 (decimal value 48), b010000 (decimal value 16)인 경우 등에서 partial BSS color가 0일 수 있다. 이 경우 BSS1의 STA가 이 VHT PPDU를 수신한 경

우 앞서 설명한 intra-BSS 조건과 같이 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 BSS의 partial BSS color와 같기 때문에 이 PPDU를 intra-BSS로 판단할 수 있다. 판단 자체를 잘못하는 것도 문제이고 이에 따른 단점이 있을 수도 있다. 실제로는 OBSS PD-based SR 동작을 하는 것이 가능했던 PPDU에 대해 해당 동작을 못할 수도 있다. 따라서 이를 해결할 필요가 있다.

【0235】본 발명의 일 실시예를 따르면 STA는 수신한 VHT PPDU의 RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같으면 그 PPDU를 intra-BSS에서 온 것으로 판단할 수 있다. 다시 말하면 STA는 수신한 VHT PPDU의 RXVECTOR parameter PARTIAL_AID가 0이 아닐 때, RXVECTOR parameter GROUP_ID가 63이고, RXVECTOR parameter PARTIAL_AID[5:8]이 이 STA가 속한 BSS의 partial BSS color와 같으면 그 PPDU를 intra-BSS에서 온 것으로 판단할 수 있다. 일 실시예로 이러한 판단 방법은 STA가 속한 BSS에서 수신한 가장 최근 HE Operation element의 Partial BSS Color field가 partial BSS color를 사용해도 됨을 지시하고 있을 때(예를 들면 1로 셋팅되어 있을 때) 수행하는 것이 가능하다.

【0237】* TXOP_DURATION

【0238】STA는 HE preamble에 duration information을 포함시킬 수 있다.

STA는 HE preamble에 TXOP Duration field를 포함할 수 있다. 따라서 TXOP Duration field를 포함하는 PPDU를 수신하는 STA는 여기서 얻는 duration information을 기반으로 NAV를 셋팅하는 것이 가능하다. 또한 TXOP Duration field의 값은 TXVECTOR parameter TXOP_DURATION 또는 RXVECTOR parameter TXOP_DURATION 등을 통해 전달될 수 있다. 또한 TXOP Duration field를 특정값으로 설정함으로써 TXOP Duration field가 duration information을 나타내지 않는다는 것을 나타낼 수 있다. 예를 들면 TXOP Duration field가 모두 1로 셋팅되는 것은 TXOP Duration field가 duration information을 나타내지 않는 것일 수 있다. TXOP Duration field는 7 bits로 구성될 수 있다. 따라서 MAC header의 Duration/ID field가 나타내는 duration information보다 resolution이 낮을 수 있다. 따라서 STA는 TXOP Duration field가 duration information을 나타내지 않게 함으로써 PPDU를 수신하는 STA가 MAC header의 Duration/ID field의 duration information을 사용하도록 유도할 수 있다.

【0239】또한 PS-Poll frame을 포함하는 PPDU를 전송할 때 STA는 TXOP Duration field는 duration information을 나타내지 않을 수 있다. 이것은 이 STA가 TXOP responder아 아닐 때일 수 있다.

【0240】또한 TXOP responder는 soliciting PPDU의 TXOP Duration field가 duration information을 나타내고 있지 않으면 전송하는 PPDU의 TXOP Duration field를 duration information을 나타내지 않도록 설정할 수 있다.

【0241】 또한 TXOP responder는 soliciting PPDU의 TXOP Duration field가 duration information을 나타내지 않지 않으면 전송하는 PPDU의 TXOP Duration field를 duration information을 나타내지 않지 않도록 설정할 수 있다.

【0242】 또한 TXOP responder는 soliciting PPDU가 TXOP Duration field를 포함하고 있지 않으면, 예를 들면 soliciting PPDU가 HE PPDU가 아니면 전송하는 PPDU의 TXOP Duration field를 duration information을 나타내지 않지 않도록 설정할 수 있다.

【0243】 또한 AP는 BSS에 속한 STA들이 BSS color를 사용하지 않도록 지시할 수 있다. 예를 들면 BSS Color field 비트 수의 제한 때문에 inter-BSS와 같은 BSS color를 사용하는 경우가 발생할 수 있다. 그리고 이를 발견한 AP는 BSS color를 사용하지 않도록 지시할 수 있다. 이 지시는 HE Operation element의 BSS Color Disabled subfield를 이용해서 할 수 있다. 또한 NAV를 설정할 때 MAC header의 정보를 이용할 수 있도록 할 수 있다. 예를 들면 BSS Colo Disabled를 BSS color를 사용하지 않도록 지시한 AP는 TXVECTOR parameter TXOP_DURATION을 duration information이 없는 것을 나타내는 값으로 설정할 수 있다.

【0244】 그러나 HE trigger-based PPDU의 TXOP Duration field가 duration information을 갖고 있지 않으면 이 PPDU를 수신하는 intended recipient가 아닌 STA는 이 PPDU 또는 이 PPDU가 포함한 frame으로부터 Duration information을 얻을 수 없다. HE trigger-based PPDU가 포함한 frame을 제대로 수신할 수 없기 때문이다.

【0246】도 18은 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면이다.

【0247】도 18을 참조하면 BSS1의 AP가 보내는 HE PPDU의 TXOP Duration field를 duration information이 없음을 나타내는 값으로 설정할 수 있다. 예를 들면 수신자가 MAC header의 duration information을 이용하도록 유도하는 것일 수 있다. 예를 들면 이 AP가 BSS Color Disabled를 BSS color를 사용하지 않도록 지시했기 때문일 수도 있다. 이 PPDU를 수신하는 STA1은 TXOP Duration field로부터 duration information을 얻지 못한다. STA1은 BSS1의 STA일 수도 있고 BSS1과 다른 BSS의 STA일 수도 있다. 하지만 이 HE PPDU는 HE SU PPDU 또는 HE extended range SU PPDU 또는 HE MU PPDU이므로 STA1이 이 PPDU 수신을 unsupported 하지 않는다면 PPDU가 포함하고 있는 frame을 수신할 수 있다. 따라서 frame으로부터 duration information을 얻는 것이 가능하다.

【0248】또한 이러한 PPDU에 응답하는 STA는 soliciting PPDU의 TXOP Duration field가 duration information을 나타내고 있지 않으므로 앞서 설명한 룰에 따라 보내는 PPDU(도면에서 2번째 PPDU)의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내고 있지 않는 값으로 설정하게 된다. 이 HE trigger-based PPDU를 수신하는 STA1은 TXOP Duration field로부터 duration information을 얻지 못한다. 그러나 STA1은 이 HE trigger-based PPDU가 포함하는 frame을 수신할 수 없으므로 duration information을 이 PPDU로부터 전혀 얻지 못

하게 된다. 따라서 이 BSS1의 TXOP을 적절히 보호하지 못할 가능성이 있다. STA1이도 18의 첫번째 PPDU를 수신하지 못한 경우, 두번째 PPDU가 끝났을 때 NAV 설정이 되어 있지 않을 수 있고, 그러면 BSS1의 TXOP 안에서 이어지는 시퀀스를 보호하지 못할 수 있다.

【0249】이 문제를 해결하기 위해 HE trigger-based PPDU의 TXOP Duration field는 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다. 예를 들어 HE trigger-based PPDU를 보내는 TXOP responder는 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다. HE trigger-based PPDU를 보내는 TXOP responder는 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내는 값으로 설정할 수 있다. 특히 HE trigger-based PPDU를 보내는 TXOP responder는 soliciting PPDU의 RXVECTOR parameter TXOP_DURATION이 duration information을 나타내지 않는 값으로 설정되었더라도 HE trigger-based PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다.

【0250】HE trigger-based PPDU를 보내는 TXOP responder는 soliciting PPDU의 RXVECTOR parameter TXOP_DURATION이 duration information을 나타내고 있든지, 나타내고 있지 않든지 그 HE trigger-based PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정하지 않을 수 있다. 다시 말하면 TXOP_DURATION이 duration information을 나타내고 있든지, 나타내고 있지 않든지 그 HE trigger-based PPDU의 TXVECTOR parameter

TXOP_DURATION을 duration information을 나타내는 값으로 설정할 수 있다.

【0251】 또한 HE SU PPDU 또는 HE extended range SU PPDU를 보내는 TXOP responder는 soliciting PPDU의 RXVECTOR parameter TXOP_DURATION이 duration information을 나타내지 않는 값으로 설정되어 있을 때 그 보내는 PPDU의 TXVECTOR parameter TXOP_DURATION을 duration information을 나타내지 않는 값으로 설정할 수 있다.

【0253】 도 19는 본 발명의 일 실시예에 따른 TXOP Duration 설정과 수신을 나타낸 도면이다.

【0254】 도 19를 참조하면 BSS1의 AP가 보내는 HE PPDU의 TXOP Duration field를 duration information이 없음을 나타내는 값으로 설정할 수 있다. 예를 들면 수신자가 MAC header의 duration information을 이용하도록 유도하는 것일 수 있다. 예를 들면 이 AP가 BSS Color Disabled를 BSS color를 사용하지 않도록 지시했기 때문일 수도 있다. 이 PPDU를 수신하는 STA1은 TXOP Duration field로부터 duration information을 얻지 못한다. STA1은 BSS1의 STA일 수도 있고 BSS1과 다른 BSS의 STA일 수도 있다. 하지만 이 HE PPDU는 HE SU PPDU 또는 HE extended range SU PPDU 또는 HE MU PPDU이므로 STA1이 이 PPDU 수신을 unsupported 하지 않는다면 PPDU가 포함하고 있는 frame을 수신할 수 있다. 따라서 frame으로부터 duration information을 얻는 것이 가능하다.

【0255】또한 도 19에서 HE trigger-based PPDU로 응답하는 STA는 TXOP Duration field를 duration information을 나타내어 보냈다. 따라서 이를 수신하는 STA1은 수신한 HE trigger-based PPDU의 RXVECTOR parameter TXOP_DURATION으로부터 얻은 duration information으로 NAV를 설정할 수 있다. 따라서 BSS1의 TXOP을 보호할 수 있게 된다. 이 HE trigger-based PPDU의 바로 앞 PPDU(도 19에서 첫번째 PPDU)를 수신하는 못하는 경우에도 HE trigger-based PPDU를 수신함으로써 BSS1의 TXOP을 보호하게 된다. 최소한 도 18의 경우보다는 BSS1의 TXOP을 보호할 수 있다. BSS1과 STA1이 속한 BSS가 BSS color collision이 발생한 경우라도 STA1은 intra-BSS NAV를 설정하게 되고, 도 18과 같이 NAV를 전혀 설정하지 못하는 케이스보다 TXOP을 보호할 수 있게 된다.

【0257】도 20은 본 발명의 일 실시예에 따른 BSS color change 이벤트 후 UL MU operation을 나타낸 도면이다.

【0258】앞서 설명한 것처럼 Trigger frame에 응답하는 STA가 TXVECTOR parameter BSS_COLOR를, 즉 HE-SIG-A의 BSS Color를, 가장 최근 수신한 HE Operation element의 BSS Color subfield의 값으로 설정하는 경우가 있을 수 있다. 예를 들면 Trigger frame이 non-HE PPDU로 전달되는 경우에 TXVECTOR parameter BSS_COLOR를, 즉 HE-SIG-A의 BSS Color를, 가장 최근 수신한 HE Operation element의 BSS Color subfield의 값으로 설정할 수 있다.

【0259】그러나 BSS color change 이벤트가 일어난 이후 STA들 간에 가장 최

근 HE Operation element의 BSS Color subfield의 값이 다른 경우가 발생할 수 있고, 그러한 경우 Trigger frame에 응답하는 STA들이 HE TB PPDU(HE trigger-based PPDU)를 보낼 때 서로 다른 HE-SIG-A 신호를 생성하여 전송할 수 있고, AP는 이 HE TB PPDU를 수신 실패할 수 있다. AP 뿐만 아니라 주변 STA들도 이 HE TB PPDU들의 HE-SIG-A를 수신 실패하여 적절한 동작, 예를 들면 NAV 설정,을 하지 못 할 수 있다. 기존에 HE TB PPDU의 HE-SIG-A는 UL MU operation에 참여하여 HE TB PPDU를 보내는 multiple STAs가 동일하게 생성하도록 설계되었는데, 그렇지 못한 경우가 발생하는 것이다.

【0260】 예를 들면, AP가 BSS color change를 지시하고 했고 BSS color change 시점이 도달하였을 때, 혹은 도달한 이후 전송된 HE Operation element를 수신한 STA와 수신하지 못한 STA는 최근 수신한 HE Operation element의 BSS Color subfield 값이 다르게 된다.

【0261】 도 20을 참조하면 AP는 Beacon frame을 통해 HE BSS Color Change Announcement element를 전송할 수 있고, 이로써 BSS color change 이벤트가 일어날 것임을 BSS의 STAs에게 알릴 수 있다. 이때 HE Operation element의 BSS Color subfield는 기존의 BSS color인 x로 설정될 수 있고, HE Color Change Announcement element의 New BSS Color subfield에서 특정 시점부터 사용할 BSS Color 값인 y를 알릴 수 있다. 특정 시점은 Color Switch Countdown에서 몇 개 TBTT 후에 BSS Color가 바뀔 지 카운트다운 방식으로 알리는 것이 가능하다. 그리고 특정 시점이 도달했을 때(도면에서 Beacon frame의 Color Switch Countdown의

값이 0이 되었을 때) HE Operation element의 BSS Color subfield는 바뀐 BSS color 값으로 설정될 수 있는데, STA1은 그 HE Operation element를 성공적으로 수신하고, STA2는 그 HE Operation element를 수신 실패할 수 있다. 그리고 Trigger frame이 STA1과 STA2를 solicit한 상황에서 STA1과 STA2는 각각 y와 x로 서로 다른 BSS Color 값으로 설정한 HE-SIG-A를 전송할 수 있고, 부적절한 UL MU operation이 일어날 수 있다.

【0263】 도 21은 본 발명의 일 실시예에 따른 BSS color change 이벤트 후 UL MU Operation을 나타낸 도면이다.

【0264】 도 20에서 설명한 문제를 해결하기 위해 HE TB PPDU로 응답하는 경우에 TXVECTOR parameter BSS_COLOR, 즉 HE-SIG-A의 BSS Color를 active BSS color로 설정할 수 있다. 예를 들면 non-HE PPDU로 전송된 Trigger frame에 응답하는 경우에 HE TB PPDU로 응답할 때 TXVECTOR parameter BSS_COLOR, 즉 HE-SIG-A의 BSS Color를 active BSS color로 설정할 수 있다. 따라서 Trigger frame이 HE PPDU로 전송된 경우 HE TB PPDU로 응답할 때 TXVECTOR parameter BSS_COLOR, 즉 HE-SIG-A의 BSS Color를 그 HE PPDU의 RXVECTOR parameter BSS_COLOR로 설정하고, Trigger frame이 non-HE PPDU로 전송된 경우 HE TB PPDU로 응답할 때 TXVECTOR parameter BSS_COLOR, 즉 HE-SIG-A의 BSS Color를 active BSS color로 설정할 수 있다. 일 실시예로 active BSS color를 사용하는 것은 BSS color change 이벤트가 일어났을 때일 수 있다. 일 실시예로 active BSS color를 사용하는 것은 BSS Color Change

TBTT 후일 수 있다. 일 실시예로 active BSS color를 사용하는 것은 BSS Color Change Announcement element가 전송된 후일 수 있다.

【0265】 또는 non-HE PPDU로 Trigger frame을 수신하고 HE TB PPDU로 응답하는 경우 TXVECTOR parameter BSS_COLOR, 즉 HE-SIG-A의 BSS Color를 BSS Color Change TBTT 전에는 최근 수신한 HE Operation element의 BSS Color subfield 값으로, BSS Color Change TBTT 이후에는 HE BSS Color Change Announcement element의 New BSS Color subfield 값으로 설정할 수 있다.

【0266】 도 21을 참조하면 AP가 BSS color change를 HE BSS Color Change Announcement element를 통해 지시하고, BSS color change TBTT 시점의 HE Operation element를 STA1은 수신했고, STA2는 수신하지 못 했다. 이때 AP가 STA1과 STA2를 Trigger frame, non-HE PPDU를 통한 Trigger frame으로 solicit하더라도 STA1과 STA2는 HE-SIG-A의 BSS Color를 active BSS color로 설정함으로써 동일한 HE-SIG-A 신호를 만들어낼 수 있다. STA1은 최근 수신한 HE Operation element의 BSS Color subfield 값으로 HE-SIG-A의 BSS Color를 설정하고, STA2는 HE BSS Color Change Announcement element의 New BSS Color subfield의 값으로 HE-SIG-A의 BSS Color를 설정할 수 있다.

【0267】 또다른 실시예로 도 20에서 설명한 문제를 해결하기 위해 BSS color change 이벤트가 있을 때 AP는 Trigger frame을 HE PPDU를 사용하여 전송할 수 있다.

【0269】도 22는 본 발명의 일 실시예에 따른 unassociated STA의 UL MU Operation을 나타낸 도면이다.

【0270】도 14, 15 등 앞서 설명한 것과 같이 unassociated STA가 Trigger frame에 응답할 때 적절한 TXVECTOR parameter BSS_COLOR, HE-SIG-A의 BSS Color 설정을 위한 룰이 필요할 수 있다. 예를 들면 Trigger frame이 non-HE PPDU로 전송되는 경우 unassociated STA가 HE Operation element를 수신한 적이 없을 수도 있다. 다음은 Unassociated STA가 UORA에 참여할 때 HE TB PPDU의 HE-SIG-A의 BSS Color를 적절히 설정하기 위한 실시예들이다.

【0271】일 실시예로 unassociated STA가 UORA(UL OFDMA-based Random Access)에 참여하기 위해서는 intended recipient인 AP, 또는 참여하려는 UORA를 Trigger하는 AP로부터 HE Operation element를 반드시 받아야할 수 있다. 그리고 unassociated STA가 UORA에 참여하고 HE TB PPDU로 응답할 때 TXVECTOR parameter BSS_COLOR를 HE Operation element의 BSS Color subfield의 값으로 설정할 수 있다. 예를 들면 unassociated STA가 non-HE PPDU로 온 Trigger frame에 대해 HE TB PPDU로 응답할 때 TXVECTOR parameter BSS_COLOR를 HE Operation element의 BSS Color subfield의 값으로 설정할 수 있다.

【0272】일 실시예로 unassociated STA가 non-HE PPDU를 통해 온 Trigger frame을 통해 UORA(UL OFDMA-based Random Access)에 참여하기 위해서는 intended recipient인 AP, 또는 참여하려는 UORA를 Trigger하는 AP로부터 HE Operation element를 반드시 받아야할 수 있다. 그리고 unassociated STA가 non-HE PPDU를 통

해 온 Trigger frame에 대해 HE TB PPDU로 응답할 때 TXVECTOR parameter BSS_COLOR를 HE Operation element의 BSS Color subfield의 값으로 설정할 수 있다.

【0273】 일 실시예로 unassociated STA가 non-HE PPDU를 통해 온 Trigger frame을 통해 UORA에 참여할 때는 intended recipient인 AP, 또는 참여하려는 UORA를 Trigger하는 AP로부터 HE Operation element를 반드시 받아야하고, HE PPDU를 통해 온 Trigger frame을 통해 UORA에 참여할 때는 HE Operation element를 받지 않고도 참여할 수 있을 수 있다. 그리고 non-HE PPDU를 통해 온 Trigger frame에 응답할 때는 그 Trigger frame을 보낸 AP로부터 받은 HE Operation element의 BSS Color subfield 값으로 TXVECTOR parameter BSS_COLOR를 셋팅하고, HE PPDU를 통해 온 Trigger frame에 응답할 때는 그 Trigger frame을 보낸 PPDU의 RXVECTOR parameter BSS_COLOR 값으로 HE TB PPDU의 TXVECTOR parameter BSS_COLOR 값을 셋팅할 수 있다.

【0274】 도 22를 참조하면 unassociated STA가 Trigger frame에 응답할 때 HE TB PPDU의 HE-SIG-A의 BSS Color 값을 solicit한 AP로부터 받은 HE Operation element의 BSS Color subfield 값으로 설정할 수 있다.

【0275】 또다른 실시예로 위 실시예들에서 HE Operation element의 BSS Color subfield 값을 쓰는 대신 active BSS color를 HE TB PPDU의 TXVECTOR parameter BSS_COLOR 값으로 사용하는 것도 가능하다.

【0276】 본 발명의 또다른 실시예로 도 15에 표현한 것과 같이 Trigger

frame에 BSS Color를 추가하여 unassociated STA도 Trigger frame을 받으면 BSS Color 값을 알 수 있게 할 수 있다.

【0277】 본 발명의 또다른 실시예로 AP가 unassociated STA를 위한 UORA를 지시하는 경우, unassociated STA를 위한 User Info field를 포함한 Trigger frame을 보내는 경우엔 BSS Color가 포함된 PPDU, 예를 들면 HE PPDU를 통해 Trigger frame을 전달하는 것이 가능하다.

【0278】 또한 위 실시예들에서 어떤 AP로부터 받은 HE Operation element를 사용해야할 때 multiple BSSID 기능을 사용하는 경우 해당 AP로부터 HE Operation element를 받지 않은 경우가 발생할 수 있다. 그러한 경우 해당 AP와 같은 BSS인 AP, 예를 들면 reference BSSID의 AP로부터의 HE Operation element를 사용하는 것이 가능하다.

【0280】 도 23은 본 발명의 일 실시예에 따른 RU Allocation subfield의 인코딩을 나타낸 도면이다.

【0281】 본 발명의 일 실시예를 따르면 Trigger frame이 RU를 지시할 때 그 BSS가 operating하는 channel에서의 상대적인 RU 위치 및 크기를 지시할 수 있다. 이때 가능한 RU 구조가 미리 설정되어있을 수 있다. 예를 들면 어떤 크기의 RU 중 몇 번째인지를 Trigger frame에서 지시할 수 있다.

【0282】Trigger frame에서 RU 지시는 도 7 (b)의 RU Allocation subfield에서 하는 것이 가능하다. 이때 B12는 해당 RU가 primary 80 MHz 채널 안에 있는 것과 아닌 것을 구분 짓는 시그날링일 수 있다. RU가 primary 80 MHz 채널에 있으면 0, secondary 80 MHz 채널에 있으면 1로 설정할 수 있다. 단, 160 MHz 크기의 RU(2*996-tone RU)인 경우에는 둘 중 하나의 값, 예를 들면 0으로 약속해놓을 수도 있고, 아무 값이나 사용할 수도 있다. 또한 B19-B13의 값으로 RU 위치 및 크기를 나타낼 수 있다. 도 23을 참조하면 B19-B13의 값이 RU index 및 크기를 나타낼 수 있다. 예를 들어 B19-B13이 0-36의 값은 가능한 26-tone RU들 차례대로 매핑될 수 있고, 37-52의 값은 가능한 52-tone RU들 차례대로 매핑될 수 있다.

【0284】도 24는 본 발명의 일 실시예에 따른 unassociated STA의 UL MU operation을 나타낸 도면이다.

【0285】도 24를 참조하면 AP가 Trigger frame을 통해 unassociated STA를 위한 UORA를 지시하는 것이 가능하다. 또한 unassociated STA는 빠른 접속을 위해 HE Operation element 또는 VHT Operation element 수신 없이 UORA에 참여할 수 있다. 앞서 설명한 것처럼 UORA를 위한 counter 설정을 위해 default value(for OCWmin and OCWmax)를 사용할 수 있다. 그러나 HE Operation element 또는 VHT Operation element는 BSS의 channel 정보, 예를 들면 80 MHz segment의 center frequency 정보를 포함할 수 있고, 이를 수신하지 않고 UORA를 하면 채널 정보, 특히 Primary 20 MHz 채널 정보를 모르기 때문에 발생하는 문제가 있을 수 있다. 도

24에서 AP는 20 MHz가 넘는 bandwidth로 unassociated STA를 위한 random access RU를 지시하는 Trigger frame을 보냈고, unassociated STA가 이를 수신하였다. 이때 unassociated STA가 수신하는 채널은 AP의 BSS의 P20 채널이 아닐 수 있다. 예를 들면 Trigger frame이 non-HT duplicate PPDU로 전송되었을 수 있다. 또는 HE PPDU로 Trigger frame이 전송되었더라도 legacy preamble 및 HE-SIG-A가 20 MHz duplicate 되어 전송되고, 이로써 PPDU 전체의 bandwidth 정보를 얻을 수 있으며, 수신한 20 MHz를 포함하는 20, 40, 80 MHz band에 대한 약속이 미리 정해져 있어 Trigger frame을 수신하는 것이 가능하다. 하지만 그렇더라도 20 MHz의 PPDU를 받은 것이 아니라면 다른 정보 없이 unassociated STA가 primary 20 channel을 알 수 없다.

【0286】 이러한 경우 unassociated STA가 Trigger frame에 응답하여 HE TB PPDU를 전송하더라도 그에 이어지는 frame을 수신하지 못할 수 있다. 예를 들어 도 24와 같이 AP가 acknowledgment를 primary 20 MHz channel로 송신하면 unassociated STA는 채널 위치를 모르기 때문에 이를 수신하기 어려울 수 있다. 또는 HE TB PPDU에 보낸 Request frame에 대한 Response frame을 unassociated STA가 수신하기 어려울 수 있다. 도 24와 같이 unassociated STA가 Trigger frame을 수신한 20 MHz 채널이 AP의 primary 20 MHz 채널과 다를 때 HE TB PPDU에 대한 응답을 primary 20 MHz 채널로 보내면 unassociated STA가 이를 수신하기 어려울 수 있다.

【0287】 따라서 이를 해결하기 위해 unassociated STA가 전송한 HE TB PPDU에 대한 응답을 전송할 때의 규칙을 정할 수 있다. 예를 들면 non-HT duplicate

PPDU로 응답을 전송할 수 있다. 그렇게 되면 unassociated STA가 어떤 20 MHz 채널을 수신하고 있더라도 응답 PPDU를 수신할 수 있다. 이때 AP가 보내는 응답 PPDU가 unassociated STA가 수신하는 20 MHz 채널에도 전송되도록 하기 위해 Trigger frame을 보냈던 대역과 같거나 Trigger frame을 보냈던 대역을 포함하는 대역에서 응답 PPDU를 전송할 수 있다.

【0288】 또다른 실시예로 wider bandwidth의 PPDU로 응답을 전송할 수 있다. 예를 들면 HE SU PPDU 또는 HE MU PPDU로 응답을 전송할 수 있다. 이때 AP가 보내는 응답 PPDU가 unassociated STA가 수신하는 20 MHz 채널을 포함하여 전송되도록 하기 위해 Trigger frame을 보냈던 대역과 같거나 Trigger frame을 보냈던 대역을 포함하는 대역에서 응답 PPDU를 전송할 수 있다. 이때 160 또는 80+80 MHz로 보내는 경우 unassociated STA가 수신해야할 RU는 unassociated STA를 solicit했던 Trigger frame이 위치했던 80 MHz segment와 같은 80 MHz segment에 있거나 160 또는 80+80 MHz RU 전체가 아닐 수 있다.

【0289】 위 실시예들에서 응답은 unassociated STA가 보낸 HE TB PPDU에 바로 SIFS 뒤 이어지는 PPDU일 수 있고, 또는 unassociated STA가 보낸 HE TB PPDU의 TXOP 후 unassociated STA가 HE TB PPDU에 보낸 Request frame(e.g. Probe Request frame, (Re)Association Request frame, Authentication Request frame, etc.)에 대한 Response frame(e.g. Probe Response frame, (Re)Association Response frame, Authentication Response frame, etc.)을 포함하는 PPDU일 수 있다.

【0290】Unassociated STA가 UORA로 HE TB PPDU를 보냈을 때 채널 정보를 몰라서 발생하는 다음과 같은 또다른 문제가 있다. Trigger frame이 random access RU를 지시할 때 도 23에서 설명한 것과 같은 방법을 사용할 수 있다. 그러나 160 MHz 또는 80+80 MHz로 HE TB PPDU를 solicit하는 경우 unassociated STA는 primary 80 MHz 채널이 어디인지 모르기 때문에 도 7 (b)의 B12로 primary 80 MHz인지 secondary 80 MHz인지 지시하더라도 필요한 80 MHz 채널을 찾지 못할 수 있다. 또한 Trigger frame이 random access RU를 2*996-tone RU(160 또는 80+80 MHz RU)로 지시하면 전체 RU가 어디에 위치하는지 모를 수 있다.

【0291】이러한 문제를 해결하기 위해 AP는 160 MHz 또는 80+80 MHz의 PPDU에 Trigger frame을 보내지 않을 수 있다. 또는 AP는 Trigger frame에서 지시하는 RU가 2*996-tone RU(160 또는 80+80 MHz RU)가 아닐 수 있다. 또는 AP는 Trigger frame에서 지시하는 RU가 secondary 80 MHz 채널에 있지 않을 수 있다. 이 실시예들은 AP가 unassociated STA들을 trigger하는 경우로 한정할 수 있다. 또다른 실시예로 Trigger frame이 포함된 80 MHz segment와 다른 80 MHz segment에 있는 RU에 unassociated STA를 solicit하지 않을 수 있다.

【0292】또다른 실시예로 Trigger frame에 primary 80 MHz 정보를 알 수 있는 정보를 포함시킬 수 있다. 예를 들면 Trigger frame이 전달된 RU가 primary 80 MHz인지 아닌지 나타내는 1-bit indication이 Trigger frame에 포함될 수 있다. 또는 primary 80 MHz channel과 secondary 80 MHz channel이 어디인지 나타내는 정보가 Trigger frame에 포함될 수 있고, 이는 각 80 MHz의 center frequency와 관련된

정보일 수 있다. 이 실시예들은 unassociated STA를 위한 random access RU를 할당하는 Trigger frame인 경우로 한정할 수 있다.

【0294】 상기와 같이 무선랜 통신을 예로 들어 본 발명을 설명하였지만, 본 발명은 이에 한정하지 않으며 셀룰러 통신 등 다른 통신 시스템에서도 동일하게 적용될 수 있다. 또한 본 발명의 방법, 장치 및 시스템은 특정 실시예와 관련하여 설명되었지만, 본 발명의 구성 요소, 동작의 일부 또는 전부는 범용 하드웨어 아키텍쳐를 갖는 컴퓨터 시스템을 사용하여 구현될 수 있다.

【0295】 전술한 본 발명의 설명은 예시를 위한 것이며, 본 발명이 속하는 기술분야의 통상의 지식을 가진 자는 본 발명의 기술적 사상이나 필수적인 특징을 변경하지 않고서 다른 구체적인 형태로 쉽게 변형이 가능하다는 것을 이해할 수 있을 것이다. 그러므로 이상에서 기술한 실시예들은 모든 면에서 예시적인 것이며 한정적인 것이 아는 것으로 해석해야 한다. 예를 들어, 단일형으로 설명되어 있는 각 구성 요소는 분산되어 실시될 수도 있으며, 마찬가지로 분산된 것으로 설명되어 있는 구성 요소들도 결합된 형태로 실시될 수 있다.

【0296】 본 발명의 범위는 상기 상세한 설명보다는 후술하는 특허청구범위에 의하여 나타내어지며, 특허청구범위의 의미 및 범위 그리고 그 균등 개념으로부터 도출되는 모든 변경 또는 변형된 형태가 본 발명의 범위에 포함되는 것으로 해석되어야 한다.

## 【특허청구범위】

### 【청구항 1】

무선랜을 위한 방법, 장치 및 시스템.

제출 일자 : 2017-05-02

# 【요약서】

## 【요약】

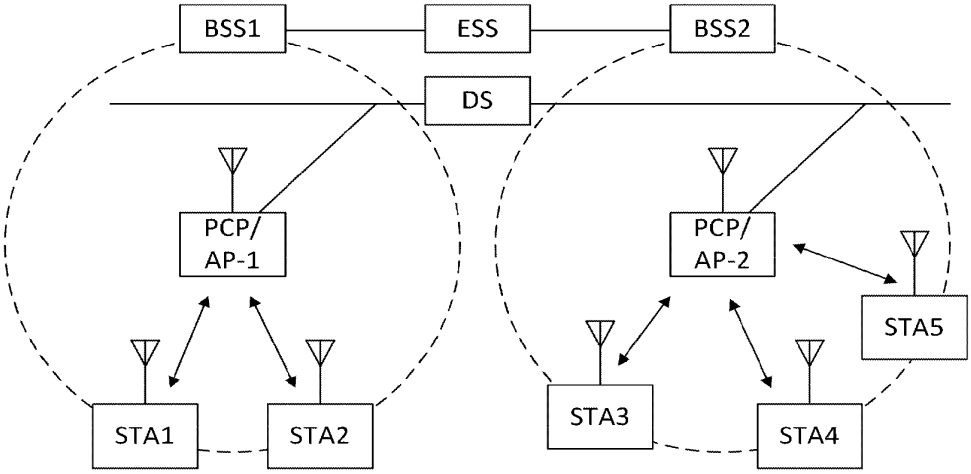
무선랜을 위한 장치, 시스템 및 무선랜 통신 방법이 게시 된다. 본 발명의 실시 예에 따르면 효율적인 BSS 판단과 NAV 설정을 위한 방법, 장치 및 시스템이 제공될 수 있다.

## 【대표도】

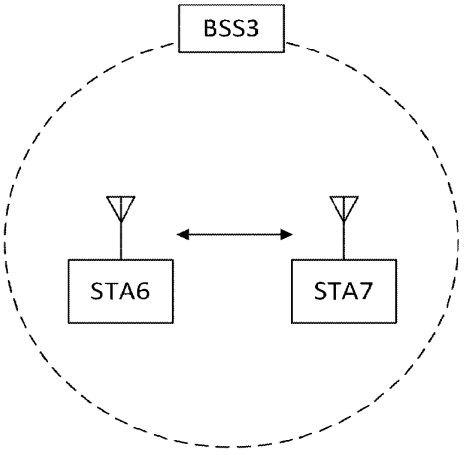
도 13

## 【도면】

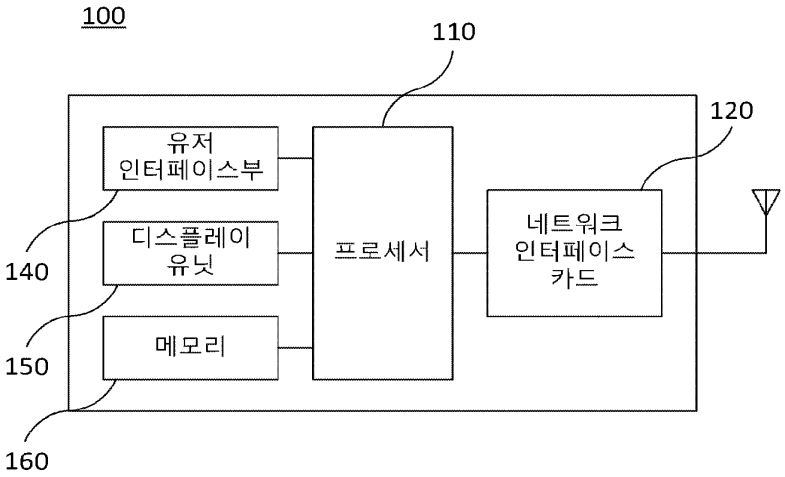
【도 1】


BSS1
ESS
BSS2
DS
PCP/
AP-1
PCP/
AP-2
STA5
STA1
STA2
STA3
STA4

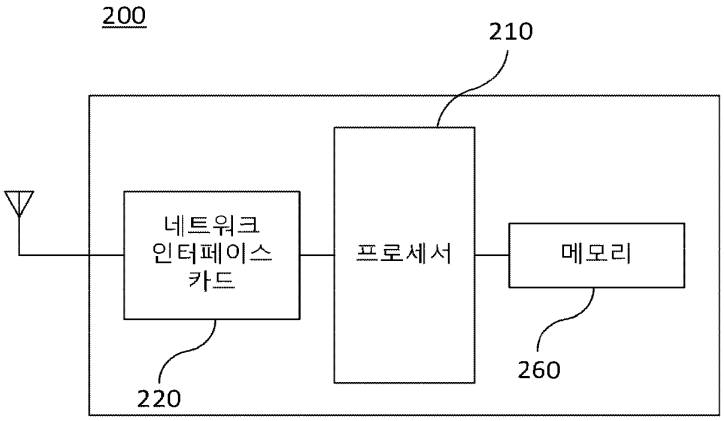
【도 2】


BSS3
STA6
STA7

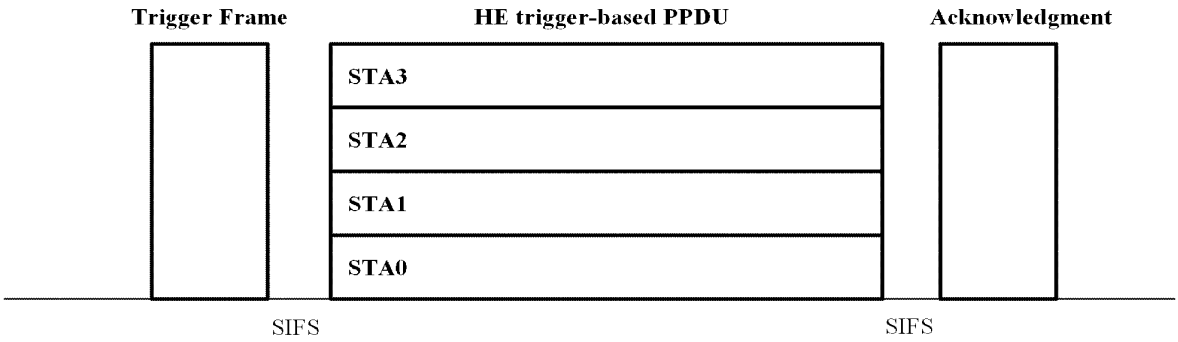
【도 3】


100
110
120
유저
인터페이스부
디스플레이
유닛
메모리
프로세서
네트워크
인터페이스
카드
140
150
160

【도 4】


200
210
네트워크
인터페이스
카드
프로세서
메모리
220
260

【도 5】




【도 6】

| | Frame Control | Duration | RA | TA | Common Info | User Info | … | User Info | Padding | FCS |
|---|---|---|---|---|---|---|---|---|---|---|
| Octets: | 2 | 2 | 6 | 6 | 8 or more | 5 or more | | 5 or more | variable | 4 |

【도 7】

(a) Common Info

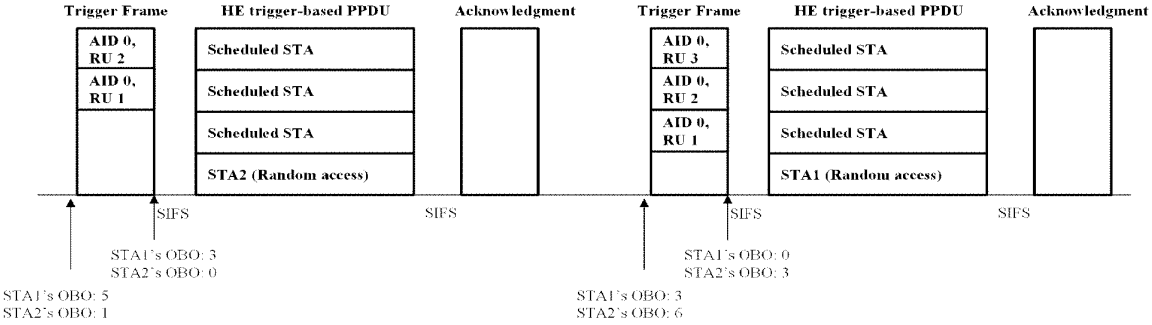
| | B0 – B3 | B4 – B15 | B16 | B17 | B18 – B19 | B20 – B21 | B22 | B23 – B25 | B26 |
|---|---|---|---|---|---|---|---|---|---|
| | Trigger Type | Length | Cascade Indication | CS Required | BW | GI and LTF Type | MU-MIMO LTF Mode | Number of HE-LTF Symbols | STBC |
| Bits: | 4 | 12 | 1 | 1 | 2 | 2 | 1 | 3 | 1 |

| | B27 | B28 – B33 | B34 – B36 | B37 – B52 | B53 | B54 – B62 | B63 | |
|---|---|---|---|---|---|---|---|---|
| | LDPC Extra Symbol | AP TX Power | Packet Extension | Spatial Reuse | Doppler | HE-SIG-A Reserved | Reserved | Trigger Dependent Common Info |
| Bits: | 1 | 6 | 3 | 16 | 1 | 9 | 1 | variable |

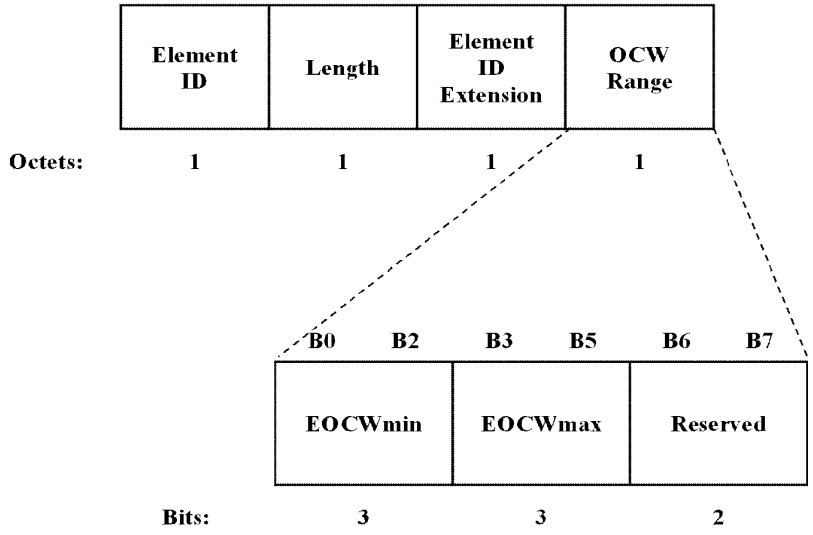
(b) User Info

| | B0 – B11 | B12 – B19 | B20 | B21 – B24 | B25 | B26 – B31 | B32 – B38 | B39 | |
|---|---|---|---|---|---|---|---|---|---|
| | AID12 | RU Allocation | Coding Type | MCS | DCM | SS Allocation | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: | 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

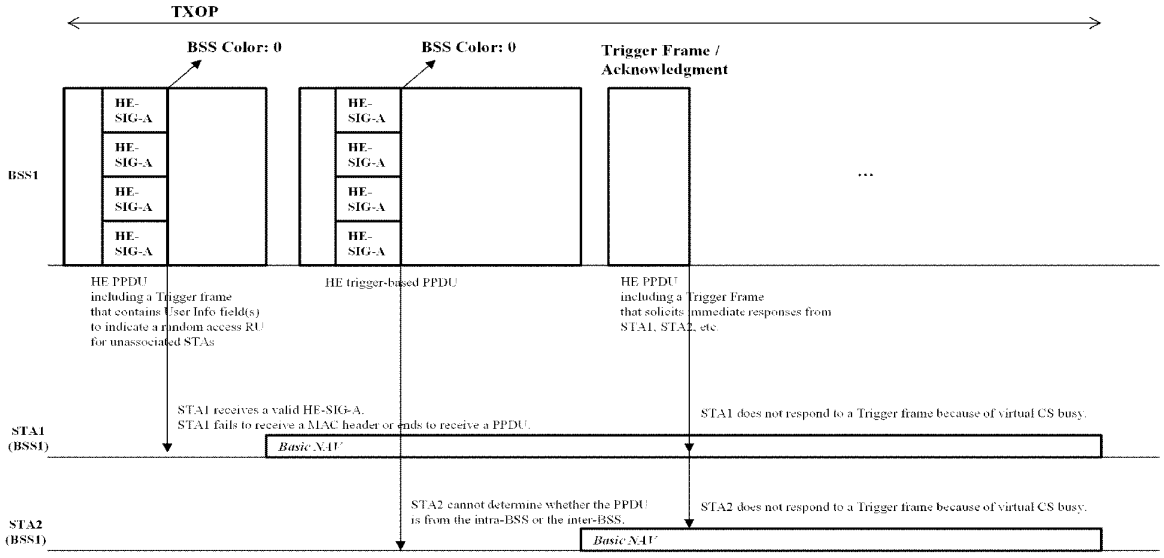
【도 8】


Trigger Frame
HE trigger-based PPDU
Acknowledgment
AID 0, RU 2
AID 0, RU 1
Scheduled STA
Scheduled STA
Scheduled STA
STA2 (Random access)
SIFS
SIFS
STA1's OBO: 3
STA2's OBO: 0
STA1's OBO: 5
STA2's OBO: 1
Trigger Frame
HE trigger-based PPDU
Acknowledgment
AID 0, RU 3
AID 0, RU 2
AID 0, RU 1
Scheduled STA
Scheduled STA
Scheduled STA
STA1 (Random access)
SIFS
SIFS
STA1's OBO: 0
STA2's OBO: 3
STA1's OBO: 3
STA2's OBO: 6

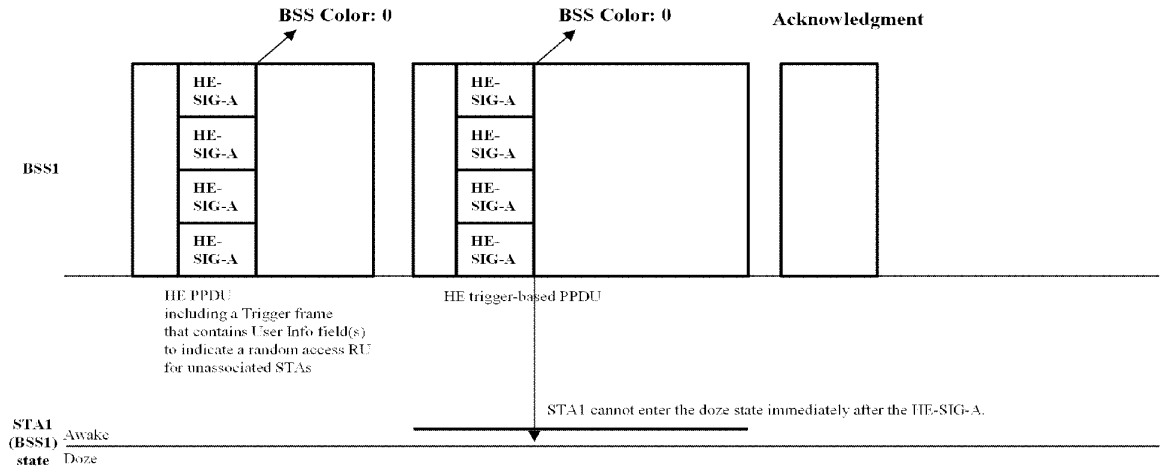
【도 9】


Element ID
Length
Element ID Extension
OCW Range
Octets:
1
1
1
1
B0
B2
B3
B5
B6
B7
EOCWmin
EOCWmax
Reserved
Bits:
3
3
2

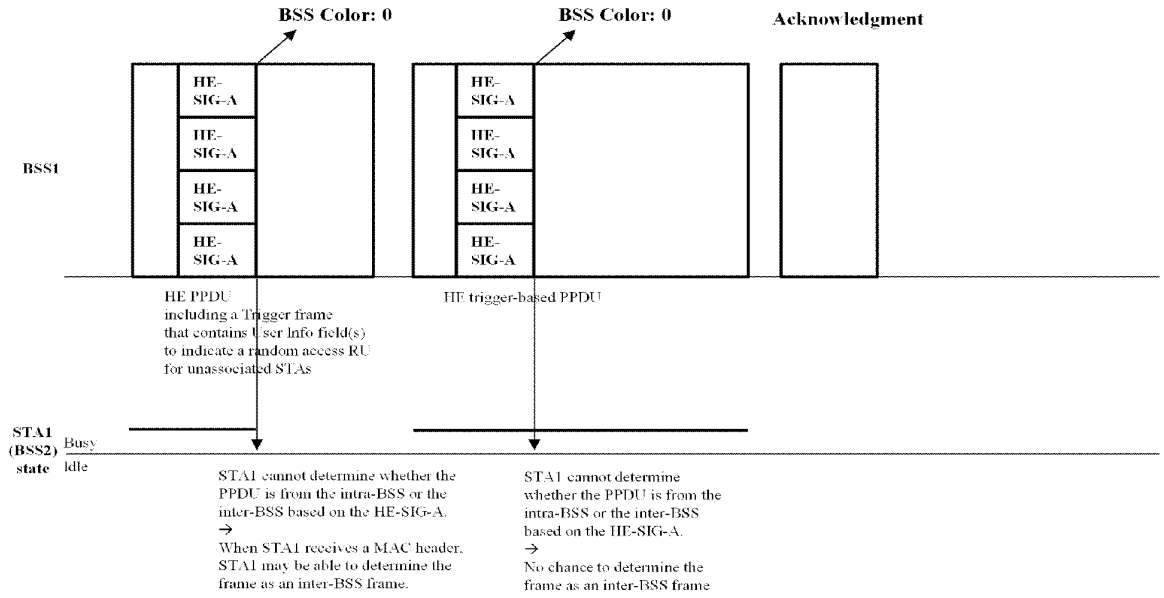
【도 10】


TXOP
BSS Color: 0
BSS Color: 0
Trigger Frame / Acknowledgment
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
...
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
HE PPDU including a Trigger Frame that solicits immediate responses from STA1, STA2, etc.
STA1 receives a valid HE-SIG-A.
STA1 fails to receive a MAC header or ends to receive a PPDU.
STA1 does not respond to a Trigger frame because of virtual CS busy.
STA1 (BSS1)
Basic NAV
STA2 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS.
STA2 does not respond to a Trigger frame because of virtual CS busy.
STA2 (BSS1)
Basic NAV

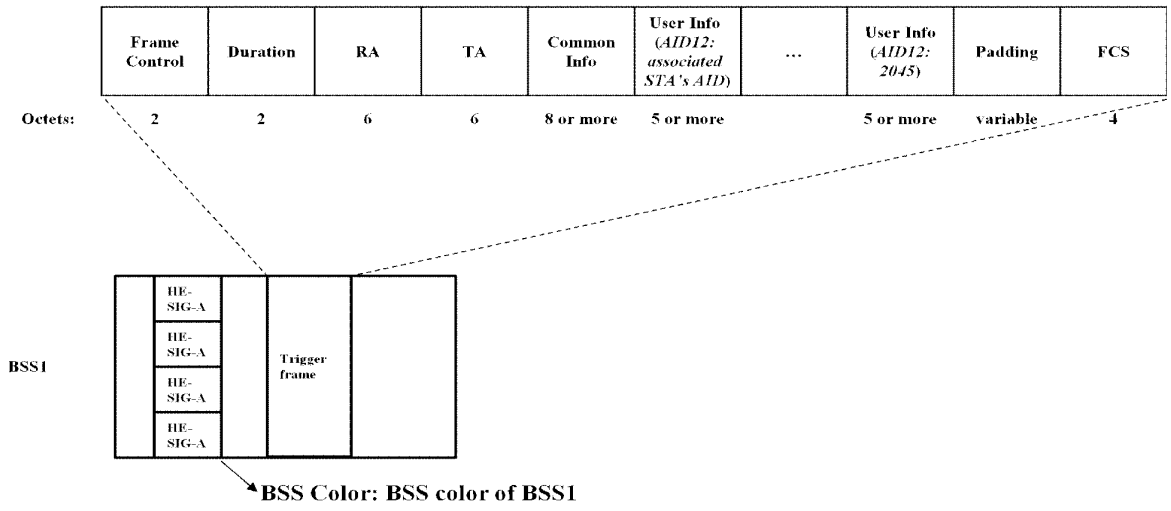
【도 11】


BSS Color: 0
BSS Color: 0
Acknowledgment
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
STA1 cannot enter the doze state immediately after the HE-SIG-A.
STA1 (BSS1) state
Awake
Doze

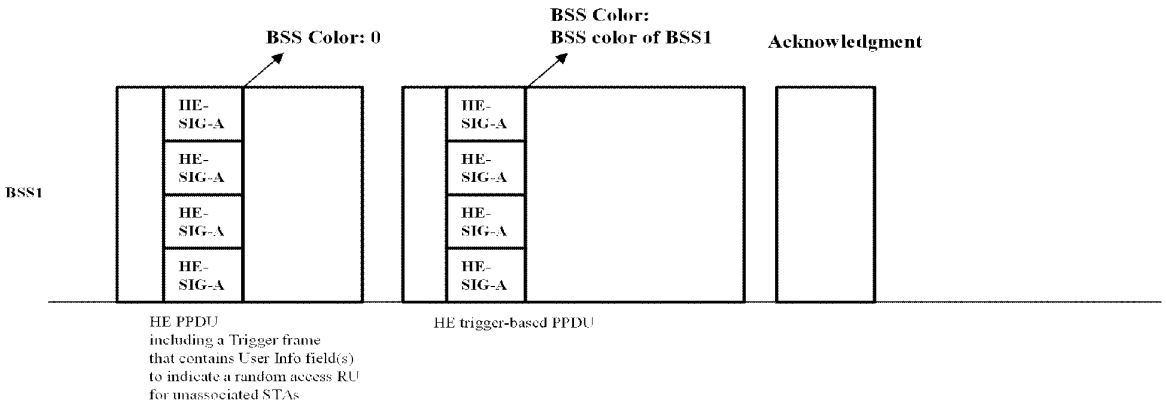
【도 12】


BSS Color: 0
BSS Color: 0
Acknowledgment
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
STA1 (BSS2) state
Busy
Idle
STA1 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS based on the HE-SIG-A.
→
When STA1 receives a MAC header, STA1 may be able to determine the frame as an inter-BSS frame.
STA1 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS based on the HE-SIG-A.
→
No chance to determine the frame as an inter-BSS frame

【도 13】


Frame Control
Duration
RA
TA
Common Info
User Info (AID12: associated STA's AID)
...
User Info (AID12: 2045)
Padding
FCS
Octets:
2
2
6
6
8 or more
5 or more
5 or more
variable
4
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
Trigger frame
BSS Color: BSS color of BSS1

【도 14】




【도 15】

**(a) User Info for the associated STA(s)**

| | B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|---|
| | AID12 | RU Allocation | Coding Type | MCS | DCM | SS Allocation | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: | 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

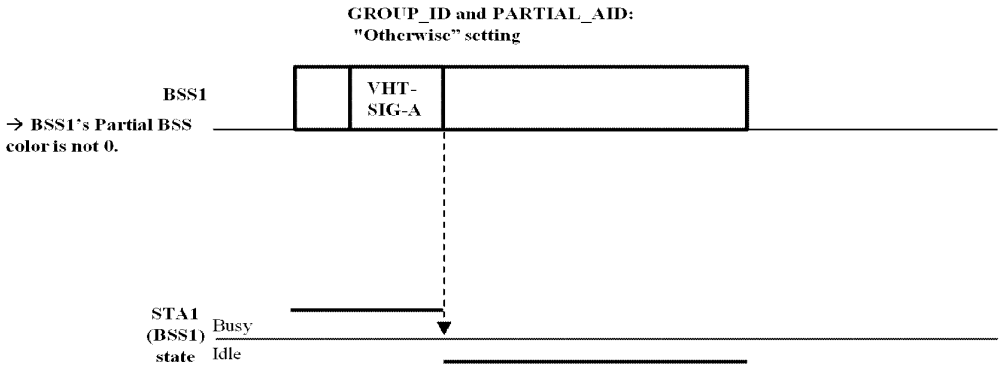
**(b) User Info not for the associated STA(s)**

| | B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|---|
| | AID12 | RU Allocation | Coding Type | MCS | DCM | BSS Color | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: | 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

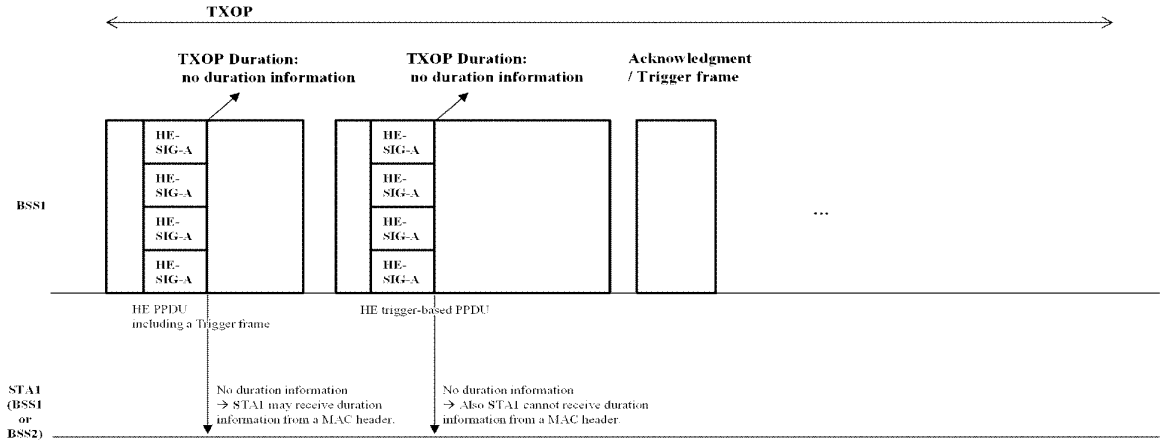
【도 16】

| Condition | GROUP_ID | PARTIAL_AID |
|---|---|---|
| Addressed to AP | 0 | BSSID[39:47] |
| Addressed to Mesh STA | 0 | RA[39:47] |
| Sent by an AP and addressed to a STA associated with that AP<br>or<br>Sent by a DLS or TDLS STA in a direct path t o a DLS or TDLS peer STA | 63 | (AID + (BSSID[44:47] XOR BSSID[40:43] * 2^5) mod 2^9 |
| Otherwise (see NOTE) | 63 | 0 |
| NOTE The last row covers the following cases:<br>- A PPDU sent to an IBSS STA<br>- A PPDU sent by an AP to a non associated STA<br>- Any other condition not explicitly listed elsewhere in the table | | |

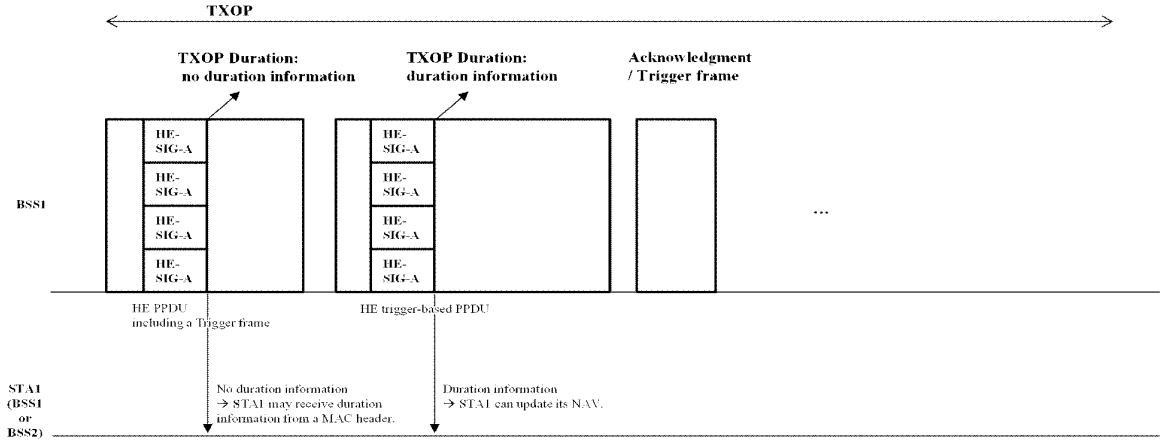
【도 17】



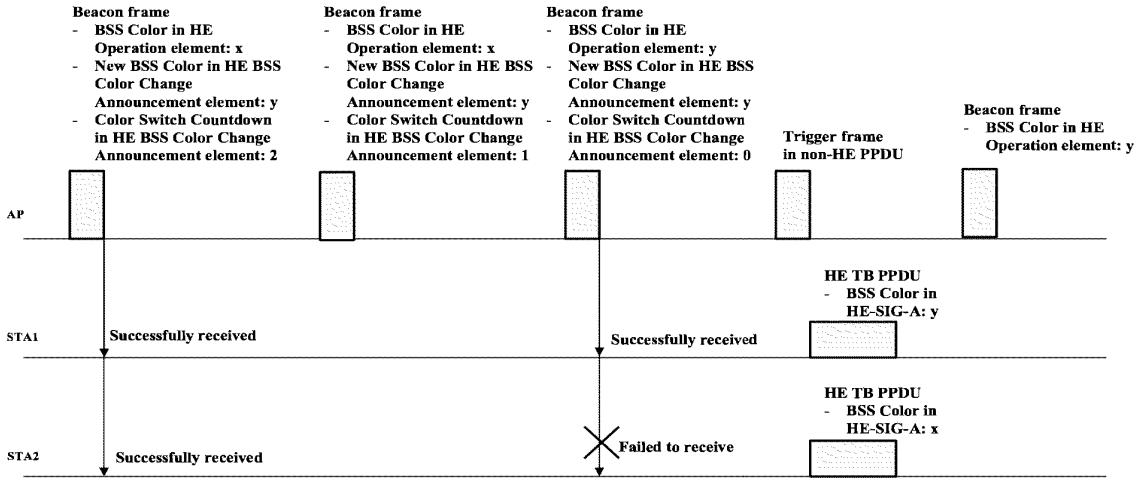
【도 18】


TXOP
TXOP Duration:
no duration information
TXOP Duration:
no duration information
Acknowledgment
/ Trigger frame
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
...
HE PPDU
including a Trigger frame
HE trigger-based PPDU
STA1
(BSS1
or
BSS2)
No duration information
→ STA1 may receive duration
information from a MAC header.
No duration information
→ Also STA1 cannot receive duration
information from a MAC header.

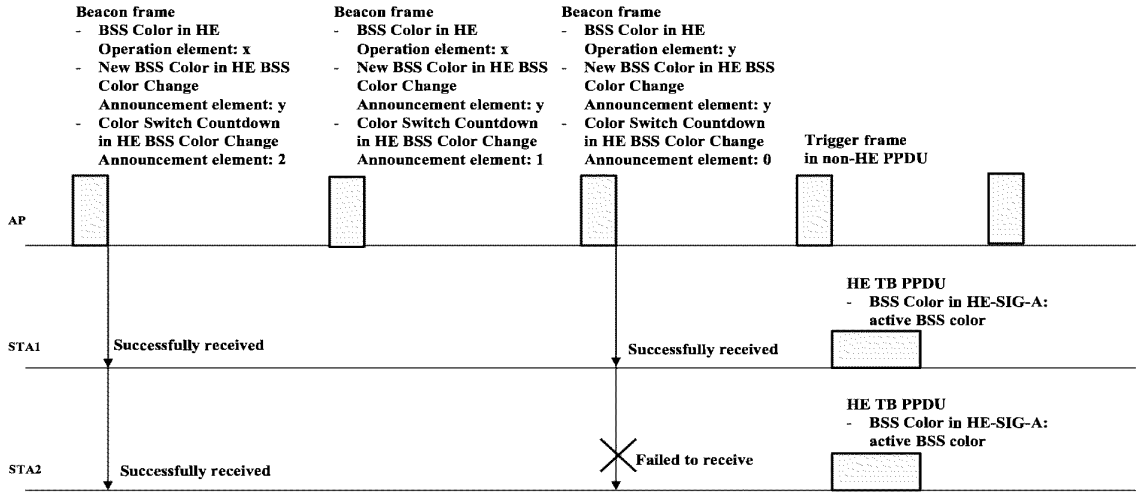
【도 19】


TXOP
TXOP Duration:
no duration information
TXOP Duration:
duration information
Acknowledgment
/ Trigger frame
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
BSS1
...
HE PPDU
including a Trigger frame
HE trigger-based PPDU
STA1
(BSS1
or
BSS2)
No duration information
→ STA1 may receive duration
information from a MAC header.
Duration information
→ STA1 can update its NAV.

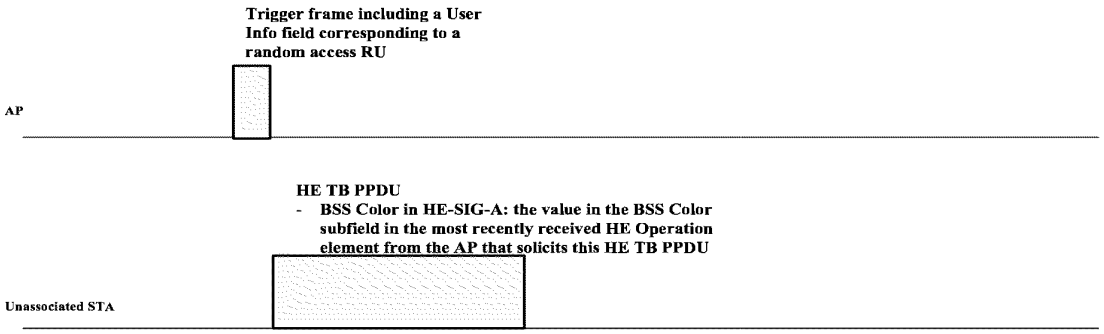
【도 20】


Beacon frame
- BSS Color in HE Operation element: x
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 2
Beacon frame
- BSS Color in HE Operation element: x
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 1
Beacon frame
- BSS Color in HE Operation element: y
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 0
Trigger frame in non-HE PPDU
Beacon frame
- BSS Color in HE Operation element: y
AP
HE TB PPDU
- BSS Color in HE-SIG-A: y
STA1
Successfully received
Successfully received
HE TB PPDU
- BSS Color in HE-SIG-A: x
STA2
Successfully received
Failed to receive

【도 21】


Beacon frame
- BSS Color in HE Operation element: x
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 2
Beacon frame
- BSS Color in HE Operation element: x
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 1
Beacon frame
- BSS Color in HE Operation element: y
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 0
Trigger frame in non-HE PPDU
AP
HE TB PPDU
- BSS Color in HE-SIG-A: active BSS color
STA1
Successfully received
Successfully received
HE TB PPDU
- BSS Color in HE-SIG-A: active BSS color
STA2
Successfully received
Failed to receive

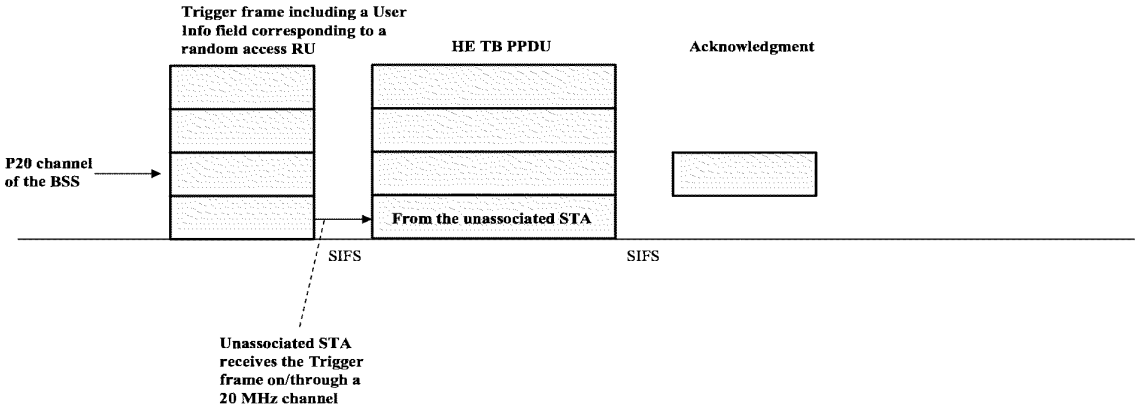
【도 22】




【도 23】

| B19 – B13 | Description | Number of entries |
|---|---|---|
| 0–36 | Possible 26-tone RU cases in 80 MHz | 37 |
| 37–52 | Possible 52-tone RU cases in 80 MHz | 16 |
| 53–60 | Possible 106-tone RU cases in 80 MHz | 8 |
| 61–64 | Possible 242-tone RU cases in 80 MHz | 4 |
| 65–66 | Possible 484-tone RU cases in 80 MHz | 2 |
| 67 | 996-tone RU cases in 80 MHz | 1 |
| 68 | 2×996-tone RU case | 1 |
| 69–127 | Reserved | 59 |
| Total | | 128 |

【도 24】


Trigger frame including a User Info field corresponding to a random access RU
HE TB PPDU
Acknowledgment
P20 channel of the BSS
From the unassociated STA
SIFS
SIFS
Unassociated STA receives the Trigger frame on/through a 20 MHz channel

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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www.uspto.gov

| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 17/670,419 | 02/11/2022 | 2642 | 2240 | B-10124CON1 633517-8 | 4 | 2 |

**CONFIRMATION NO. 6110**

**FILING RECEIPT**

158747
LADAS & PARRY
E-MAIL
4525 WILSHIRE BOULEVARD
SUITE 240
LOS ANGELES, CA 90010

Date Mailed: 02/17/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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**Inventor(s)**

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**Applicant(s)**

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SK TELECOM CO., LTD., Seoul, KOREA, REPUBLIC OF;

**Power of Attorney:** The patent practitioners associated with Customer Number 158747

**Domestic Priority data as claimed by applicant**

This application is a CON of 16/590,302 10/01/2019
which is a CON of PCT/KR2018/004397 04/16/2018

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
REPUBLIC OF KOREA 10-2017-0048762 04/14/2017 Access Code Provided
REPUBLIC OF KOREA 10-2017-0146358 11/04/2017 Access Code Provided
REPUBLIC OF KOREA 10-2017-0146356 11/04/2017 Access Code Provided

**Permission to Access Application via Priority Document Exchange:** Yes

**Permission to Access Search Results:** Yes

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**If Required, Foreign Filing License Granted:** 02/15/2022

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/670,419**

**Projected Publication Date:** 05/26/2022

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

**Preliminary Class**

455

**Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:** No

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## Title 37, Code of Federal Regulations, 5.11 & 5.15

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---

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## PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/670,419

### APPLICATION AS FILED - PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY FEE($) |
|---|---|---|---|---|---|---|---|
| BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | 320 |
| SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | 700 |
| EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | 800 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 4 minus 20 = | * | | | OR | x 100 = | 0.00 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 2 minus 3 = | * | | | | x 480 = | 0.00 |
| APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | | | 420 |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | | | 0.00 |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | TOTAL | | | TOTAL | 2240 |

### APPLICATION AS AMENDED - PART II

| | | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY ADDITIONAL FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT A | Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| | Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

| | | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | RATE($) | ADDITIONAL FEE($) | OR | RATE($) | ADDITIONAL FEE($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT B | Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| | Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Application Number: 17670419 Document Date: 02/11/2022

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Form Revision Date: March 1, 2019

PTO/SB/80 (11-05)
Approved for use through 11/30/2020. OMB 0651-0035
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I hereby appoint:

☑ Practitioners associated with the Customer Number: 158747

*OR*

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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*OR*

| | | | |
|---|---|---|---|
| ☐ Firm or Individual Name | | | |
| Address | | | |
| City | | State | Zip |
| Country | | | |
| Telephone | | Email | |

Assignee Name and Address:

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.
5F 216 Hwangsaeul-ro Bundang-gu
Seongnam-si, Gyeonggi-do, 13595 Republic of Korea

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**SIGNATURE of Assignee of Record**

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

| | | | |
|---|---|---|---|
| Signature | | Date | Nov. 22. 2019 |
| Name | JUN SAM EUN | Telephone | 82-10-6623 |
| Title | CEO | | |

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I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 158747

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

| Name | Registration Number | | Name | Registration Number |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 158747

OR

| | | | |
|---|---|---|---|
| ☐ Firm or Individual Name | | | |
| Address | | | |
| City | | State | Zip |
| Country | | | |
| Telephone | | Email | |

Assignee Name and Address:

SK TELECOM CO., LTD.
65, Eulji-ro, Jung-gu
Seoul 04539 Republic of Korea

**A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.**

**SIGNATURE of Assignee of Record**

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

| | | | |
|---|---|---|---|
| Signature | [signature] | Date | Nov. 21, 2019 |
| Name | Byun Seo Gyu | Telephone | 82-2-6100-2464 |
| Title | Director | | |

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

Client Ref: WILP-180048-US
Willis Ref: FNHEWW-180016-US
Our Ref: B-10124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
|---|---|
| **Title of Invention** | **WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME** |

**DECLARATION**

As the below named inventor, I hereby declare that:

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. §1001 by fine or imprisonment of not more than five (5) years, or both.

NOTE: 37 C.F.R. §1.63(c) states, "A person may not execute an oath or declaration unless the person has reviewed and understands the contents of the application, including the claims and is aware of the duty to disclose to the Office all information known to be material to patentability as defined in §1.56."

In the event that the filing date and/or application number are not entered above at the time I execute this document, and if such information is deemed necessary, I hereby authorize and request the attorney of record to insert above the filing date and/or application number of the application.

Client Ref: WILP-180048-US
Wilus Ref: FNHEWW-180010-US
Our Ref: B-10124CON 632252-3

## ASSIGNMENT

WHEREAS, I am the inventor of an invention described and/or claimed in the application identified in this document; and

WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

I hereby confirm any prior assignment to ASSIGNEE, and to the extent that I have not already done so, agree to assign, and hereby do, sell, assign and transfer unto ASSIGNEE and its successors in interest, the full and exclusive right, title, and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the application identified in this document, to the application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the application identified in this document, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the application identified in this document and the subject matter disclosed therein, these rights, title, and interest to be held and enjoyed by ASSIGNEE to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by the undersigned had this assignment and sale not been made, the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of inventor: **Geonjung KO** | |
|---|---|
| Signature: 고정호 | Date: 8. 13. 2019 |

Client Ref: WILP-180048-US
Wilus Ref: FNBEWW-180010-US
Our Ref: B-16124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
|---|---|
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |

## DECLARATION

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This declaration is directed to:

☑ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

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In the event that the filing date and/or application number are not entered above at the time I execute this document, and if such information is deemed necessary, I hereby authorize and request the attorney of record to insert above the filing date and/or application number of the application.

Client Ref: WILP-18004S-US
Wilus Ref: FNBEWW-18001S-US
Our Ref: B-19124CON 632252-3

## ASSIGNMENT

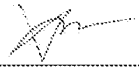
WHEREAS, I am the inventor of an invention described and/or claimed in the application identified in this document; and

WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

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I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of Inventor:<br>**Woojin AHN** | |
|---|---|
| Signature:  | Date:<br>Aug. 19 2019 |

Client Ref: WILP-180048-US
Wilus Ref: FNHEWW-180016-US
Our Ref: B-18124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
|---|---|
| **Title of Invention** | **WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME** |

## DECLARATION

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In the event that the filing date and/or application number are not entered above at the time I execute this document, and if such information is deemed necessary, I hereby authorize and request the attorney of record to insert above the filing date and/or application number of the application.

Client Ref: WILP-180048-US
Wilus Ref: FNHEWW-180048-US
Our Ref: B-18124CON 632252-3

## ASSIGNMENT

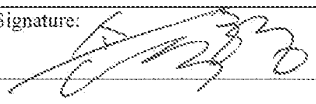
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WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

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I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of Inventor:<br>**Juhyung SON** | |
|---|---|
| Signature:  | Date: Sep 20, 2019 |

Client Ref: WILP-180048-US
Wilus Ref: FNBEWW-180018-US
Our Ref: B-18124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

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| **Title of Invention** | **WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME** |

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I hereby confirm any prior assignment to ASSIGNEE, and to the extent that I have not already done so, agree to assign, and hereby do, sell, assign and transfer unto ASSIGNEE and its successors in interest, the full and exclusive right, title, and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the application identified in this document, to the application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the application identified in this document, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the application identified in this document and the subject matter disclosed therein, these rights, title, and interest to be held and enjoyed by ASSIGNEE to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by the undersigned had this assignment and sale not been made, the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of Inventor: **Jinsam KWAK** | |
|---|---|
| Signature: | Date: Sep 19, 2019 |

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

# STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD.

Application No./Patent No.: _____ Filed/Issue Date: _____

Titled: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC., a INSTITUTE

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   SK TELECOM CO., LTD.

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

| | |
|---|---|
| /Young Seok Koo 76,255/ | February 9, 2022 |
| Signature | Date |
| YOUNG SEOK KOO | 76,255 |
| Printed or Typed Name | Title or Registration Number |

## Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Applicant/Patent Owner: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD.

Application No./Patent No.: _____ Filed/Issue Date: _____

Titled: WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

SK TELECOM CO., LTD., a CORPORATION

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.



This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

| | |
|---|---|
| /Young Seok Koo 76,255/ | February 9, 2022 |
| Signature | Date |
| YOUNG SEOK KOO | 76,255 |
| Printed or Typed Name | Title or Registration Number |

## Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Client Ref: WILP-180048-US
Willis Ref: FNHEWW-180016-US
Our Ref: B-10124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
|---|---|
| **Title of Invention** | **WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME** |

**DECLARATION**

As the below named inventor, I hereby declare that:

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. §1001 by fine or imprisonment of not more than five (5) years, or both.

NOTE: 37 C.F.R. §1.63(e) states, "A person may not execute an oath or declaration unless the person has reviewed and understands the contents of the application, including the claims and is aware of the duty to disclose to the Office all information known to be material to patentability as defined in §1.56."

In the event that the filing date and/or application number are not entered above at the time I execute this document, and if such information is deemed necessary, I hereby authorize and request the attorney of record to insert above the filing date and/or application number of the application.

Client Ref: WILP-180048-US
Wilus Ref: FNHEWW-180010-US
Our Ref: B-10124CON 632252-3

## ASSIGNMENT

WHEREAS, I am the inventor of an invention described and/or claimed in the application identified in this document; and

WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

I hereby confirm any prior assignment to ASSIGNEE, and to the extent that I have not already done so, agree to assign, and hereby do, sell, assign and transfer unto ASSIGNEE and its successors in interest, the full and exclusive right, title, and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the application identified in this document, to the application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the application identified in this document, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the application identified in this document and the subject matter disclosed therein, these rights, title, and interest to be held and enjoyed by ASSIGNEE to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by the undersigned had this assignment and sale not been made, the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of inventor: **Geonjung KO** | |
|---|---|
| Signature: 고정호 | Date: 8. 19. 2019 |

Client Ref: WILP-180048-US
Wilus Ref: FNBEWW-180010-US
Our Ref: B-16124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
|---|---|
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |

## DECLARATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☑ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. §1001 by fine or imprisonment of not more than five (5) years, or both.

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In the event that the filing date and/or application number are not entered above at the time I execute this document, and if such information is deemed necessary, I hereby authorize and request the attorney of record to insert above the filing date and/or application number of the application.

Client Ref: WILP-18004S-US
Wilus Ref: FRHEWW-18001S-US
Our Ref: B-19124CON 632252-3

## ASSIGNMENT

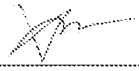
WHEREAS, I am the inventor of an invention described and/or claimed in the application identified in this document; and

WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

I hereby confirm any prior assignment to ASSIGNEE, and to the extent that I have not already done so, agree to assign, and hereby do, sell, assign and transfer unto ASSIGNEE and its successors in interest, the full and exclusive right, title, and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the application identified in this document, to the application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the application identified in this document, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the application identified in this document and the subject matter disclosed therein, these rights, title, and interest to be held and enjoyed by ASSIGNEE to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by the undersigned had this assignment and sale not been made, the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of Inventor:<br>**Woojin AHN** | |
|---|---|
| Signature:  | Date:<br>Aug. 19 2019 |

Client Ref: WILP-180048-US
Wilus Ref: FNHEWW-180016-US
Our Ref: B-18124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
|---|---|
| **Title of Invention** | **WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME** |

## DECLARATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☒ The attached application, or

☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. §1001 by fine or imprisonment of not more than five (5) years, or both.

NOTE: 37 C.F.R. §1.63(e) states, "A person may not execute an oath or declaration unless the person has reviewed and understands the contents of the application, including the claims and is aware of the duty to disclose to the Office all information known to be material to patentability as defined in §1.56."

In the event that the filing date and/or application number are not entered above at the time I execute this document, and if such information is deemed necessary, I hereby authorize and request the attorney of record to insert above the filing date and/or application number of the application.

## ASSIGNMENT

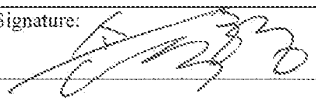
WHEREAS, I am the inventor of an invention described and/or claimed in the application identified in this document; and

WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

I hereby confirm any prior assignment to ASSIGNEE, and to the extent that I have not already done so, agree to assign, and hereby do, sell, assign and transfer unto ASSIGNEE and its successors in interest, the full and exclusive right, title, and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the application identified in this document, to the application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the application identified in this document, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the application identified in this document and the subject matter disclosed therein, these rights, title, and interest to be held and enjoyed by ASSIGNEE to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by the undersigned had this assignment and sale not been made, the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of Inventor:<br>**Juhyung SON** | |
|---|---|
| Signature:  | Date: Sep 20, 2019 |

Client Ref: WILP-180048-US
Wilus Ref: FNBEWW-180018-US
Our Ref: B-18124CON 632252-3

**COMBINED DECLARATION (37 C.F.R. §1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 C.F.R. §1.76) AND ASSIGNMENT OF INVENTION**

| | |
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| **Title of Invention** | **WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME** |

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☐ United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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Client Ref: WILP-18004S-US
Wilus Ref: FNBEWW-180010-US
Our Ref: B-10124CON 632252-3

## ASSIGNMENT

WHEREAS, I am the inventor of an invention described and/or claimed in the application identified in this document; and

WHEREAS, for good and valuable consideration, I hereby assign to (1) **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.**, having a place of business at 5F 216 Hwangsaeul-ro Bundang-gu Seongnam-si Gyeonggi-do 13595, Republic of Korea, and (2) **SK TELECOM CO., LTD.**, having a place of business at 65, Eulji-ro Jung-gu Seoul 04539, Republic of Korea ("ASSIGNEE") the entire right, title, and interest for the United States as defined in 35 U.S.C. §100, in the aforesaid invention;

I hereby confirm any prior assignment to ASSIGNEE, and to the extent that I have not already done so, agree to assign, and hereby do, sell, assign and transfer unto ASSIGNEE and its successors in interest, the full and exclusive right, title, and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the application identified in this document, to the application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the application identified in this document, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the application identified in this document and the subject matter disclosed therein, these rights, title, and interest to be held and enjoyed by ASSIGNEE to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by the undersigned had this assignment and sale not been made, the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

I hereby covenant and agree to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the aforesaid invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of ASSIGNEE without further or other compensation than that above set forth; and

I hereby grant the attorney of record the power to insert on this document any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office or other authority for recordation of this document.

| Name of Inventor: **Jinsam KWAK** | |
|---|---|
| Signature: | Date: Sep 19, 2019 |

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE** ***Patent***

| | | |
|---|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | ) | ***Re.: Preliminary Amendment*** |
| | ) | Group: Not yet assigned |
| USSN: Not yet assigned | ) | Examiner: Not yet assigned |
| Filing Date: Concurrently herewith | ) | Our Ref.: B-10124CON1 633517-8 |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | ) | Date: February 9, 2022 |

**PRELIMINARY AMENDMENT**

Sir:

Prior to examination of the above-identified U.S. patent application, please enter the following amendments and remarks into the prosecution history of the above-identified U.S. patent application without prejudice or disclaimer.

**Amendments to the Specification** begin on page 2 of this paper.

**Amendments to the Claims** begin on page 3 of this paper.

**Remarks** begin on page 5 of this paper.

## AMENDMENTS TO THE SPECIFICATION

Please insert the following paragraph and section entitled "CROSS-REFERENCE TO RELATED APPLICATIONS" on page 1, immediately after the title section entitled "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" and before the section entitled "Technical Field", to read as follows:

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of US Patent Application No. 16/590,302 filed on October 1, 2019, which is a continuation of International Patent Application No. PCT/KR2018/004397 filed on April 16, 2018, which claims the priority to Korean Patent Application No. 10-2017-0048762 filed in the Korean Intellectual Property Office on April 14, 2017, Korean Patent Application No. 10-2017-0146358 filed in the Korean Intellectual Property Office on November 4, 2017, and Korean Patent Application No. 10-2017-0146356 filed in the Korean Intellectual Property Office on November 4, 2017, the entire contents of which are incorporated herein by reference..

* * *

## AMENDMENTS TO THE CLAIMS

Please amend the claims to read as indicated in the following list of claims:

**Listing of claims**

1-20. (Canceled)

21. (New) A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, set a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmit the trigger-based PPDU based on the trigger frame,

when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

wherein the BSS color is one of identifiers identifying a BSS.

22. (New) The wireless communication terminal of claim 21, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

23. (New) The wireless communication terminal of claim 21, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero,

wherein the partial AID field is a signaling field used to indicate a value obtained based on an AID value.

24. (New) A method of operating a wireless communication terminal wirelessly communicating with a base wireless communication terminal, the method comprising:

receiving a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, wherein the trigger frame indicates a resource unit (RU) which is allocated to the wireless communication terminal,

when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, setting a value of a BSS color indicated by a trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

when the PPDU including the trigger frame does not indicate the BSS color, set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal, and

transmitting the trigger-based PPDU based on the trigger frame,

when the wireless communication terminal receives information on BSS color change from the base wireless communication terminal and a BSS color change time point indicated by the information on the BSS color change is reached, the active BSS color is a value of a BSS color indicated by the information on the BSS color change,

wherein the BSS color is one of identifiers identifying a BSS.

## REMARKS

In this Preliminary Amendment, the section of the "CROSS-REFERENCE TO RELATED APPLICATIONS" is inserted to include reference to the earlier applications. This amendment is to comply with 37 C.F.R. §1.77. A substitute specification should not be required as this amendment only adds a benefit or priority claim.

Claims 1-20 are cancelled and new claims 21-24 are added.

Amendment of the subject application is respectfully requested.

* * *

*No Disclaimers or Disavowals*

Although the present communication may include alterations to the application or claims, or may contain characterizations of claim scope or referenced art, the Applicant is not conceding that any previously pending claims are unpatentable in view of the cited reference(s). Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. The Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent child or related prosecution history shall not reasonably infer that the Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Very truly yours,

/Young Seok Koo 76,255/

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Attorney for the Applicant
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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Applicant: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | Examiner: Not Yet Assigned |
| Serial No.: Not Yet Assigned | Art Unit: N/A |
| Filing Date: Concurrently Herewith | Conf. No.: N/A |
| For: "WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME" | Our Ref: B-10124CON1 633517-8 |
| Date: February 9, 2022 | Re: ***Information Disclosure Statement*** |

**INFORMATION DISCLOSURE STATEMENT**

**Mail Stop Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97 and 1.98 to disclose information that may be relevant to the above-identified patent application. The Applicant requests the Examiner consider the documents listed on the enclosed form PTO-1449 (modified) in the examination of this application.

The filing of this Information Disclosure Statement (IDS) shall not be construed as a representation that a search has been made (37 C.F.R. 1.97(g)), an admission that the information cited is, or is considered to be, material to patentability, or that no other material information exists.

The filing of this Information Disclosure Statement shall not be construed as an admission against interest in any manner (37 C.F.R § 1.97(h)).

If any additional fee is required for this filing, the Applicant requests the Examiner contact a practitioner associated with the Customer Number listed below for authorization.

This information disclosure statement also includes the statements marked below. Failure to mark a statement should not be construed as a negative assertion.

*Timing and Fees*

This IDS is being filed:

[x] Concurrently with the application, and no fee is due.

[ ] Within three months of the filing of the national application, other than a continued prosecution application under § 1.53(d), and no fee is due.

[ ] Within three months of the date of entry of the national stage as set forth in § 1.491 in an international application, and no fee is due.

[ ] Before the mailing of a first Office Action on the merits, and no fee is due.

[ ] Before the mailing of a first Office Action after the filing of a request for continued examination under§ 1.114, and no fee is due.

---

[ ] After the periods described above, and before a final Office Action under § 1.113, a Notice of Allowance under § 1.311, or an action that otherwise closes prosecution in the application, and is

- [ ] accompanied by the fee set forth in § 1.17(p), or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1): That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2): That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

---

[ ] After the periods described above, and is accompanied by the fee set forth in § 1.17(p), and is

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

- [ ] filed with the statement set forth in 37 C.F.R. 1.97(e)(2), that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

[ ] Concurrently with a Request for Continued Examination, and no additional fee is due for this IDS.

*Items Disclosed*

At least one item listed on the enclosed form PTO-1449 (modified) was

[x] Cited in an Office Action for a related application, the application number of the related application and the issue date of the Office Action are provided below and the Office Action is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

---

[x] Cited in an International Search Report (ISR) or an International Preliminary Report on Patentability (IPRP) or a Written Opinion (WO) of the International Searching Authority (ISA) for the related PCT Application, the PCT application number and the issue date of the ISR/IPRP/WO are provided below and the ISR/IPRP/WO is enclosed.

Please see the enclosed form PTO-1449 (modified) for related application number(s) and issue date(s).

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*Additional Information*

[x] Translations of the foreign-language documents are also enclosed as machine-translations, human-translations, or counterpart applications as noted. Machine translations were provided by the Japanese Patent Office, ESPACENET, Google Documents, Patent Fetcher® /ESPACENET, Google Translate or Google Translator Toolkit as noted and with OCR by Adobe Acrobat 9 or ABBYY PDF Transformer 3 if needed.

[x] English-language abstracts of foreign-language documents are provided.

[x] Documents listed on the enclosed ISR/IPRP/WO or the Office Action have relevance at least as described therein.

[ ] The documents with the following reference numbers were described in the specification of the present application; omission of a reference from this list does not indicate that it was not discussed in the specification of the present application.

---

[ ] At least one of the references cited in the Office Action listed on the attached PTO-1449 (modified) were previously submitted in an IDS or cited by the Examiner for the present application on _____ and therefore are not submitted in this IDS.

[x] Other: **In the attached Form PTO-1449 (modified), documents from the parent application (USSN: 16/590,302 (now published as U.S. 2020/0037395) are being cited. Please further note that the foreign references and non-patent documents listed in the attached were cited in the parent application, USSN 16/590,302 (now published as U.S. 2020/0037395).**

February 9, 2022

**In accordance with 37 C.F.R. §1.98(d) (1) and (2), copies of the foreign references and non-patent documents listed in the enclosed Form PTO-1449 (modified) are not enclosed.**

Respectfully submitted,

/ Young Seok Koo 76255 /

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| Form PTO-1449 (Modified)<br>Page 1 of 1 | ATTY DOCKET NO.<br>B-10124CON1 633517-8 | U.S. SERIAL NO.<br>N/A |
|---|---|---|
| LIST OF PATENTS AND PUBLICATIONS STATEMENT | APPLICANT<br>WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD. | FILING DATE<br>Concurrently Herewith |
| | | GROUP NO.<br>N/A |

**U.S. PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | ISSUE/PUBL. DATE | NAME | CLASS | SUB-CLASS | REMARKS |
|---|---|---|---|---|---|---|---|
| | 1. | 2017/0325178 | Nov. 9, 2017 | VERMA et al. | | | |
| | 2. | 2016/0330742 | Nov. 10, 2016 | LI et al. | | | |
| | 3. | 2019/0182864 | Jun. 13, 2019 | HUANG et al. | | | |
| | 4. | 2018/0242355 | Aug. 23, 2018 | Lou et al. | | | |
| | 5. | 2021/0127427 | Apr. 29, 2021 | NOH et al. | | | |
| | 6. | 2018/0227950 | Aug. 9, 2018 | IWAI et al. | | | |
| | 7. | 2018/0146426 | May 24, 2018 | PARK | | | |
| | 8. | 2016/0353275 | Dec. 1, 2016 | Liu et al. | | | |
| | 9. | 2018/0184285 | Jun. 28, 2018 | Patil et al. | | | |
| | 10. | 2016/0212246 | Jul. 21, 2016 | SEOK | | | |
| | 11. | 2020/0037395 | Jan. 30, 2020 | KO et al. | | | |

**FOREIGN PATENT DOCUMENTS**

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION |
|---|---|---|---|---|---|---|---|
| | 12. | 2016/024770 | Feb. 18, 2016 | WO | | | Espacenet |
| | 13. | 2016/195402 | Dec. 8, 2016 | WO | | | Espacenet |
| | 14. | 10-2017-0038746 | Apr. 7, 2017 | KR | | | KIPRIS |
| | 15. | 2018/190697 | Oct. 18, 2018 | WO | | | Espacenet |
| | 16. | 106487737 | Mar. 8, 2017 | CN | | | Espacenet |
| | 17. | 104350799 | Feb. 11, 2015 | CN | | | Espacenet |

**OTHER DOCUMENTS** (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIAL | REFERENCE NUMBER | DOCUMENT |
|---|---|---|
| | 18. | International Search Report for PCT/KR2018/004397 mailed on August 7, 2018 and its English translation from WIPO (now published as WO 2018/190697) |
| | 19. | Written Opinion of the International Searching Authority for PCT/KR2018/004397 mailed on August 7, 2018 and its English translation by Google Translate (now published as WO 2018/190697) |
| | 20. | Geonjung KO et al., "Text for Intra-PPDU Power Save for a Multiple BSSID Set Case", WILUS, IEEE 802.11-16/1205r0, September 12, 2016. Pages 1-2. |
| | 21. | Geonjung KO et al., "Discussions on Partial BSS Color", WILUS, IEEE 802.11-16/0918r1; September 12, 2016. Slides 1-14. |
| | 22. | International Preliminary Report on Patentability (Chapter I) for PCT/KR2018/004397 issued on October 15, 2019 and its English translation from WIPO (now published as WO2018/190697) |
| | 23. | Office Action for Indian Patent Application No. 201927042859 mailed on March 25, 2021 |
| | 24. | Office Action for Korean Patent Application No. 10-2019-7028525 mailed on September 9, 2020 and its English translation from Global Dossier |
| | 25. | Office Action dated September 27, 2021 for Chinese Patent Application No. 201880024847.X and its English translation provided by Applicant's foreign counsel. |
| | 26. | Khan, Gul Zameen et al.: "On the Field Level Loss of a VHT PPDU in a MIMO-OFDM System for a WiFi Direct 802.11ac WLAN", Conference Title: PROCEEDINGS OF THE 14TH INTERNATIONAL CONFERENCE ON FRONTIERS OF INFORMATION TECHNOLOGY PROCEEDINGS – FIT 2016, PP. 1-6. |
| | 27. | Graham Smith: "TG ax: A Unified Approach to Spatial Reuse", SR technologies, IEEE 802.11-16/1064r3, October 2016, pp. 1-14. |
| | 28. | Jianhan Liu et al.: "AID Assign Rule Based on BSS Color and HE Operation Element", Mediatek, USA, IEEE 802.11-16/0364r3, March 11, 2016, Slides 1-19. |
| | 29. | Notice of Allowance dated November 8, 2021 for U.S. Patent Application No. 16/590,302 (now published as US 2020/0037395). |
| | 30. | Office Action dated June 28, 2021 for U.S. Patent Application No. 16/590,302 (now published as US 2020/0037395). |

| *EXAMINER* | *DATE CONSIDERED* |
|---|---|
| | |

**EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.**

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

## Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

## Inventor Information:

**Inventor 1** Remove

**Legal Name**

| Prefix | Given Name | Middle Name | Family Name | Suffix |
|---|---|---|---|---|
| | Geonjung | | KO | |

**Residence Information (Select One)** ○ US Residency ◉ Non US Residency ○ Active US Military Service

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**Mailing Address of Inventor:**

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| **Address 2** | | | |
| **City** | Seoul | **State/Province** | |
| **Postal Code** | 06514 | **Country** [i] | KR |

**Inventor 2** Remove

**Legal Name**

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| | Woojin | | AHN | |

**Residence Information (Select One)** ○ US Residency ◉ Non US Residency ○ Active US Military Service

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| **Postal Code** | 14038 | **Country** [i] | KR |

**Inventor 3** Remove

**Legal Name**

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
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| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

| Prefix | Given Name | Middle Name | Family Name | Suffix |
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| | Juhyung | | SON | |

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**Inventor 4** Remove

**Legal Name**

| Prefix | Given Name | Middle Name | Family Name | Suffix |
|---|---|---|---|---|
| | Jinsam | | KWAK | |

**Residence Information (Select One)** ○ US Residency ◉ Non US Residency ○ Active US Military Service

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|---|---|---|---|

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| **City** | Gyeonggi-do | **State/Province** | |
| **Postal Code** | 16014 | **Country** [i] | KR |

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

## Correspondence Information:

**Enter either Customer Number or complete the Correspondence Information section below.**
**For further information see 37 CFR 1.33(a).**

☐ **An Address is being provided for the correspondence Information of this application.**

| | | | |
|---|---|---|---|
| **Customer Number** | 158747 | | |
| **Email Address** | LA_MAIL@LA.LADAS.COM | Add Email | Remove Email |

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
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| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

## Application Information:

| | | | |
|---|---|---|---|
| **Title of the Invention** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | | |
| **Attorney Docket Number** | B-10124CON1 633517-8 | **Small Entity Status Claimed** ☐ | |
| **Application Type** | Nonprovisional | | |
| **Subject Matter** | Utility | | |
| **Total Number of Drawing Sheets (if any)** | 29 | **Suggested Figure for Publication (if any)** | |

## Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

| Application number of the previously filed application | Filing date (YYYY-MM-DD) | Intellectual Property Authority or Country |
|---|---|---|
| | | |

## Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

## Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

| | | | |
|---|---|---|---|
| Please Select One: | ◉ Customer Number | ○ US Patent Practitioner | ○ Limited Recognition (37 CFR 11.9) |
| Customer Number | 158747 | | |

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

## Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

| Prior Application Status | Pending | | Remove |
|---|---|---|---|
| Application Number | Continuity Type | Prior Application Number | Filing or 371(c) Date (YYYY-MM-DD) |
| | Continuation of | 16590302 | 2019-10-01 |
| Prior Application Status | | | Remove |
| Application Number | Continuity Type | Prior Application Number | Filing or 371(c) Date (YYYY-MM-DD) |
| 16590302 | Continuation of | PCT/KR2018/004397 | 2018-04-16 |

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

## Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

| | | | Remove |
|---|---|---|---|
| Application Number | Country[i] | Filing Date (YYYY-MM-DD) | Access Code[i] (if applicable) |
| 10-2017-0048762 | KR | 2017-04-14 | B902 |
| | | | Remove |
| Application Number | Country[i] | Filing Date (YYYY-MM-DD) | Access Code[i] (if applicable) |
| 10-2017-0146358 | KR | 2017-11-04 | 578D |
| | | | Remove |
| Application Number | Country[i] | Filing Date (YYYY-MM-DD) | Access Code[i] (if applicable) |
| 10-2017-0146356 | KR | 2017-11-04 | 7A09 |

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

## Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

## Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

**NOTE**: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

**1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)**

**A. Priority Document Exchange (PDX)** - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

**B. Search Results from U.S. Application to EPO** - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

**2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)**

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

**NOTE:** Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (02-18)
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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

## Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

**Applicant 1**

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

| ◉ Assignee | ○ Legal Representative under 35 U.S.C. 117 | ○ Joint Inventor |
|---|---|---|
| ○ Person to whom the inventor is obligated to assign. | ○ Person who shows sufficient proprietary interest | |

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

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|---|---|

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Additional Applicant Data may be generated within this form by selecting the Add button.

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| Application Data Sheet 37 CFR 1.76 | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

**Applicant 2**

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

| | | |
|---|---|---|
| ◉ Assignee | ○ Legal Representative under 35 U.S.C. 117 | ○ Joint Inventor |
| ○ Person to whom the inventor is obligated to assign. | ○ Person who shows sufficient proprietary interest | |

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

| Organization Name | SK TELECOM CO., LTD. | | |
|---|---|---|---|
| **Mailing Address Information For Applicant:** | | | |
| **Address 1** | 65, Eulji-ro, Jung-gu | | |
| Address 2 | | | |
| **City** | Seoul | **State/Province** | |
| **Country** | KR | Postal Code | 04539 |
| Phone Number | | Fax Number | |
| Email Address | | | |

Additional Applicant Data may be generated within this form by selecting the Add button.

## Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

**Assignee 1**

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

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| **Application Data Sheet 37 CFR 1.76** | Attorney Docket Number | B-10124CON1 633517-8 |
|---|---|---|
| | Application Number | |
| Title of Invention | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME | |

| Organization Name | | | |
|---|---|---|---|
| **Mailing Address Information For Assignee including Non-Applicant Assignee:** | | | |
| **Address 1** | | | |
| Address 2 | | | |
| **City** | | **State/Province** | |
| **Country** i | | Postal Code | |
| Phone Number | | Fax Number | |
| Email Address | | | |
| Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. | | | |

## Signature:

**NOTE:** This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

| **Signature** | /Young Seok Koo 76255/ | | | Date (YYYY-MM-DD) | 2022-02-10 |
|---|---|---|---|---|---|
| First Name | Young Seok | Last Name | Koo | Registration Number | 76,255 |
| Additional Signature may be generated within this form by selecting the Add button. | | | | | |

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | |
| **Filing Date:** | |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Filer:** | Young Seok Koo/Azatuhi Chinaryan |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |

Filed as Large Entity

**Filing Fees for Utility under 35 USC 111(a)**

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| UTILITY APPLICATION FILING | 1011 | 1 | 320 | 320 |
| UTILITY SEARCH FEE | 1111 | 1 | 700 | 700 |
| UTILITY EXAMINATION FEE | 1311 | 1 | 800 | 800 |
| **Pages:** | | | | |
| UTILITY APPL SIZE FEE PER 50 SHEETS >100 | 1081 | 1 | 420 | 420 |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | **Total in USD ($)** | | **2240** |

| Electronic Acknowledgement Receipt | |
|---|---|
| **EFS ID:** | 44961041 |
| **Application Number:** | 17670419 |
| **International Application Number:** | |
| **Confirmation Number:** | 6110 |
| **Title of Invention:** | WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME |
| **First Named Inventor/Applicant Name:** | Geonjung KO |
| **Customer Number:** | 158747 |
| **Filer:** | Young Seok Koo |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | B-10124CON1 633517-8 |
| **Receipt Date:** | 11-FEB-2022 |
| **Filing Date:** | |
| **Time Stamp:** | 23:41:19 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | yes |
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| Payment was successfully received in RAM | $2240 |
| RAM confirmation Number | E20222AN41584335 |
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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 632252_EngSpecDrawings.pdf | 4739006<br>ee0e1ac7360d50ff6a0c21fa7af2f2604f38b274 | yes | 137 |
| | **Multipart Description/PDF files in .zip description** | | | | |
| | **Document Description** | | **Start** | **End** | |
| | Specification | | 1 | 101 | |
| | Claims | | 102 | 107 | |
| | Abstract | | 108 | 108 | |
| | Drawings-other than black and white line drawings | | 109 | 137 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Power of Attorney | 633517_POA_All.pdf | 887954<br>d949bcb4166601e551dad1a9483be0ba0e8b0bbb | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Assignee showing of ownership per 37 CFR 3.73 | 633517_Statement373c.pdf | 3339347<br>bcc91e87bdcd571787ca01f7475966a0eda4aceb | no | 14 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Oath or Declaration filed | 632252_CombinedDecAssign_Signed.pdf | 3057064<br>740ce8be57a8716c064baa40492cfe48e15c6ce7 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 5 | | 633517_PreliminaryAmendment.pdf | 133937<br>fc3e59f07f801b48246aee06a80b9ea5f144039f | yes | 6 |
| | **Multipart Description/PDF files in .zip description** | | | | |
| | **Document Description** | | **Start** | **End** | |
| | Preliminary Amendment | | 1 | 1 | |
| | Specification | | 2 | 2 | |
| | Claims | | 3 | 4 | |
| | Applicant Arguments/Remarks Made in an Amendment | | 5 | 6 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | | 633517_IDS.pdf | 277629<br>a65caede66798d0900179a6ae0c039989e9bbcb8 | yes | 6 |
| | **Multipart Description/PDF files in .zip description** | | | | |
| | **Document Description** | | **Start** | **End** | |
| | Transmittal Letter | | 1 | 4 | |
| | Information Disclosure Statement (IDS) Form (SB08) | | 5 | 6 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 7 | Non Patent Literature | Ref_16590302_NOA_11-8-21.pdf | 447452<br>43482d3bba202e6ee57ef1827cc68fd0db321298 | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Non Patent Literature | Ref_16590302_OA_6-28-21.pdf | 1155383<br>67df8001610c5c027edd7d3da765c274d7d8f8e2 | no | 27 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 9 | Non Patent Literature | Ref_IEEE802-11-16-0364r3.pdf | 416612<br>5489384155592f1ab5374d67129cf0899a37ec011 | no | 19 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 10 | Non Patent Literature | Ref_IEEE802-11-16-1064r3_npl.pdf | 842935<br>454ccdbb9654a10220858e31ef483538745dc91a | no | 14 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 11 | Application Data Sheet | 633517_ADS_pdf.pdf | 127061<br>b38600730fcd355b7092c16f50dcbc1a858cf300 | no | 10 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied ADS fillable form | | | | | |
| 12 | Fee Worksheet (SB06) | fee-info.pdf | 46669<br>54e30ba831c3b78be46a5c6bb540bd1b07690cfd | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 15471049 | | |

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

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**[DESCRIPTION]**

**[Invention Title]**

WIRELESS COMMUNICATION METHOD USING BSS IDENTIFIER AND WIRELESS COMMUNICATION TERMINAL USING SAME

**[Technical Field]**

The present invention relates to a wireless communication method and a wireless communication terminal using a BSS identifier.

**[Background Art]**

In recent years, with supply expansion of mobile apparatuses, a wireless communication technology that can provide a rapid wireless Internet service to the mobile apparatuses has been significantly spotlighted. The wireless communication technology allows mobile apparatuses including a smart phone, a smart pad, a laptop computer, a portable multimedia player, an embedded apparatus, and the like to wirelessly access the Internet in home or a company or a specific service providing area.

One of most famous wireless communication technology is wireless LAN technology. Institute of Electrical and Electronics Engineers (IEEE) 802.11 has commercialized or developed various technological standards since an initial wireless LAN technology is supported using frequencies of 2.4 GHz. First, the IEEE 802.11b supports a communication speed of a maximum of 11 Mbps while using frequencies of a 2.4 GHz band. IEEE 802.11a which is commercialized after the IEEE 802.11b uses frequencies of not the 2.4 GHz band but a 5 GHz band to reduce an influence by interference as compared with the frequencies of the 2.4 GHz band which are significantly congested and improves the communication speed up to a maximum of 54 Mbps by using an Orthogonal Frequency Division Multiplexing (OFDM) technology. However, the IEEE 802.11a has a disadvantage in that a communication distance is shorter than the IEEE 802.11b. In addition, IEEE 802.11g uses the frequencies of the 2.4 GHz band similarly to the IEEE 802.11b to implement the communication speed of a maximum of 54 Mbps and satisfies backward compatibility to significantly come into the spotlight and further, is superior to the IEEE 802.11a in terms of the communication distance.

Moreover, as a technology standard established to overcome a limitation of the

communication speed which is pointed out as a weak point in a wireless LAN, IEEE 802.11n has been provided. The IEEE 802.11n aims at increasing the speed and reliability of a network and extending an operating distance of a wireless network. In more detail, the IEEE 802.11n supports a high throughput (HT) in which a data processing speed is a maximum of 540 Mbps or more and further, is based on a multiple inputs and multiple outputs (MIMO) technology in which multiple antennas are used at both sides of a transmitting unit and a receiving unit in order to minimize a transmission error and optimize a data speed. Further, the standard can use a coding scheme that transmits multiple copies which overlap with each other in order to increase data reliability.

As the supply of the wireless LAN is activated and further, applications using the wireless LAN are diversified, the need for new wireless LAN systems for supporting a higher throughput (very high throughput (VHT)) than the data processing speed supported by the IEEE 802.11n has come into the spotlight. Among them, IEEE 802.11ac supports a wide bandwidth (80 to 160 MHz) in the 5 GHz frequencies. The IEEE 802.11ac standard is defined only in the 5 GHz band, but initial 11ac chipsets will support even operations in the 2.4 GHz band for the backward compatibility with the existing 2.4 GHz band products. Theoretically, according to the standard, wireless LAN speeds of multiple stations are enabled up to a minimum of 1 Gbps and a maximum single link speed is enabled up to a minimum of 500 Mbps. This is achieved by extending concepts of a wireless interface accepted by 802.11n, such as a wider wireless frequency bandwidth (a maximum of 160 MHz), more MIMO spatial streams (a maximum of 8), multi-user MIMO, and high-density modulation (a maximum of 256 QAM). Further, as a scheme that transmits data by using a 60 GHz band instead of the existing 2.4 GHz/5 GHz, IEEE 802.11ad has been provided. The IEEE 802.11ad is a transmission standard that provides a speed of a maximum of 7 Gbps by using a beamforming technology and is suitable for high bit rate moving picture streaming such as massive data or non-compression HD video. However, since it is difficult for the 60 GHz frequency band to pass through an obstacle, it is disadvantageous in that the 60 GHz frequency band can be used only among devices in a short-distance space.

Meanwhile, in recent years, as next-generation wireless communication

technology standards after the 802.11ac and 802.11ad, discussion for providing a high-efficiency and high-performance wireless communication technology in a high-density environment is continuously performed. That is, in a next-generation wireless communication technology environment, communication having high frequency efficiency needs to be provided indoors/outdoors under the presence of high-density terminals and base terminals and various technologies for implementing the communication are required.

Especially, as the number of devices using a wireless communication technology increases, it is necessary to efficiently use a predetermined channel. Therefore, required is a technology capable of efficiently using bandwidths by simultaneously transmitting data between a plurality of terminals and base terminals.

**[Disclosure]**

**[Technical Problem]**

An object of an embodiment of the present invention is to provide a wireless communication terminal using a BSS identifier.

**[Technical Solution]**

According to an embodiment of the present invention, a base wireless communication terminal communicating wirelessly includes a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals. The processor may be configured to: generate a trigger frame for triggering uplink transmission based random access of at least one wireless communication terminal, and insert the trigger frame into a physical layer protocol data unit (PPDU) to transmit the PPDU.

When the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a Basic Service Set (BSS) operated by the base wireless communication terminal, the processor may be configured to transmit the PPDU using a PPDU format including a field indicating a BSS color. In this case, the BSS color may be a kind of identifier for identifying the BSS.

In more detail, when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a BSS operated by the base wireless communication terminal, the processor may transmit the PPDU using a high efficiency (HE) PPDU format.

In another specific embodiment, when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a BSS operated by the base wireless communication terminal, the processor may be configured to insert a field indicating a BSS color in the trigger frame. In this case, the BSS color may be a kind of identifier for identifying the BSS.

Specifically, the processor may be configured to insert a field representing the BSS color into a User Info field signaling information that is individually applied to the one or more wireless communication terminals for which the trigger frame triggers transmission. In another specific embodiment, a field indicating the BSS color may be inserted into a Common Info field for signaling information that is commonly applied to the one or more wireless communication terminals for which the trigger frame triggers transmission.

The processor may be configured to set a specific field of the trigger frame to a value of a predetermined Association ID (AID) to trigger random access of a wireless communication terminal unassociated with a BSS operated by the base wireless communication terminal.

The processor may be configured to transmit the trigger frame based on a predetermined schedule. In this case, the trigger frame triggers uplink transmission based random access of a wireless communication terminal performing a power saving operation based on the predetermined schedule.

In more detail, the processor may be configured to set a Receiver Address (RA)

field of the trigger frame to a group address indicating a wireless communication terminal performing a power saving operation based on the predetermined schedule.

In another specific embodiment, the trigger frame may include a User Info field for signaling information that is individually applied to the one or more wireless communication terminals to trigger transmission, and the processor may be configured to set a value of an association ID (AID) indicated by a User Info field corresponding to a frequency band allocated for the uplink transmission based random access to a predetermined value indicating a wireless communication terminal performing a power saving operation based on the predetermined schedule. In this case, the predetermined value may be a reserved value that is not allocated for another purpose.

In another specific embodiment, the trigger frame may include a User Info field for signaling information that is individually applied to the one or more wireless communication terminals to trigger the transmission, and the processor may set a TID Aggregation limit field included in a User Info field corresponding to a frequency band allocated for the uplink transmission based random access to a predetermined value indicating a wireless communication terminal performing a power saving operation based on the predetermined schedule. In this case, the TID Aggregation limit field may be a field used to indicate the limit of the number of TIDs corresponding to data that can be aggregated in an A-MPDU transmitted based on the trigger frame.

According to an embodiment of the present invention, a wireless communication terminal wirelessly communicating with a base wireless communication terminal includes a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals. The processor may be configured to: receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering

transmission to the base wireless communication terminal, and transmit the trigger-based PPDU based on the trigger frame.

When the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, the processor may be configured to set a value of a BSS color indicated by the trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame. In this case, the BSS color may be one of identifiers identifying a BSS.

In addition, if the PPDU including the trigger frame does not indicate a BSS color, the processor may be configured to set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal. In this case, the active BSS color may indicate a BSS color actually used by the wireless communication terminal.

The processor may be configured to receive information on a BSS color change from the base wireless communication terminal. In this case, when a BSS color change time point indicated by the information on the BSS color change is reached, the processor may be configured to set the active BSS color to a value of a BSS color indicated by the information on the BSS color change.

The BSS color change time point may be set based on a target beacon transmission time transmitted by the base wireless communication terminal.

If the PPDU indicates a partial BSS color using a Partial Association ID (AID) field, the processor may determine whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero. In this case, the partial AID field may be a signaling field used to indicate part of an AID value. In addition, the Intra-BSS PPDU may be a PPDU transmitted from a BSS including the wireless communication terminal, and the Inter-BSS PPDU may be a PPDU

transmitted from a BSS not including the wireless communication terminal.

According to an embodiment of the present invention, an operation method of base wireless communication terminal communicating wirelessly includes generating a trigger frame for triggering uplink transmission based random access of at least one wireless communication terminal; and inserting the trigger frame into a physical layer protocol data unit (PPDU) to transmit the PPDU.

The transmitting the PPDU may include, when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a Basic Service Set (BSS) operated by the base wireless communication terminal, transmitting the PPDU using a PPDU format including a field indicating a BSS color of a Basic Service Set (BSS) operated by the base wireless communication terminal. The BSS color may be a kind of identifier for identifying a BSS.

**[Advantageous Effects]**

An embodiment of the present invention provides a wireless communication method using a BSS identifier and a wireless communication terminal using the same.

**[Description of Drawings]**

FIG. 1 shows a wireless LAN system according to an embodiment of the present invention.

FIG. 2 shows a wireless LAN system according to another embodiment of the present invention.

FIG. 3 shows a block diagram illustrating a configuration of a station according to an embodiment of the inventive concept.

FIG. 4 shows a block diagram illustrating a configuration of an access point according to an embodiment of the present invention.

FIG. 5 shows a process that a station sets an access point and a link according to an embodiment of the present invention.

FIG. 6 illustrates an operation of transmitting a trigger based PPDU by a plurality of wireless communication terminals based on a trigger frame according to an embodiment of the present invention.

FIG. 7 shows a trigger frame format according to an embodiment of the present invention.

FIG. 8 shows formats of a Common Info field and a User Info field included in a trigger frame according to an embodiment of the present invention.

FIG. 9 shows a method of performing random access by a wireless communication terminal according to an embodiment of the present invention.

FIG. 10 shows a specific format of the UORA parameter set element according to an embodiment of the present invention.

FIG. 11 shows a method of determining whether a PPDU received by a wireless communication terminal is an intra-BSS PPDU or an Inter-BSS PPDU according to an embodiment of the present invention.

FIG. 12 shows a power save operation of a wireless communication terminal according to an embodiment of the present invention.

FIG. 13 shows an operation of performing a UL MU transmission by a wireless communication terminal according to an embodiment of the present invention.

FIG. 14 shows a method of configuring a BSS color of a corresponding PPDU when a base wireless communication terminal according to an embodiment of the present invention transmits a PPDU including a trigger frame that triggers the transmissions of a wireless communication terminal unassociated with a base wireless communication terminal and a wireless communication terminal associated with a base wireless communication terminal.

FIG. 15 shows a method of configuring a BSS color of a corresponding PPDU when a base wireless communication terminal according to an embodiment of the present invention transmits a PPDU to a wireless communication terminal included in a multiple BSSIDs set including a BSS operated by the base wireless communication terminal.

FIG. 16 shows the format of a User Info field of a trigger frame according to an embodiment of the present invention.

FIG. 17 shows a method in which a wireless communication terminal sets a value of a BSS color indicated by a trigger based PPDU when a wireless communication terminal according to an embodiment of the present invention transmits a trigger-based PPDU to a base wireless communication terminal unassociated with the wireless communication terminal.

FIG. 18 shows a method of a wireless communication terminal to set TXVECTOR parameters GROUP_ID and PARTIAL_AID of a VHT SU PPDU according to an embodiment of the present invention.

FIG. 19 is a view of determining whether a VHT PPDU received by a wireless communication terminal according to an embodiment of the present invention is an Inter-BSS PPDU or an Intra-BSS PPDU using the value of the Partial AID field of the signaling field of the VHT PPDU received by the wireless communication terminal.

FIG. 20 shows that a wireless communication terminal sets a TXOP Duration field of a PPDU according to an embodiment of the present invention.

FIG. 21 shows that a wireless communication terminal sets a TXOP Duration field of a PPDU according to another embodiment of the present invention.

FIG. 22 shows that a wireless communication terminal performs UL MU transmission according to an embodiment of the present invention.

FIG. 23 shows that a wireless communication terminal performs a UL MU transmission by according to another embodiment of the present invention.

FIG. 24 shows an encoding value of an RU Allocation field used by a wireless communication terminal according to an embodiment of the present invention.

FIG. 25 shows a UL MU transmission for a base wireless communication terminal unassociated with a wireless communication terminal according to an embodiment of the present invention.

FIG. 26 shows a method for generating an A-MPDU by aggregating MPDUs through a wireless communication terminal according to an embodiment of the present invention.

FIG. 27 shows a method for generating an A-MPDU by a wireless communication terminal according to another embodiment of the present invention.

FIG. 28 shows a control method of an EDCA parameter used by a wireless communication terminal during MU UL transmission according to an embodiment of the present invention.

FIG. 29 shows a method of transmitting a BSR by a wireless communication terminal according to an embodiment of the present invention.

FIG. 30 shows a Target Wake Time (TWT) operation of a wireless communication terminal according to an embodiment of the present invention.

FIG. 31 shows that a wireless communication terminal sets a MU EDCA parameter in a TWT operation according to an embodiment of the present invention.

FIG. 32 shows operations of a base wireless communication terminal and a wireless communication terminal according to an embodiment of the present invention.

[Mode for Carrying out the Invention]

Preferred embodiments of the present invention will be described below in more detail with reference to the accompanying drawings. The present invention may, however, be embodied in different forms and should not be constructed as limited to the embodiments set forth herein. Parts not relating to description are omitted in the drawings in order to clearly describe the present invention and like reference numerals refer to like elements throughout.

Furthermore, when it is described that one comprises (or includes or has) some elements, it should be understood that it may comprise (or include or has) only those elements, or it may comprise (or include or have) other elements as well as those elements if there is no specific limitation.

This application claims priority to and the benefit of Korean Patent Application Nos. 10-2017-0048762 (2017.04.14), Nos. 10-2017-0146358 (2017.11.04), and Nos. 10-2017-0146356 (2017.11.04) filed in the Korean Intellectual Property Office and the embodiments and mentioned items described in the respective applications are included in the Detailed Description of the present application.

FIG. 1 is a diagram illustrating a wireless communication system according to an embodiment of the present invention. For convenience of description, an embodiment of

the present invention is described through the wireless LAN system. The wireless LAN system includes one or more basic service sets (BSS) and the BSS represents a set of apparatuses which are successfully synchronized with each other to communicate with each other. In general, the BSS may be classified into an infrastructure BSS and an independent BSS (IBSS) and FIG. 1 illustrates the infrastructure BSS between them.

As illustrated in FIG. 1, the infrastructure BSS (BSS1 and BSS2) includes one or more stations STA1, STA2, STA3, STA4, and STA5, access points PCP/AP-1 and PCP/AP-2 which are stations providing a distribution service, and a distribution system (DS) connecting the multiple access points PCP/AP-1 and PCP/AP-2.

The station (STA) is a predetermined device including medium access control (MAC) following a regulation of an IEEE 802.11 standard and a physical layer interface for a wireless medium, and includes both a non-access point (non-AP) station and an access point (AP) in a broad sense. Further, in the present specification, a term 'terminal' may be used to refer to a concept including a wireless LAN communication device such as non-AP STA, or an AP, or both terms. A station for wireless communication includes a processor and a transceiver and according to the embodiment, may further include a user interface unit and a display unit. The processor may generate a frame to be transmitted through a wireless network or process a frame received through the wireless network and besides, perform various processing for controlling the station. In addition, the transceiver is functionally connected with the processor and transmits and receives frames through the wireless network for the station.

The access point (AP) is an entity that provides access to the distribution system (DS) via wireless medium for the station associated therewith. In the infrastructure BSS, communication among non-AP stations is, in principle, performed via the AP, but when a direct link is configured, direct communication is enabled even among the non-AP stations. Meanwhile, in the present invention, the AP is used as a concept including a personal BSS coordination point (PCP) and may include concepts including a centralized controller, a base station (BS), a node-B, a base transceiver system (BTS), and a site controller in a broad sense.

A plurality of infrastructure BSSs may be connected with each other through the

distribution system (DS). In this case, a plurality of BSSs connected through the distribution system is referred to as an extended service set (ESS).

FIG. 2 illustrates an independent BSS which is a wireless communication system according to another embodiment of the present invention. For convenience of description, another embodiment of the present invention is described through the wireless LAN system. In the embodiment of FIG. 2, duplicative description of parts, which are the same as or correspond to the embodiment of FIG. 1, will be omitted.

Since a BSS3 illustrated in FIG. 2 is the independent BSS and does not include the AP, all stations STA6 and STA7 are not connected with the AP. The independent BSS is not permitted to access the distribution system and forms a self-contained network. In the independent BSS, the respective stations STA6 and STA7 may be directly connected with each other.

FIG. 3 is a block diagram illustrating a configuration of a station 100 according to an embodiment of the present invention.

As illustrated in FIG. 3, the station 100 according to the embodiment of the present invention may include a processor 110, a transceiver 120, a user interface unit 140, a display unit 150, and a memory 160.

First, the transceiver 120 transmits and receives a wireless signal such as a wireless LAN physical layer frame, or the like and may be embedded in the station 100 or provided as an exterior. According to the embodiment, the transceiver 120 may include at least one transmit and receive module using different frequency bands. For example, the transceiver 120 may include transmit and receive modules having different frequency bands such as 2.4 GHz, 5 GHz, and 60 GHz. According to an embodiment, the station 100 may include a transmit and receive module using a frequency band of 6 GHz or more and a transmit and receive module using a frequency band of 6 GHz or less. The respective transmit and receive modules may perform wireless communication with the AP or an external station according to a wireless LAN standard of a frequency band supported by the corresponding transmit and receive module. The transceiver 120 may operate only one transmit and receive module at a time or simultaneously operate multiple transmit and receive modules together according to the performance and requirements of the station

100. When the station 100 includes a plurality of transmit and receive modules, each transmit and receive module may be implemented by independent elements or a plurality of modules may be integrated into one chip.

Next, the user interface unit 140 includes various types of input/output means provided in the station 100. That is, the user interface unit 140 may receive a user input by using various input means and the processor 110 may control the station 100 based on the received user input. Further, the user interface unit 140 may perform output based on a command of the processor 110 by using various output means.

Next, the display unit 150 outputs an image on a display screen. The display unit 150 may output various display objects such as contents executed by the processor 110 or a user interface based on a control command of the processor 110, and the like. Further, the memory 160 stores a control program used in the station 100 and various resulting data. The control program may include an access program required for the station 100 to access the AP or the external station.

The processor 110 of the present invention may execute various commands or programs and process data in the station 100. Further, the processor 110 may control the respective units of the station 100 and control data transmission/reception among the units. According to the embodiment of the present invention, the processor 110 may execute the program for accessing the AP stored in the memory 160 and receive a communication configuration message transmitted by the AP. Further, the processor 110 may read information on a priority condition of the station 100 included in the communication configuration message and request the access to the AP based on the information on the priority condition of the station 100. The processor 110 of the present invention may represent a main control unit of the station 100 and according to the embodiment, the processor 110 may represent a control unit for individually controlling some component of the station 100, for example, the transceiver 120, and the like. The processor 110 may be a modulator and/or demodulator which modulates wireless signal transmitted to the transceiver 120 and demodulates wireless signal received from the transceiver 120. The processor 110 controls various operations of wireless signal transmission/reception of the station 100 according to the embodiment of the present invention. A detailed embodiment

thereof will be described below.

The station 100 illustrated in FIG. 3 is a block diagram according to an embodiment of the present invention, where separate blocks are illustrated as logically distinguished elements of the device. Accordingly, the elements of the device may be mounted in a single chip or multiple chips depending on design of the device. For example, the processor 110 and the transceiver 120 may be implemented while being integrated into a single chip or implemented as a separate chip. Further, in the embodiment of the present invention, some components of the station 100, for example, the user interface unit 140 and the display unit 150 may be optionally provided in the station 100.

FIG. 4 is a block diagram illustrating a configuration of an AP 200 according to an embodiment of the present invention.

As illustrated in FIG. 4, the AP 200 according to the embodiment of the present invention may include a processor 210, a transceiver 220, and a memory 260. In FIG. 4, among the components of the AP 200, duplicative description of parts which are the same as or correspond to the components of the station 100 of FIG. 2 will be omitted.

Referring to FIG. 4, the AP 200 according to the present invention includes the transceiver 220 for operating the BSS in at least one frequency band. As described in the embodiment of FIG. 3, the transceiver 220 of the AP 200 may also include a plurality of transmit and receive modules using different frequency bands. That is, the AP 200 according to the embodiment of the present invention may include two or more transmit and receive modules among different frequency bands, for example, 2.4 GHz, 5 GHz, and 60 GHz together. Preferably, the AP 200 may include a transmit and receive module using a frequency band of 6 GHz or more and a transmit and receive module using a frequency band of 6 GHz or less. The respective transmit and receive modules may perform wireless communication with the station according to a wireless LAN standard of a frequency band supported by the corresponding transmit and receive module. The transceiver 220 may operate only one transmit and receive module at a time or simultaneously operate multiple transmit and receive modules together according to the performance and requirements of the AP 200.

Next, the memory 260 stores a control program used in the AP 200 and various

resulting data. The control program may include an access program for managing the access of the station. Further, the processor 210 may control the respective units of the AP 200 and control data transmission/reception among the units. According to the embodiment of the present invention, the processor 210 may execute the program for accessing the station stored in the memory 260 and transmit communication configuration messages for one or more stations. In this case, the communication configuration messages may include information about access priority conditions of the respective stations. Further, the processor 210 performs an access configuration according to an access request of the station. The processor 210 may be a modulator and/or demodulator which modulates wireless signal transmitted to the transceiver 220 and demodulates wireless signal received from the transceiver 220. The processor 210 controls various operations such as radio signal transmission/reception of the AP 200 according to the embodiment of the present invention. A detailed embodiment thereof will be described below.

FIG. 5 is a diagram schematically illustrating a process in which a STA sets a link with an AP.

Referring to FIG. 5, the link between the STA 100 and the AP 200 is set through three steps of scanning, authentication, and association in a broad way. First, the scanning step is a step in which the STA 100 obtains access information of BSS operated by the AP 200. A method for performing the scanning includes a passive scanning method in which the AP 200 obtains information by using a beacon message (S101) which is periodically transmitted and an active scanning method in which the STA 100 transmits a probe request to the AP (S103) and obtains access information by receiving a probe response from the AP (S105).

The STA 100 that successfully receives wireless access information in the scanning step performs the authentication step by transmitting an authentication request (S107a) and receiving an authentication response from the AP 200 (S107b). After the authentication step is performed, the STA 100 performs the association step by transmitting an association request (S109a) and receiving an association response from the AP 200 (S109b).

Meanwhile, an 802.1X based authentication step (S111) and an IP address

obtaining step (S113) through DHCP may be additionally performed. In FIG. 5, the authentication server 300 is a server that processes 802.1X based authentication with the STA 100 and may be present in physical association with the AP 200 or present as a separate server.

In a specific embodiment, the AP 200 may be a wireless communication terminal that allocates a communication medium resource and performs scheduling in an independent network, such as an ad-hoc network, which is not connected to an external distribution service. In addition, the AP 200 may be at least one of a base station, an eNB, and a transmission point TP. The AP 200 may also be referred to as a base wireless communication terminal.

The base wireless communication terminal may be a wireless communication terminal that allocates and schedules medium resources in communication with a plurality of wireless communication terminals. Specifically, the base wireless communication terminal may serve as a cell coordinator. In a specific embodiment, the base wireless communication terminal may be a wireless communication terminal that allocates and schedules communication medium resources in an independent network, such as an ad-hoc network, that is not connected to an external distribution service.

When data is transmitted using Orthogonal Frequency Division Modulation (OFDMA) or Multi Input Multi Output (MIMO), any one wireless communication terminal may transmit data to a plurality of wireless communication terminals simultaneously. Also, any one wireless communication terminal may simultaneously receive data from a plurality of wireless communication terminals.

[0053] For convenience of description, any one wireless communication terminal communicating with a plurality of wireless communication terminals at the same time will

be referred to as a base wireless communication terminal. Furthermore, the base wireless communication terminal may be referred to as a base communication device. In addition, the base wireless communication terminal may be a wireless communication terminal that allocates a communication medium resource and performs scheduling in communication with a plurality of wireless communication terminals. Specifically, the base wireless communication terminal may perform the role of a cell coordinator. In this case, the base wireless communication terminal may be the access point 200. In addition, the plurality of wireless communication terminals may be the station 100 associated with the access point 200. In a specific embodiment, the base wireless communication terminal may be a wireless communication terminal that allocates a communication medium resource and performs scheduling in an independent network, such as an ad-hoc network, which is not connected to an external distribution service. In addition, the base wireless communication terminal may be at least one of a base station, an eNB, and a transmission point TP. Through FIGS. 6 to 32, an operation in which a plurality of wireless communication terminals transmit data and a base wireless communication terminal receives data will be described.

FIG. 6 illustrates an operation of transmitting a trigger based PPDU by a plurality of wireless communication terminals based on a trigger frame according to an embodiment of the present invention.

The base wireless communication terminal may transmit a trigger frame including trigger information for triggering transmission of at least one wireless communication terminal or Uplink multi-user response scheduling (UMRS) of the MAC header. At least one wireless communication terminal receiving the trigger frame or the UMRS including the trigger information may transmit a trigger based PPDU based on the trigger

information. The trigger based PPDU may indicate a PPDU including a response frame to a trigger frame. In more detail, the trigger-based PPDU may indicate an HE trigger-based PPDU. One or more wireless communication terminals may simultaneously transmit a trigger-based PPDU to the base wireless communication terminal using at least one of MU-MIMO and OFDMA. In this case, one or more wireless communication terminals may transmit the trigger-based PPDU within a predetermined time from receiving a trigger frame including trigger information or UMRS. At this point, the predetermined time may be an SIFS. In addition, transmitting a response frame to a frame received within a predetermined time by the wireless communication terminal may be referred to as an immediate response.

As described above, the UMRS may include trigger information. Also, UMRS may be included in the A-Control field of the MAC header. In addition, one or more wireless communication terminals may transmit a non-HT PPDU in response to the trigger frame. Specifically, when the trigger frame is MU-RTS type, one or more wireless communication terminals may transmit a non-HT PPDU in response to the trigger frame.

In addition, the A-MPDU may include trigger information. In more detail, the A-MPDU may include a trigger frame. The A-MPDU may include two or more trigger frames. In this case, the contents of the trigger frame may be the same. In addition, when including an A-MPDU trigger frame, the base wireless communication terminal may not be allowed to include in the A-MPDU an MPDU including UMRS that triggers uplink transmission of the same wireless communication terminal as the wireless communication terminal where the corresponding trigger frame triggers uplink transmission.

In the embodiment of FIG. 6, the AP transmits a trigger frame to the first station STA1 to the fourth station STA4. The first station STA1 to the fourth station STA4 receive

a trigger frame and simultaneously transmit a trigger-based PPDU to the AP based on the trigger frame. The AP receives a trigger-based PPDU and transmits an ACK frame based on the MPDU included in the trigger-based PPDU. A specific format of the trigger frame will be described with reference to FIG. 7.

FIG. 7 shows a trigger frame format according to an embodiment of the present invention. FIG. 8 shows formats of a Common Info field and a User Info field included in a trigger frame according to an embodiment of the present invention.

The trigger frame may include information on the wireless communication terminal where the trigger frame triggers the transmission. In detail, the trigger frame may include a Common Info field indicating information that is commonly applied to at least one wireless communication terminal where the trigger frame triggers the uplink transmission. In addition, the trigger frame may include a User Info field indicating information that is individually applied to at least one wireless communication terminal where the trigger frame triggers the uplink transmission. In a specific embodiment, the trigger frame may include a Frame Control field, a Duration field, an RA field, a TA field, a Common Info field, at least one User Info field, a Padding field, and an FCS field, as in the embodiment of FIG. 7.

The RA field may indicate the address of a station receiving the trigger frame. When there is only one wireless communication terminal triggered by the trigger frame, the RA field may indicate an address of the corresponding wireless communication terminal. When there is more than one wireless communication terminal triggered by the trigger frame, the RA field may indicate a broadcast address. When the trigger type of the trigger frame is GCR MU-BAR, the RA field may indicate an address of a wireless

communication terminal group for which transmission of reception status is requested.

The TA field may indicate the address of a station transmitting the trigger frame. When the base wireless communication terminal does not use multiple BSSIDs, the TA field may indicate the MAC address of the base wireless communication terminal transmitting the trigger frame. In addition, when the base wireless communication terminal uses multiple BSSIDs and the base wireless communication terminal transmits a trigger frame to the wireless communication terminal to communicate with the base wireless communication terminal, the TA field may indicate the MAC address of the base wireless communication terminal. In this case, the wireless communication terminal communicating with the base wireless communication terminal may include not only a wireless communication terminal associated with the base wireless communication terminal, but also a wireless communication terminal unassociated with the base wireless communication terminal. In addition, when the base wireless communication terminal uses multiple BSSIDs and the base wireless communication terminal transmits a trigger frame to a plurality of wireless communication terminals communicating with two or more BSSs of a multiple BSSIDs set, the TA field may indicate a transmitted BSSID.

The Padding field may indicate meaningless data. In more detail, when the wireless communication terminal receiving the trigger frame needs time to secure the response transmission preparation for the trigger frame, the base wireless communication terminal may insert a Padding field into the trigger frame. In this case, the base wireless communication terminal may determine the length of the Padding field based on the capability of the wireless communication terminal receiving the trigger frame. When the wireless communication terminal receiving the trigger frame does not need time for response transmission preparation for the trigger frame, the base wireless communication

terminal may not insert the Padding field in the trigger frame. The base wireless communication terminal may indicate the start of the padding field by setting the start portion of the padding field to a specific value. In this case, the specific value may be 0xFFF(4095). In addition, the base wireless communication terminal may set the remaining portion other than the start portion of the padding field to a value different from the specific value.

In more detail, the User Info field may indicate a frequency band allocated to a wireless communication terminal triggered by a trigger frame. The User Info field may include a wireless communication terminal identifier for identifying a wireless communication terminal triggered by the trigger frame and information indicating a bandwidth of a frequency band allocated to the wireless communication terminal. In this case, the wireless communication terminal identifier may be an identifier for shortening an association ID (AID). For example, the trigger frame may include an identifier for shortening the AID of the wireless communication terminal triggered by the trigger frame and an index indicating a frequency band allocated to the wireless communication terminal. In this case, the identifier for shortening the AID may be 12 Least Significant Bits (LSBs) of the AID. According to a specific embodiment, the User Info field may include an AID12 field indicating a wireless communication terminal identifier for identifying a wireless communication terminal triggered by the trigger frame.

The base wireless communication terminal may set a value of the wireless communication terminal identifier of the User Info field to a specific value to indicate that a frequency band of the corresponding User Info field is allocated for random access. In more detail, the base wireless communication terminal may set the value of the wireless communication terminal identifier of the User Info field to a first specific value to indicate

that the frequency band of the corresponding User Info field is allocated for random access for the wireless communication terminal associated the base wireless communication terminal. In addition, the base wireless communication terminal may set the value of the wireless communication terminal identifier of the User Info field to a first specific value to indicate that the frequency band of the corresponding User Info field is allocated for random access for the wireless communication terminal unassociated with the base wireless communication terminal. In this case, the first specific value may be 0. In addition, the second specific value may be 2045. The wireless communication terminal unassociated with the base wireless communication terminal may be a wireless communication terminal unassociated with any base wireless communication terminal.

The User Info field may indicate a frequency band allocated to the wireless communication terminal in a resource unit (RU). In more detail, the User Info field may include an RU allocation field indicating an RU allocated to a wireless communication terminal corresponding to the User Info field.

As described above, the wireless communication terminal receiving the trigger frame may need time to prepare to transmit a response to the trigger frame. In this case, the base wireless communication terminal may insert a Padding field into the trigger frame according to the time required for the wireless communication terminal to prepare to transmit a response to the trigger frame. The minimum time required for the wireless communication terminal to prepare to transmit a response to the trigger frame may be referred to as MinTrigProcTime. When the base wireless communication terminal transmits a trigger frame that triggers random access, the base wireless communication terminal can not determine which wireless communication terminal will perform transmission through the random access. Therefore, when the base wireless communication

terminal transmits a trigger frame that triggers a random access, there is a problem in a method of a base wireless communication terminal to set the field of a trigger frame in order to ensure that the wireless communication terminal has the time necessary to prepare to transmit a response to the trigger frame.

When the trigger frame triggers random access of the wireless communication terminal associated with the base wireless communication terminal, the base wireless communication terminal may set a field of the trigger frame based on MinTrigProcTime of the wireless communication terminal that the trigger frame explicitly triggers. Specifically, when the trigger frame triggers random access of the wireless communication terminal associated with the base wireless communication terminal, the base wireless communication terminal may set a field of the trigger frame based on the longest MinTrigProcTime among MinTrigProcTimes of the wireless communication terminal that the trigger frame explicitly triggers. In this case, the wireless communication terminal triggered explicitly by the trigger frame may indicate a wireless communication terminal indicated by the identifier of the wireless communication terminal through the User Info field described above. In another specific embodiment, when the trigger frame triggers random access of the wireless communication terminal associated with the base wireless communication terminal, the base wireless communication terminal may set a field of the trigger frame based on the longest MinTrigProcTime among MinTrigProcTimes of the wireless communication terminals associated with the base wireless communication terminal.

When the trigger frame triggers random access of the wireless communication terminal unassociated with the base wireless communication terminal, the base wireless communication terminal may set a field of the trigger frame based on the largest value

among the MinTrigProcTime values that the wireless communication terminal is capable of signaling. In this case, the largest value among the MinTrigProcTime values that the wireless communication terminal is capable of signaling may be 16 us.

In the above-described embodiments, the base wireless communication terminal sets at least one of a Padding field, an A-MPDU padding, an A-MPDU subframe, an EOF padding, a frame, and a reserved field of a frame so that it is possible to ensure the time required to prepare to transmit a response to the trigger frame.

In addition, the base wireless communication terminal may be inserted before the User Info field indicating any one of the wireless communication terminal than the User Info field indicating the random access. For example, the base wireless communication terminal may insert a User Info field including an AID12 subfield having a value other than 0 and 2045 before the User Info field having a value of 0 or 2045 in the AID12 subfield.

Specific formats of the User Info field and the Common Info field may be shown in FIGS. 8(a) and 8(b).

FIG. 9 shows a method of performing random access by a wireless communication terminal according to an embodiment of the present invention.

As in the embodiments described with reference to FIG. 8, the base wireless communication terminal may trigger a random access of the wireless communication terminal using a trigger frame. In this case, the wireless communication terminal may randomly access the frequency band indicated by the trigger frame using OFDMA. In more detail, the wireless communication terminal may access an RU allocated for random access based on any number in the OFDMA Contention Window (OCW). In this case, a random

number is referred to as an OFDMA backoff (OBO) counter. In more detail, the wireless communication terminal receiving the trigger frame that triggers the random access may reduce the OBO counter by the number of RUs allocated for the random access. The wireless communication terminal associated with the base wireless communication terminal may decrease the OBO counter by the number of RUs indicated as an RU allocated for the random access of the wireless communication terminal associated with the base wireless communication terminal by the trigger frame. In addition, the wireless communication terminal unassociated with the base wireless communication terminal may reduce the OBO counter by the number of RUs indicated as an RU allocated for the random access of the wireless communication terminal unassociated with the base wireless communication terminal by the trigger frame.

When the OBO counter becomes to 0, the wireless communication terminal is allowed to access any of the RUs allocated for random access. Specifically, when the OBO counter becomes 0, the wireless communication terminal may randomly select any one of the RUs allocated for the random access to access the selected RU. In a specific embodiment, the wireless communication terminal associated with the base wireless communication terminal may randomly select any one of RUs indicated as an RU allocated for random access of the wireless communication terminal associated with the base wireless communication terminal by the trigger frame. In addition, the wireless communication terminal unassociated with the base wireless communication terminal may randomly select any one of the RUs indicated as an RU allocated for the random access of the wireless communication terminal unassociated with the base wireless communication terminal by the trigger frame. When the selected RU is busy, the wireless communication terminal may stop access to the RU and maintain the OBO counter as 0. When the RU is

busy according to at least one of physical carrier sensing and virtual carrier sensing, the wireless communication terminal may determine that the RU is busy. In this case, the wireless communication terminal may perform physical carrier sensing and virtual carrier sensing according to the carrier sensing method in the UL MU procedure.

When the wireless communication terminal receives a new UL OFDMA Random Access (UORA) parameter set element from the base wireless communication terminal or performs random access for the first time, the wireless communication terminal may set the OCW to the minimum value OCWmin of the OCW. In this case, the UORA parameter set element may be an element signaling a parameter used for OFDMA random access. The UORA parameter set element will be described in detail with reference to FIG. 10. In addition, the base wireless communication terminal may be a base wireless communication terminal associated with the wireless communication terminal. The base wireless communication terminal may be a base wireless communication terminal to receive the uplink transmission to be performed by the wireless communication terminal. In addition, in the case of an unassociated wireless communication terminal, the base wireless communication terminal may be a base wireless communication terminal transmitting a UORA parameter set element or transmitting a trigger frame.

In addition, the wireless communication terminal may adjust the value of the OCW according to the result of transmission using the random access. In this case, the value of OCW may indicate the maximum value of the range indicated by OCW, and the minimum value of the range indicated by OCW may be 0. In more detail, the wireless communication terminal may randomly select one of natural numbers from 0 to an OCW value and set it as an OBO counter. When the wireless communication terminal fails to transmit using random access, the wireless communication terminal may set the value of

the OCW to (2*OCW + 1). In this case, the wireless communication terminal may obtain the OBO counter again using the newly set OCW. When the value of the OCW is the maximum value OCWmax that the value of the OCW is capable of having, the wireless communication terminal may maintain the value of the OCW as it is. The wireless communication terminal may obtain OCWmin and OCWmax from the base wireless communication terminal. In more detail, the wireless communication terminal may obtain OCWmin and OCWmax from the UORA parameter set element received from the base wireless communication terminal. The base wireless communication terminal may transmit the UORA parameter set element using a beacon frame or a probe response frame.

In the embodiment of FIG. 9, the first station STA1 and the second station STA2 are associated with an AP transmitting a trigger frame or an AP included in the same multiple BSSIDs set as an AP transmitting a trigger frame. The OBO counter of the first station STA1 is five and the OBO counter of the second station STA2 is one. The first station STA1 and the second station STA2 receive a trigger frame indicating that two RUs are allocated for random access from the AP. The first station STA1 and the second station STA2 decrement the OBO counter by two. Since the OBO counter of the second station STA2 reaches 0, the second station STA2 randomly selects one of two RUs indicated as an RU allocated for random access by the trigger frame, and then attempts the transmission for AP through the selected RU. The second station STA2 receives an ACK for the transmission for the AP from the AP. In this case, the second station STA2 sets the OCW to OCWmin and obtains a new OBO counter value as 6 in the newly set OCW.

The OBO counter of the first station STA1 is three and the OBO counter of the second station STA2 is six. The first station STA1 and the second station STA2 receive a trigger frame indicating that three RUs are allocated for random access from the AP. The

first station STA1 and the second station STA2 decrement the OBO counter by three. Since the OBO counter of the first station STA1 reaches 0, the first station STA1 randomly selects one of three RUs indicated as an RU allocated for random access by the trigger frame, and then attempts the transmission for AP through the selected RU.

FIG. 10 shows a specific format of the UORA parameter set element according to an embodiment of the present invention.

As described above, the base wireless communication terminal may signal a parameter used for UORA using a UORA parameter set element. In more detail, the base wireless communication terminal may transmit a UORA parameter set element using a beacon frame or a probe response frame. The UORA parameter set element may include information necessary to obtain OCWmin and OCWmax. In more detail, the UORA parameter set element may include an Element ID field, a Length field, an Element ID Extension field, and an OCW Range field as shown in FIG. 10. The Element ID field and the Element ID Extension field may indicate values for identifying a UORA parameter set element. In addition, the Length field may indicate the length of the UORA parameter set element. The OCW Range field may include information necessary to obtain OCWmin and OCWmax. In more detail, the OCW Range field may include an EOCWmin field and an EOCWmax. The wireless communication terminal may obtain 2^EOCWmin -1 as OCWmin. In addition, the wireless communication terminal may obtain 2^EOCWmax-1 as OCWmax.

The wireless communication terminal may set OCWmin and OCWmax based on the most recently received UORA parameter set element. In this case, the wireless communication terminal may set OCWmin and OCWmax based on the most recently received UORA parameter set element regardless of an Access Category (AC) to be

transmitted. In more detail, the wireless communication terminal may set OCWmin and OCWmax using information indicated by the most recently received UORA parameter set element regardless of an Access Category (AC) to be transmitted.

As in the embodiments described with reference to FIGS. 9 through 10, the fact that a wireless access terminal randomly accesses a frequency band indicated by a trigger frame and performs uplink transmission is referred to as uplink transmission based random access. In more detail, the uplink transmission based random access may indicate that the wireless communication terminal performs uplink transmission using OFDMA in a frequency band indicated by a trigger frame.

The wireless communication terminal may select a PPDU to be used for transmission according to at least one of a transmission condition and a capability of the wireless communication terminal. For example, when the receiver reports that the DCM can be received or the ER Single User (SU) payload can be received, the wireless communication terminal may transmit a 242-tone extended range (ER) SU PPDU to the wireless communication terminal to receive the PPDU. In addition, when the receiver reports that the UL HE MU PPDU can be received, the wireless communication terminal may transmit the UL HE MU PPDU to the wireless communication terminal that is to receive the PPDU. Whether to receive the ER Single User (SU) payload may be whether to receive the 106-tone ER SU PPDU. In addition, when the wireless communication terminal receives a HE ER SU PPDU using STBC or a HE SU PPDU using STBC, the wireless communication terminal may transmit a PPDU including a control frame in response to the received PPDU using the same format as the received PPDU.

In addition, the base wireless communication terminal may transmit a PPDU

including a control frame in response to the trigger-based PPDU using a PPDU format supported by the receiver. When the base wireless communication terminal transmits a trigger frame that is not the MU RTS type, the base wireless communication terminal may transmit a PPDU including a trigger frame using a PPDU format supported by the receiver. When the wireless communication terminal receives a PPDU including a trigger frame that is not MU RTS type or a MAC frame including UMRS, the wireless communication terminal may transmit a trigger-based PPDU including a control frame in response to the corresponding PPDU.

When the wireless communication terminal receives a HE ER SU PPDU including a fine timing measurement (FTM) frame or a HE SU PPDU including a FTM frame, the wireless communication terminal may transmit an ACK frame in response to the FTM frame using the same format as the received PPDU. In this case, when the wireless communication terminal receives the HE SU PPDU including the FTM frame and the PPDU that is most recently successfully transmitted is HE ER SU PPDU after associated with the transmitter, the wireless communication terminal may transmit the control frame to the HE ER SU PPDU.

When the wireless communication terminal transmits a control frame in response to the HE ER SU PPDU, the wireless communication terminal may transmit a control frame using a HE ER SU PPDU. When the most recently successful PPDU is not a HE ER SU PPDU after the wireless communication terminal associates with the transmitter, the wireless communication terminal may transmit a control frame using a non-high efficiency (HE) PPDU.

When the wireless communication terminal transmits a control frame in response to the HE ER SU PPDU, the wireless communication terminal may transmit the control frame

using a non-HT PPDU or a non-HT duplicate PPDU. When the most recently successful PPDU is not a HE ER SU PPDU after the wireless communication terminal associates with the transmitter, the wireless communication terminal may transmit a control frame using a HE ER SU PPDU.

A PPDU format change may occur between a HE ER SU PPDU and a non-HT PPDU in a subsequent TXOP. In more detail, the wireless communication terminal may transmit a HE ER SU PPDU in response to the non-HT PPDU. In addition, the wireless communication terminal may transmit the non-HT PPDU in response to the HE ER PPDU. The transmitter soliciting the transmission of the control frame in response may set the duration of the TXOP based on the format of the response PPDU. In addition, when the wireless communication terminal receives an immediate ACK for the most recently transmitted PPDU, the wireless communication terminal may determine that the most recent transmission of the PPDU is successful.

When multiple BSSs are overlapped, the communication efficiency of the wireless communication terminal may be degraded due to interference caused by transmission in another BSS. In particular, when a frequency band is used through a contention procedure, a wireless communication terminal may not secure even a transmission opportunity due to interference with other wireless communication terminals. To solve this problem, a wireless communication terminal may perform a spatial reuse (SR) operation. Specifically, the SR operation may include an operation of accessing the channel depending on whether the received frame is a MAC frame transmitted from a BSS including the wireless communication terminal or a MAC frame transmitted from another BSS. For convenience of description, when a frame is used without any description in the following description, it

is assumed to refer to a MAC frame.

In a specific embodiment, the operation of accessing the channel may include a NAV setup and reset operation, a CCA operation, and a deferral operation. For example, the wireless communication terminal may adjust a Clear Channel Assessment (CCA) threshold according to whether a frame received by the wireless communication terminal is a frame transmitted from a BSS including the wireless communication terminal or a frame transmitted from an OBSS. Also, the wireless communication terminal may adjust the transmission power of the PPDU to be transmitted according to the CCA threshold adjustment during the SR operation.

For convenience of explanation, a BSS including the wireless communication terminal is referred to as Intra-BSS, and a basic service set overlapped with Intra-BSS is referred to as an Overlapped Basic Service Set (OBSS). In addition, a BSS different from the Intra-BSS is referred to as Inter-BSS. In addition, a frame transmitted from the Intra-BSS is referred to as an Intra-BSS frame, and a frame transmitted from the OBSS is referred to as an OBSS frame or an Inter-BSS frame. In addition, the PPDU transmitted from the Intra-BSS is referred to as an Intra-BSS PPDU, and the PPDU transmitted from the OBSS is referred to as an OBSS PPDU or an Inter-BSS PPDU.

Specifically, the wireless communication terminal may apply the CCA threshold according to whether the received PPDU is an Inter-BSS PPDU or an Intra-BSS PPDU while the received PPDU is transmitted. In the specific embodiment, the CCA threshold according to whether the received PPDU is an Inter-BSS PPDU or an Intra-BSS PPDU while the payload of the received PPDU is transmitted may be applied. Also, the wireless communication terminal may receive the first PPDU and receive the second PPDU while applying the CCA threshold according to whether the first PPDU is an Inter-BSS PPDU or

an Intra-BSS PPDU. Specifically, the wireless communication terminal may apply the CCA threshold according to whether the received PPDU is an Inter-BSS PPDU or an Intra-BSS PPDU while the received PPDU is transmitted. Specifically, when the wireless communication terminal receives the Inter-BSS PPDU and applies the CCA threshold corresponding to the Inter-BSS PPDU, it may receive the Intra-BSS PPDU. In this case, the wireless communication terminal may apply the CCA threshold corresponding to the Intra-BSS PPDU instead of the CCA threshold corresponding to the Inter-BSS PPDU. However, when the wireless communication terminal receives the Intra-BSS PPDU and applies the CCA threshold corresponding to the Intra-BSS PPDU, and the wireless communication terminal may receive the Inter-BSS PPDU while the transmission of the Intra-BSS PPDU is not completed. In this case, the wireless communication terminal may maintain the CCA threshold corresponding to the Intra-BSS PPDU until the transmission of the intra-BSS PPDU is completed. Specifically, the wireless communication terminal may not apply the CCA threshold corresponding to the inter-BSS PPDU until the transmission of the Intra-BSS PPDU is completed. In the above-described operations, the CCA threshold corresponding to the Inter-BSS PPDU may be equal to or greater than the CCA threshold corresponding to the Intra-BSS PPDU. For convenience of description, performing a Preamble Detection (PD) using a CCA threshold corresponding to an Inter-BSS PPDU may be referred to as an OBSS PD based SR operation.

A method of identifying whether a PPDU received by a wireless communication terminal is an intra-BSS PPDU or an Inter-BSS PPDU will be described.

The wireless communication terminal may determine whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the BSS color indicated by the signaling

field of the PPDU. In this case, the BSS color is one kind of BSS identifier. In addition, the number of values that the BSSID can have may be smaller than the number of values that the BSSID can have. The base wireless communication terminal determines the BSS color of the BSS operated by the base wireless communication terminal. In this case, the base wireless communication terminal may determine any one of 1 to 63 as the BSS color. The BSS colors of the BSSs included in the same multiple BSSI set may all be the same. Accordingly, the base wireless communication terminal may set the value of the BSS color so that the BSS colors of the BSSs included in the same multiple BSSI set is the same. The base wireless communication terminal may signal the BSS color of the BSS operated by the base wireless communication terminal using the HE Operation element or the BSS Color Change Announcement element. The wireless communication terminal other than the base wireless communication terminal may set the value of the BSS color received from the base wireless communication terminal to the value of the BSS Color field of the HE operation element. In addition, when the base wireless communication terminal changes the value of the BSS color of the BSS operated by the base wireless communication terminal, the base wireless communication terminal may signal the value of the BSS color to be changed by transmitting information on the BSS color change. In this case, the information on the BSS color change may be a BSS Color Change Announcement element.

The wireless communication terminal may set the value of the BSS color received from the base wireless communication terminal to the value of the active BSS color. In this case, the active BSS color may indicate a BSS color actually used by the wireless communication terminal. In more detail, the BSS color set by the wireless communication terminal to the value of the BSS Color field of the HE-SIG-A field of the PPDU and the

value of the BSS Color field of the HE Operation element may be referred to as an active BSS color. Therefore, the wireless communication terminal may set the value of the active BSS color to the value of the BSS color indicated by the PPDU transmitted by the wireless communication terminal. Specifically, the wireless communication terminal sets the value of the active BSS color to the value of the BSS Color field of the HE-SIG-A field of the PPDU transmitted by the wireless communication terminal. For example, the base wireless communication terminal may set the value of the active BSS color with BSS_COLOR of the TXVECTOR parameter and set the value of the active BSS color in the BSS Color field of the HE-SIG-A field of the PPDU. When the wireless communication terminal receives the information on the BSS color change and reaches the BSS color change time point indicated by the information on the BSS color change, the wireless communication terminal may set the active BSS color to a value of the BSS color indicated by the information on the BSS color change. In this case, the value of the BSS color indicated by the information on the BSS color change may be a value indicated by the New BSS Color subfield of the BSS Color Change Announcement element. The BSS color change time point may be determined based on target beacon transmission times (TBTT). In addition, when the wireless communication terminal establishes an association, a tunneled direct-link setup (TDLS) link, a direct-link setup (DLS) link, or an IBSS membership with another wireless communication terminal, the wireless communication terminal may set the value of the BSS Color field of the HE-SIG-A field of the PPDU transmitted to the corresponding wireless communication terminal to the value of the active BSS color. In the following description, the value of the BSS color of the BSS may refer to an active BSS color.

The base wireless communication terminal may stop performing the OBSS PD

based SR operation of the wireless communication terminal receiving the PPDU by setting the value of the BSS color indicated by the PPDU to 0. In a specific embodiment, when at least one of the intended receivers of the PPDU is unassociated with the BSS operated by the base wireless communication terminal, the base wireless communication terminal may set the BSS color indicated by the corresponding PPDU to 0. In addition, when the intended receiver of the HE SU PPDU or the HE ER SU PPDU is unassociated with the BSS operated by the base wireless communication terminal, the base wireless communication terminal may set the BSS color indicated by the corresponding PPDU to 0.

When the wireless communication terminal receives a PPDU indicating a value of 1 to 63 of the BSS color, the wireless communication terminal may perform an OBSS PD based SR operation. In addition, when the wireless communication terminal receives the PPDU indicating that the value of the BSS color is 0, the wireless communication terminal may not perform the OBSS PD-based SR operation. In more detail, when the wireless communication terminal receives a PPDU indicating that the value of the BSS color is 0, the wireless communication terminal may not determine whether the channel is idle based on the OBSS PD threshold. In addition, when the wireless communication terminal receives a PPDU indicating that the value of the BSS color is 0, the wireless communication terminal may not discard the corresponding PPDU. Specifically, when the wireless communication terminal receives a HE SU PPDU or HE ER SU PPDU indicating that the value of the BSS color is 0, the wireless communication terminal may not discard the corresponding PPDU. Through these embodiments, the base wireless communication terminal may transmit a PPDU to a wireless communication terminal unassociated with the BSS operated by the base communication terminal. In addition, the wireless communication terminal may receive the PPDU from the base wireless communication

terminal unassociated with the wireless communication terminal.

When at least one of the intended receivers of the PPDU is unassociated with the BSS operated by the base wireless communication terminal, it may be the case that the intended receiver of the PPDU transmitted by the base wireless communication terminal, the intended receiver of the A-MPDU included in the PPDU, or the intended receiver of the frame is unassociated with the BSS operated by the base wireless communication terminal. In addition, as described above, the base wireless communication terminal may use the trigger frame to trigger random access of the wireless communication terminal that is unassociated with the base wireless communication terminal. In this case, the base wireless communication terminal may set the value of the BSS color indicated by the PPDU including the trigger frame to 0. In this case, the operation of the wireless communication terminal will be described with reference to FIGS. 11 to 13.

FIG. 11 shows a method of determining whether a PPDU received by a wireless communication terminal is an intra-BSS PPDU or an Inter-BSS PPDU according to an embodiment of the present invention.

As described above, the wireless communication terminal may determine whether the received PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the BSS color indicated by the signaling field of the PPDU. In more detail, the wireless communication terminal may determine whether the corresponding PPDU is an intra-BSS PPDU or an Inter-BSS PPDU based on the value of the BSS color indicated by the PPDU received by the wireless communication terminal. The wireless communication terminal may determine the value of the BSS color indicated by the received PPDU based on the value indicated by the BSS Color field of the HE-SIG-A field of the received PPDU. In more

detail, the wireless communication terminal may determine the value of the BSS color indicated by the received PPDU based on the BSS_COLOR of the RXVECTOR.

In addition, the wireless communication terminal may determine whether the frame is an Inter-BSS frame or an Intra-BSS frame based on the MAC header of the frame. Specifically, when the receiver address RA or the transmitter address TA of the MAC header of the frame received by the wireless communication terminal is the BSSID of the BSS including the wireless communication terminal or is included in the multiple BSSIDs set including the wireless communication terminal, the wireless communication terminal may identify the received frame as an Intra-BSS frame.

In addition, the wireless communication terminal may determine whether the VHT PPDU is an Inter-BSS PPDU or an Intra-BSS PPDU based on the Partial AID field of the VHT PPDU. In more detail, the wireless communication terminal may determine whether the VHT PPDU is an Inter-BSS PPDU or an Intra-BSS PPDU based on the Partial AID field and the Group ID field of the VHT PPDU. When the Group ID field of the VHT PPDU received by the wireless communication terminal is 0 and the value of the Partial AID field match the values from the 39th bit to the 47th bit included in the BSSID of the BSS including the wireless communication terminal or the BSSID included in the multiple BSSIDs set included in the BSSID of the BSS including the wireless communication terminal, the wireless communication terminal may identify the VHT PPDU as an Intra-BSS PPDU. In addition, if the Group ID field of the VHT PPDU received by the wireless communication terminal is 0 and the value of the Partial AID field do not match the values from the bit with index 39 to the bit with index 47 (BSSID[39:47]) included in the BSSID of the BSS including the wireless communication terminal or the BSSID included in the multiple BSSIDs set included in the BSSID of the BSS including the wireless

communication terminal, the wireless communication terminal may identify the VHT PPDU as an Inter-BSS PPDU.

When the Group ID field of the VHT PPDU received by the wireless communication terminal is 63 and the value from the fifth bit to the eighth bit of the Partial AID field matches the value of the partial BSS color of the BSS including the wireless communication terminal, the wireless communication terminal may identify the VHT PPDU as an Intra-BSS PPDU. In addition, when the Group ID field of the VHT PPDU received by the wireless communication terminal is 63 and the values from the bit with the index 5 to the bit with the index 8 of the Partial AID field (Partial AID [5: 8]) do not match the values of the partial BSS color of the BSS including the wireless communication terminal, the wireless communication terminal may identify the corresponding VHT PPDU as an Inter-BSS PPDU. The partial BSS color may be four LSBs of the BSS color of the BSS. When the base wireless communication terminal allows partial BSS color based Intra-BSS PPDU or Inter-BSS PPDU, the wireless communication terminal may determine whether the VHT PPDU received by the wireless communication terminal is an Inter-BSS PPDU or an Intra-BSS PPDU based on the partial BSS color. The base wireless communication terminal may indicate that partial BSS color based Intra-BSS PPDU or Inter-BSS PPDU identification is allowed using the Partial BSS Color field of the HE Operation element.

When the TA field of the frame received by the wireless communication terminal does not exist and the RA field matches the transmission opportunity (TXOP) holder address of the BSS including the wireless communication terminal, the wireless communication terminal may identify the frame as an Intra-BSS frame. At this point, the frame may be limited to the control frame. In addition, the TXOP holder may indicate a

wireless communication terminal that obtains the TXOP through a contention procedure.

In addition, when the UL/DL field of the HE-SIG-A field of the PPDU received by the base wireless communication terminal indicates downlink transmission, the base wireless communication terminal may identify the corresponding PPDU as an Inter-BSS PPDU. In this case, the value of the UL/DL field may be 0.

In a specific embodiment, when a frame or PPDU received by a wireless communication terminal satisfies any one of the following conditions, the wireless communication terminal may determine the frame as an Intra-BSS frame or the PPDU as an Intra-BSS PPDU.

- The value of the BSS color indicated by the PPDU including the frame is equal to the value of the BSS color of the BSS including the wireless communication terminal. In this case, the value of the BSS color of the BSS including the wireless communication terminal may be a value of the BSS color signaled by the base wireless communication terminal associated with the wireless communication terminal.

- When the Individual/Group bit of the RA field, TA field or BSSID field of the frame is set to 0, the value of the corresponding field is equal to the BSSID of the BSS including the wireless communication terminal.

- When the base wireless communication terminal associated with the wireless communication terminal is a member of the multiple BSSIDs set and sets the Individual/Group bit of the RA field, TA field, or BSSID field of the frame to 0, the value of this field is equal to the BSSID of the BSS including the wireless communication terminal.

- The PPDU is a VHT PPDU, the Group ID field of the VHT PPDU is 0, and the

value of the Partial AID field are equal to the values from the bit with index 37 to the bit with index 47 (BSSID [39:47]) of the BSSID of the BSS including the wireless communication terminal.

- The Partial BSS Color field of the HE Operation element most recently transmitted from the BSS including the wireless communication terminal is one, the PPDU is a VHT PPDU, the Group ID field of the VHT PPDU is 63, and the values from the bit with index 5 to the bit with index 8 (Partial AID[5:8]) of the Partial AID field of the PPDU are equal to the BSS color of the partial BSS of the BSS including the wireless communication terminal.

- The frame is a control frame having no TA field, and the RA field of the frame is equal to the address of the TXOP holder of the BSS including the wireless communication terminal.

In addition, when a frame or PPDU received by a wireless communication terminal satisfies any one of the following conditions, the wireless communication terminal may determine the frame as an Inter-BSS frame or the PPDU as an Inter-BSS PPDU.

- The value of the BSS color indicated by the PPDU is not 0, and the value of the BSS color indicated by the PPDU is not equal to the value of the BSS color of the BSS including the wireless communication terminal. In this case, the value of the BSS color of the BSS including the wireless communication terminal may be a value of the BSS color signaled by the base wireless communication terminal associated with the wireless communication terminal.

- When the Individual/Group bit of the BSSID field of the frame is set to 0, the value of the corresponding field is not equal to the BSSID of the BSS including the wireless communication terminal. In this case, the PPDU receiving the frame may not

indicate the BSS color.

- When the frame does not include a BSSID field and sets the Individual/Group bits of the RA and TA fields of the frame to 0, the value of any one field is not equal to the BSSID of the BSS including the wireless communication terminal.

- When the base wireless communication terminal associated with the wireless communication terminal is a member of the multiple BSSIDs set and sets the Individual/Group bits of the RA field, TA field, and BSSID field of the frame to 0, the value of any one field is not equal to the BSSID of the BSS including the wireless communication terminal.

- The PPDU is a VHT PPDU, the Group ID field of the PPDU is 0, and the value of the Partial AID field are not equal to the values from the bit with index 37 to the bit with index 47 (BSSID[39:47]) of the BSSID of the BSS including the wireless communication terminal.

- The Partial BSS Color field of the HE Operation element most recently transmitted from the BSS including the wireless communication terminal is one, the PPDU is a VHT PPDU, the Group ID field of the VHT PPDU is 63, and the values from the bit with index 5 to the bit with index 8 (Partial AID[5:8]) of the Partial AID field of the PPDU are not identical to the BSS color of the partial BSS of the BSS including the wireless communication terminal.

- The UL/DL field of the HE-SIG-A field of the PPDU received by the base wireless communication terminal indicates downlink transmission.

In the above embodiments, the wireless communication terminal may priortize the first determination that determines whether the frame or PPDU is transmitted from the Inter-BSS or the Intra-BSS based on the MAC address over the second determination that

determines whether a frame or PPDU is transmitted from Inter-BSS or Intra-BSS based on the BSS color indicated by the PPDU. As described above, the PPDU may indicate the BSS color through the BSS Color of the HE-SIG-A field. In addition, the PPDU may indicate the BSS color through the Group ID field Partial AID field. In addition, when a frame or PPDU satisfies both an Intra-BSS frame or PPDU condition and an Inter-BSS frame or PPDU condition, the wireless communication terminal may determine the corresponding frame or PPDU as an Inter-BSS frame or PPDU. In addition, when a frame or PPDU does not satisfy both an Intra-BSS frame or PPDU condition and an Inter-BSS frame or PPDU condition, the wireless communication terminal may not determine the corresponding frame or PPDU as an Inter-BSS frame or PPDU, or an Intra-BSS frame or PPDU.

The wireless communication terminal may maintain a network allocation vector (NAV), which is an indicator that indicates that transmission that the wireless communication terminal did not initiate continues on a wireless medium. In more detail, the wireless communication terminal may set the NAV based on the duration information indicated by the Duration/ID field of the MAC header. In addition, the wireless communication terminal may set the NAV based on the duration information indicated by the TXOP Duration field of the HE-SIG-A of the PPDU. In this case, when the TXOP Duration field of the HE-SIG-A of the PPDU indicates duration information, the wireless communication terminal may set the NAV based on the TXOP Duration field of the HE-SIG-A of the PPDU. For example, when all bits of the TXOP Duration field of the HE-SIG-A of the PPDU are set to 1, the wireless communication terminal may not set the NAV based on the TXOP Duration field of the HE-SIG-A of the PPDU. In these embodiments,

when the value of TXOP indicated by the duration information obtained by a wireless communication terminal from the Duration/field of the MAC header or the TXOP Duration field of the HE-SIG-A of the PPDU is greater than the current NAV, the wireless communication terminal may set the NAV according to the obtained duration information.

The wireless communication terminal may manage the NAV differently depending on whether the frame or the PPDU is transmitted from the Intra-BSS. Through this, the wireless communication terminal can increase the efficiency of using a wireless medium when there is an OBSS. In more detail, the wireless communication terminal may maintain two NAVs, that is, an Intra-BSS NAV set based on an Intra-BSS PPDU or a frame, and a Basic NAV set based on an Inter-BSS PPDU or a frame. In this case, the wireless communication terminal may set a basic NAV based on a PPDU or frame that cannot be identified as an Inter-BSS PPDU or frame or as an Intra-BSS PPDU or frame. A detailed operation related to NAV setting of a wireless communication terminal will be described.

When a frame or a PPDU including the corresponding frame does not solicit an immediate response, the wireless communication terminal may set the Intra-BSS NAV based on the Duration/ID field of the MAC header of the corresponding frame or the TXOP Duration field of the corresponding PPDU. In addition, when the wireless communication terminal does not transmit an immediate response even when the frame or the PPDU including the corresponding frame solicits an immediate response, the wireless communication terminal may set the Intra-BSS NAV based on the Duration/ID field of the MAC header of the corresponding frame or the TXOP Duration field of the corresponding PPDU. In addition, when the wireless communication terminal is a TXOP holder, it is possible to set the NAV based only on frames that are not solicited by the wireless communication terminal.

In addition, when the wireless communication terminal does not obtain the duration information from the Duration/ID field of the frame included in the PPDU, the wireless communication terminal may be allowed to set the NAV based on the HE-SIG-A TXOP Duration field of the PPDU. When the wireless communication terminal obtains the duration information from the Duration/ID field of the frame included in the PPDU and the duration information from the TXOP Duration field of the HE-SIG-A of the PPDU, the wireless communication terminal may ignore the duration information obtained from the TXOP Duration field of the HE-SIG-A of the corresponding PPDU. In this case, the wireless communication terminal may set the NAV according to the duration information obtained from the Duration/ID field of the corresponding frame.

In addition, when the PPDU received by the wireless communication terminal is not triggered by the wireless communication terminal, the wireless communication terminal may be allowed to set the NAV based on the HE-SIG-A TXOP Duration field of the PPDU.

According to the embodiments described above, when the wireless communication terminal transmits a trigger-based PPDU, the wireless communication terminal may set the BSS color indicated by the trigger-based PPDU according to the BSS color of the PPDU including the trigger frame soliciting the trigger-based PPDU. In more detail, the wireless communication terminal may set the BSS Color field of the HE-SIG-A field of the trigger based PPDU according to the BSS color of the PPDU including the trigger frame soliciting the trigger based PPDU. When the PPDU including the trigger frame soliciting the trigger-based PPDU does not indicate BSS color, the wireless communication terminal may set the BSS Color field of the HE-SIG-A field of the trigger-based PPDU using the value of the

BSS Color field of the HE operation element most recently received. In addition, when the PPDU including the trigger frame soliciting the trigger-based PPDU reaches the BSS Color change time point without indicating the BSS color, the wireless communication terminal may set the BSS Color field of the HE-SIG-A field of the trigger-based PPDU using the New BSS Color field value of the most recently received BSS Color Change Announcement element. In this case, the BSS Color change time point may be a time point at which a predetermined number of TBTTs elapse since the BSS Color Change Announcement element is changed from the base wireless communication terminal.

In addition, when the intended receiver of the trigger frame is unassociated with the base wireless communication terminal that transmits the trigger frame, as described above, the base wireless communication terminal may set the value of the BSS color indicated by the PPDU including the trigger frame to 0. In this case, since the value of the BSS color indicated by the PPDU is 0, when the wireless communication terminal that receives the PPDU including the trigger frame fails to decode the frame included in the PPDU, the wireless communication terminal cannot determine whether the corresponding PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU. Therefore, the wireless communication terminal receiving the PPDU including the trigger frame may set the basic NAV based on the TXOP Duration field of the corresponding PPDU according to the above-described embodiment. In this case, when the PPDU is transmitted in a modulation method not supported by the wireless communication terminal, the wireless communication terminal may not be able to decode a frame included in the corresponding PPDU. In more detail, the PPDU may be transmitted in an MCS, a DCM, and a coding type that the wireless communication terminal does not support. In addition, after the wireless communication terminal receives the preamble of the PPDU, frame decoding may fail. In addition, when the PPDU is a

trigger-based PPDU, since the wireless communication terminal cannot determine the composition of the PPDU and the PSDU, it may not be able to receive a frame included in the PPDU.

In this situation, when the PPDU is transmitted from the base wireless communication terminal associated with the wireless communication terminal, the wireless communication terminal updates the basic NAV even though the Intra-BSS NAV needs to be updated. As the basic NAV is set, the wireless communication terminal may not transmit an immediate response to the base wireless communication terminal even when the base wireless communication terminal associated with the corresponding wireless communication terminal requests an immediate response. When the base wireless communication terminal associated with the wireless communication terminal requests an immediate response, the corresponding wireless communication terminal may ignore the Intra-BSS NAV and transmit the immediate response. When the base wireless communication terminal associated with the wireless communication terminal requests an immediate response, the corresponding wireless communication terminal may ignore the Intra-BSS NAV and transmit the immediate response. However, this is because even if the base wireless communication terminal associated with the wireless communication terminal requests the immediate response, the wireless communication terminal cannot ignore the basic NAV and transmit the immediate response.

In the embodiment of FIG. 11, the AP operating the first BSS BSS1 transmits a trigger frame that triggers random access of a station unassociated with the AP. In this case, the AP sets the BSS Color field of the HE-SIG-A of the PPDU including the trigger frame to 0. The first station STA1 included in the first BSS BSS1 configures the basic NAV based on the PPDU including the trigger frame.

The wireless communication terminal not included in the first BSS BSS1 sets the BSS color to 0 to transmit the trigger-based PPDU. The second station STA2 included in the first BSS BSS1 sets the basic NAV based on the trigger-based PPDU.

Thereafter, the AP operating the first BSS BSS1 transmits a trigger frame for triggering transmission of the first station STA1 and the second station STA2. The first station STA1 and the second station STA2 determine that the channel used for transmission is busy due to the basic NAV, and does not transmit the trigger based PPDU.

FIG. 12 shows a power save operation of a wireless communication terminal according to an embodiment of the present invention.

While the PPDU is transmitted between other wireless communication terminals in the BSS including the wireless communication terminal, the wireless communication terminal may determine that the PPDU cannot be received or transmitted. In this case, the wireless communication terminal may enter a doze state. The doze state may indicate a state in which the wireless communication terminal turns off a part of functions to reduce power consumption. In detail, when the wireless communication terminal receives an Intra-BSS PPDU of which the wireless communication terminal is not the intended receiver, the wireless communication terminal may maintain the doze state while the corresponding PPDU is transmitted. This is because when the wireless communication terminal receives the Intra-BSS PPDU, and the wireless communication terminal is not the intended receiver of the PPDU, the wireless communication terminal cannot receive or transmit the PPDU while the corresponding PPDU is transmitted. In a specific embodiment, the wireless communication terminal which is not the base wireless communication terminal may determine that the wireless communication terminal is not an intended

receiver of an Uplink (UL) PPDU. In addition, when the wireless communication terminal which is not the base wireless communication terminal receives a Downlink (DL) PPDU, and the identifier of the receiver indicated by the signaling field of the corresponding PPDU does not indicate the wireless communication terminal, the wireless communication terminal may determine that the wireless communication terminal is not the intended receiver of the PPDU. For example, when the HE-SIG-B field of the HE MU PPDU does not indicate an Association ID (AID) of the wireless communication terminal, the wireless communication terminal may determine that it is not an intended receiver of the corresponding PPDU. Operation of such a wireless communication terminal may be referred to as an Intra-PPDU power save.

Intra-PPDU power save operation is described in more detail. When a wireless communication terminal other than the base wireless communication terminal receives a PPDU satisfying any one of the following conditions, the wireless communication terminal other than the base wireless communication terminal may maintain the doze state until transmission of the corresponding PPDU is terminated.

- The PPDU is a HE MU PPDU, the BSS Color field of the HE-SIG-A field of the PPDU is equal to the BSS color of the BSS including the wireless communication terminal, the UL/DL field of the HE-SIG-A field of the PPDU indicates downlink transmission, and the HE-SIG-B of the PPDU does not include a STA ID field indicating a wireless communication terminal or a broadcast ID indicating a plurality of wireless communication terminals including the wireless communication terminal.

- The PPDU is HE MU PPDU, HE SU PPDU or HE ER SU PPDU, the BSS Color field of the HE-SIG-A field of the PPDU is equal to the BSS color of the BSS including the wireless communication terminal, and the UL/DL field of the HE-SIG-A field of the PPDU

indicates uplink transmission.

- The PPDU is HE MU PPDU, HE SU PPDU or HE ER SU PPDU, the BSS Color field of the HE-SIG-A field of the PPDU is equal to the BSS color of the BSS including the wireless communication terminal, the UL/DL field of the HE-SIG-A field of the PPDU indicates uplink transmission, and the PPDU is transmitted at a rate not supported by the wireless communication terminal.

- The PPDU is a trigger-based PPDU, and the BSS Color field of the HE-SIG-A field of the PPDU is equal to the BSS color of the BSS including the wireless communication terminal.

- The PPDU is a VHT PPDU, the value of the Partial AID field of the PPDU are equal to the values from the bit with index 37 to the bit with index 47 (BSSID[39:47]) of the BSSID of the BSS including the wireless communication terminal, and the value of the Group ID field of the PPDU is 0.

- The MPDU included in the PPDU includes an RA field, a TA field, or a BSSID field indicating any one of a BSSID of a BSS including the wireless communication terminal or a BISSID of a multiple BSSIDs set including a BSSID of a BSS including the wireless communication terminal. The RA field does not indicate the MAC address of the wireless communication terminal.

The wireless communication terminal may set the value indicated by the UL/DL field of the HE-SIG-A field of the transmitting PPDU to downlink or UL_FLAG of TXVECTOR. In addition, the wireless communication terminal may set the value indicated by the BSS Color field of the HE-SIG-A field of the transmitted PPDU to BSS_COLOR of TXVECTOR.

The wireless communication terminal may determine the value indicated by the

UL/DL field of the HE-SIG-A field of the received PPDU based on the UL_FLAG of the RXVECTOR. The wireless communication terminal may determine the value indicated by the BSS Color field of the HE-SIG-A field of the received PPDU based on the BSS_COLOR of the RXVECTOR. The wireless communication terminal may determine whether the PPDU is transmitted at a rate not supported by the wireless communication terminal based on whether PHY-RXEND.indication(UnsupportedRate) primitive is received in the MAC layer.

In the embodiment of FIG. 12, the AP operating the first BSS BSS1 transmits a trigger frame that triggers random access of a station unassociated with the AP. In this case, the AP sets the BSS Color field of the HE-SIG-A of the PPDU including the trigger frame to 0. The wireless communication terminal not included in the first BSS BSS1 sets the BSS color to 0 to transmit the trigger-based PPDU. Since the value of the BSS color indicated by the trigger-based PPDU is 0, the first station STA1 included in the first BSS BSS1 may not perform the Intra-BSS power save operation immediately after decoding the signaling field of the PPDU. When the first station STA1 decodes the MAC header of the trigger-based PPDU, the first station STA1 may maintain the doze state until the transmission of the trigger-based PPDU is terminated. When the PPDU indicates that a value of the BSS color is 0 in such a way, although the wireless communication terminal is able to perform the Intra-BSS power save operation, the wireless communication terminal may not be able to determine whether the received PPDU is Intra-BSS and thus may not perform the Intra-BSS power save operation.

FIG. 13 shows an operation of performing a UL MU transmission by a wireless communication terminal according to an embodiment of the present invention.

As described above, when the Intra-BSS PPDU is transmitted while the Inter-BSS PPDU is transmitted, the wireless communication terminal may perform CCA using a PD threshold level having a value equal to or greater than a used PD threshold level. In this case, the PD threshold used by the wireless communication terminal may be referred to as an OBSS PD threshold. Through this, the wireless communication terminal can increase the probability that the channel is idle than when the Intra-BSS PPDU is transmitted while the Inter-BSS PPDU is transmitted. However, when the value of the BSS color indicated by the PPDU is 0, the wireless communication terminal cannot perform the OBSS PD based SR operation.

In the embodiment of FIG. 13, the AP operating the first BSS BSS1 transmits a trigger frame that triggers random access of a station unassociated with the AP. In this case, the AP sets the BSS Color field of the HE-SIG-A of the PPDU including the trigger frame to 0. The first station STA1 included in the second BSS BSS2 cannot identify that the PPDU including the trigger frame is an Inter-BSS PDDU until the trigger frame is decoded. Accordingly, the first station STA1 may determine whether the channel is idle by using the OBSS PD threshold after decoding the trigger frame. In the embodiment of FIG. 13, since the first station STA1 uses the OBSS PD threshold larger than the normal PD threshold after decoding the trigger frame, the first station STA1 determines that a channel previously determined to be busy is idle.

The wireless communication terminal not included in the first BSS BSS1 sets the BSS color to 0 to transmit the trigger-based PPDU. Since the value of the BSS color indicated by the trigger-based PPDU is 0, the first station STA1 cannot identify whether the trigger-based PPDU is an Inter-BSS PPDU. In addition, since the first station STA1 cannot decode the payload of the trigger based PPDU, the first station STA1 cannot

perform the OBSS PD based SR operation while the trigger based PPDU is transmitted.

In order to solve the problem described with reference to FIGS. 11 to 13, an operation of a wireless communication terminal to be described below may be considered.

FIG. 14 shows a method of setting a BSS color of a corresponding PPDU when a base wireless communication terminal according to an embodiment of the present invention transmits a PPDU including a trigger frame that triggers the transmissions of a wireless communication terminal unassociated with a base wireless communication terminal and a wireless communication terminal associated with a base wireless communication terminal.

The base wireless communication terminal may set the value of the BSS color indicated by the PPDU including the trigger information to the value of the BSS color of the BSS operated by the base wireless communication terminal other than 0. Specifically, when the trigger information triggers the transmission of the wireless communication terminal that is not included in the BSS operated by the base wireless communication terminal, the base wireless communication terminal may set the value of the BSS color indicated by the PPDU including the trigger information to the value of the BSS color of the BSS operated by the base wireless communication terminal. The trigger information for triggering the transmission of the wireless communication terminal not included in the BSS operated by the base wireless communication terminal may be a trigger frame for triggering random access of the wireless communication terminal not included in the BSS operated by the base wireless communication terminal. In addition, the PPDU including the trigger information may be a PPDU including a trigger frame for triggering transmission of a wireless communication terminal not included in a BSS operated by the

base wireless communication terminal and a frame transmitted to a wireless communication terminal included in a BSS operated by the base wireless communication terminal. The PPDU including the trigger information may be a PPDU including a trigger frame for triggering transmission of a wireless communication terminal not included in a BSS operated by the base wireless communication terminal and a frame transmitted to a wireless communication terminal included in a BSS operated by the base wireless communication terminal. In addition, the PPDU including the trigger information may be a PPDU including a trigger frame for triggering the transmission of a wireless communication terminal not included in a BSS operated by the base wireless communication terminal and the transmission of a wireless communication terminal included in a BSS operated by the base wireless communication terminal.

In the embodiment of FIG. 14, the AP operating the first BSS BSS1 transmits a PPDU including a trigger frame. In this case, the base wireless communication terminal sets the AID field values of the User Info field of the trigger frame to 12 and 2045 to perform transmission of the first station AID 12 associated with the AP and trigger random access of the wireless communication terminal unassociated with the AP. Therefore, the AP sets the value of the BSS color indicated by the PPDU to the value of the BSS color of the first BSS BSS1.

Through these embodiments, the wireless communication terminal can solve the problem caused by not determining whether the PPDU received by the wireless communication terminal is an Intra-BSS PPDU or an Inter-BSS PPDU. In addition, the wireless communication terminal may apply these embodiments to the HE SU PPDU or the HE ER SU PPDU.

FIG. 15 shows a method of setting a BSS color of a corresponding PPDU when a base wireless communication terminal according to an embodiment of the present invention transmits a PPDU to a wireless communication terminal included in a multiple BSSIDs set including a BSS operated by the base wireless communication terminal.

As described above, when the base wireless communication terminal transmits a PPDU including trigger information for triggering the transmission of the wireless communication terminal included in the multiple BSSIDs set including the BSS operated by the base wireless communication terminal, the base wireless communication terminal may set the value of the BSS color indicated by the PPDU to 0. In addition, the wireless communication terminal including the trigger information and receiving the PPDU indicating the value 0 of the BSS color may set the value of the BSS color indicated by the trigger-based PPDU to 0 to transmit the trigger-based PPDU to the base wireless communication terminal. In this embodiment, similarly to those described with reference to FIGS. 11 to 13, a problem may occur in which wireless communication terminals cannot identify whether a PPDU is an Inter-BSS PPDU or an Intra-BSS PPDU.

When the intended receiver of the PPDU includes a wireless communication terminal included in a BSS operated by a base wireless communication terminal and a wireless communication terminal of the BSS corresponding to the multiple BSSIDs set including the BSSID of the BSS operated by the base wireless communication terminal, the base wireless communication terminal may set the value of the BSS color indicated by the PPDU to the value of the BSS color of the BSS operated by the base wireless communication terminal. In more detail, when the base wireless communication terminal transmits a PPDU including trigger information for triggering the transmission of the wireless communication terminal included in the multiple BSSIDs set including the BSS

operated by the base wireless communication terminal, the base wireless communication terminal may set the value of the BSS color indicated by the PPDU to the value of the BSS color of the BSS operated by the base wireless communication terminal.

In addition, the wireless communication terminal may set the value of the BSS color indicated by the trigger-based PPDU to a value other than 0. In the above-described embodiment, the wireless communication terminal may set the value of the BSS color indicated by the trigger-based PPDU to the value of the BSS color indicated by the PPDU including trigger information. In addition, when the PPDU received by the wireless communication terminal includes trigger information and the value of the BSS color indicated by the PPDU is 0, the wireless communication terminal may set the value of the BSS color indicated by the trigger-based PPDU to the value of the BSS color of the BSS operated by the base wireless communication terminal that transmits the trigger information. The wireless communication terminal may transmit the trigger-based PPDU as a response to the PPDU including the trigger information. In this case, the wireless communication terminal may obtain the value of BSS color of the BSS operated by the base wireless communication terminal from the HE Operation element previously transmitted by the base wireless communication terminal. In addition, the base wireless communication terminal may obtain the value of the BSS color of the BSS operated by the base wireless communication terminal from the trigger frame. This will be described in more detail with reference to FIG. 16.

In the embodiment of FIG. 15, the AP operating the first BSS BSS1 transmits a PPDU including a trigger frame. In this case, the trigger frame triggers random access of a station not included in the first BSS BSS1, and the base wireless communication terminal sets the value of the BSS color indicated by the PPDU including the trigger frame to 0. The

station transmitting the trigger-based PPDU based on the trigger frame sets the value of the BSS color indicated by the trigger-based PPDU to the BSS color of the first BSS BSS1 to transmit the trigger-based PPDU to the AP.

Before the wireless communication terminal obtains the UORA parameter set element from the base wireless communication terminal, the wireless communication terminal may attempt random access based on the trigger frame transmitted by the base wireless communication terminal. Specifically, when the trigger frame triggers random access of the wireless communication terminal unassociated with the base wireless communication terminal, the unassociated wireless communication terminal may attempt random access to the base wireless communication terminal before obtaining the UORA parameter set element from the base wireless communication terminal. In this case, the unassociated wireless communication terminal may attempt random access using a predetermined default UORA parameter set element. Similarly, the PPDU including the trigger frame may not indicate the value of the BSS color of the BSS in which the PPDU is transmitted and the wireless communication terminal may not obtain the HE Operation element from the base wireless communication terminal that transmits the trigger frame. In more detail, the PPDU including the trigger frame may be a non-HE PPDU. In addition, the value of the BSS color indicated by the PPDU including the trigger frame may be 0. Accordingly, the base wireless communication terminal may signal the BSS color of the BSS operated by the base wireless communication terminal through a trigger frame. Through this, the wireless communication terminal transmitting the trigger-based PPDU cannot obtain the BSS color of the BSS operated by the base wireless communication terminal transmitting the trigger frame so that it is possible to prevent failing to set a value

of the BSS color indicated by the trigger-based PPDU. This will be described with reference to FIG. 16.

FIG. 16 shows the format of a User Info field of a trigger frame according to an embodiment of the present invention.

The trigger frame may include a field indicating a value of BSS color of the BSS operated by the base wireless communication terminal transmitting the trigger frame. In more detail, the Common Info field of the trigger frame may include a field indicating a value of BSS color value the BSS operated by the base wireless communication terminal transmitting the trigger frame. For convenience of description, a field indicating a value of BSS color is referred to as a BSS Color field. In more detail, the Common Info field of the trigger frame may selectively include a BSS Color field for transmitting the trigger frame. According to a specific embodiment, when the trigger type of the trigger frame is a predefined type, the Common Info field may selectively include a BSS Color field for transmitting the trigger frame. In this case, the predetermined trigger type may indicate a trigger frame that triggers random access of a wireless communication terminal unassociated with a base wireless communication terminal that transmits the trigger frame.

In another specific embodiment, the User Info field of the trigger frame may include a BSS Color field for transmitting the trigger frame. In more detail, the User Info field of the trigger frame may selectively include a BSS Color field for transmitting the trigger frame. For example, when the User Info field indicates a wireless communication terminal unassociated with the base wireless communication terminal transmitting the trigger frame, the User Info field may include a BSS Color field transmitting the trigger frame. In this case, the User Info field may include a BSS Color field for transmitting a trigger frame instead of the SS Allocation field. In this case, the wireless communication

terminal may assume that the SS Allocation field indicates a predetermined value. For example, the wireless communication terminal may regard that the SS Allocation field indicates that both STARTING_SS_NUM and NUM_SS are 1.

FIG. 16(a) shows a specific format of a User info field when the User Info field is associated with a base wireless communication terminal that transmits a trigger frame. In addition, FIG. 16(b) shows a specific format of a User info field including a BSS Color field when the User Info field is unassociated with a base wireless communication terminal transmitting a trigger frame in a specific embodiment. In this case, the BSS Color field is a BSS Color field for transmitting a trigger frame.

In another specific embodiment, when the User Info field indicates a wireless communication terminal unassociated with the base wireless communication terminal transmitting the trigger frame, the User Info field may further include a BSS Color field transmitting the trigger frame. In this case, the length of the User Info field indicating a wireless communication terminal unassociated with the base wireless communication terminal transmitting the trigger frame is different from the length of the User Info field indicating a wireless communication terminal associated with the base wireless communication terminal transmitting the trigger frame. But, in the trigger frame, when among the User Info fields, a User Info field indicating a wireless communication terminal unassociated with a base wireless communication terminal transmitting a trigger frame is located behind another User Info field and the wireless communication terminal has a User Info field indicating the wireless communication terminal, it may not decode anymore. Therefore, even if the trigger frame includes a User Info field having a different length, the User Info field indicating the wireless communication terminal can be found.

In addition, the base wireless communication terminal may obtain the value of the

BSS color of the BSS operated by the base wireless communication terminal from the trigger frame. In more detail, the wireless communication terminal may obtain a value of BSS color of the BSS operated by the base wireless communication terminal from the BSS Color field included in the trigger frame.

In another specific embodiment, when the base wireless communication terminal triggers transmission of a wireless communication terminal unassociated with the base wireless communication terminal using a trigger frame, the wireless communication terminal can transmit the trigger-based PPDU only when the HE operation element transmitted by the base wireless communication terminal is obtained. This will be described with reference to FIG. 17.

FIG. 17 shows a method in which a wireless communication terminal sets a value of a BSS color indicated by a trigger based PPDU when a wireless communication terminal according to an embodiment of the present invention transmits a trigger-based PPDU to a base wireless communication terminal unassociated with the wireless communication terminal.

Specifically, when the wireless communication terminal is unassociated with the base wireless communication terminal that transmits the trigger frame, the wireless communication terminal may attempt uplink transmission based random access for the base wireless communication terminal based on whether the HE Operation element is obtained from the base wireless communication terminal. Specifically, when the wireless communication terminal is unassociated with the base wireless communication terminal that transmits the trigger frame and the wireless communication terminal obtains the HE Operation element from the base wireless communication terminal, the wireless

communication terminal may attempt uplink transmission based random access to the base wireless communication terminal based on the trigger frame. In this case, the wireless communication terminal may set the value of the signaling field of the trigger-based PPDU to indicate the value of the BSS Color field of the HE Operation element obtained by the trigger-based PPDU. In addition, when the wireless communication terminal is unassociated with the base wireless communication terminal that transmits the trigger frame and the wireless communication terminal does not obtain the HE Operation element from the base wireless communication terminal, the wireless communication terminal may not perform uplink transmission based random access to the base wireless communication terminal based on the trigger frame. However, when the wireless communication terminal is unassociated with the base wireless communication terminal that transmits the trigger frame, and the wireless communication terminal receives the PPDU including the trigger frame and the signaling field indicating the BSS color, the wireless communication terminal may perform uplink transmission based random access to the base wireless communication terminal based on the trigger frame even when the HE operation element is not obtained.

In the embodiment of FIG. 17, the AP transmits a trigger frame that triggers random access of a station unassociated with the AP. In this case, the wireless communication terminal that receives the HE Operation element from the AP among the stations unassociated with the AP performs uplink transmission based random access based on the trigger frame. In addition, the wireless communication terminal may set the value of the BSS Color field of the HE-SIG-A field of the trigger-based PPDU to the value of the BSS Color field of the HE Operation element obtained from the AP.

In addition, the wireless communication terminal may set the value of the signaling

field of the trigger-based PPDU so that the trigger-based PPDU indicates the active BSS color corresponding to the BSS operated by the base wireless communication terminal instead of the value of the BSS Color field of the HE Operation element. Specifically, after the BSS color change time point, the wireless communication terminal may set a value of a signaling field of the trigger-based PPDU such that the trigger-based PPDU indicates a value of the BSS color signaled by the base wireless communication terminal through the BSS color change information.

In the above-described embodiments, the base wireless communication terminal may correspond to a multiple BSSIDs set. In this case, the wireless communication terminal may receive the HE Operation element from the base wireless communication terminal to obtain the HE Operation element from the base wireless communication terminal of the reference BSSID, and regard the HE Operation element from the base wireless communication terminal of the reference BSSID in the same manner as the HE Operation element obtained from the base wireless communication terminal.

In another specific embodiment, when the base wireless communication terminal triggers transmission of a wireless communication terminal unassociated with the base wireless communication terminal using a trigger frame, the wireless communication terminal may transmit only the PPDU indicating the value of the BSS color. In this case, the PPDU indicating the value of the BSS color may be a HE PPDU. In this case, transmission of a wireless communication terminal unassociated with the base wireless communication terminal may indicate uplink transmission based random access.

As described above, the value of the BSS color may be indicated by using the Partial AID field of the VHT SU PPDU. This will be described with reference to FIGS. 18

to 19.

FIG. 18 shows a method of a wireless communication terminal to set TXVECTOR parameters GROUP_ID and PARTIAL_AID of a VHT SU PPDU according to an embodiment of the present invention.

The table of FIG. 18 shows a GROUP_IP and PARTIAL_AID setting method for each condition. In this case, [b: c] represents a value from the bit index b to the bit index c. In addition, bit n represents a bit index n. Accordingly, bit 0 represents an Individual/Group bit and bit 47 represents the last bit of the Partial AID field. In addition, the bit position b may be scaled to 2^0, and the bit position c may be scaled to 2^(c-b). The base wireless communication terminal may not allocate a value of AID having a PARTIAL_AID value of 0 to the wireless communication terminal.

The base wireless communication terminal may indicate the value of the BSS color of the BSS operated by the base wireless communication terminal using the value of the Partial AID field. In more detail, the base wireless communication terminal may set a value of the partial AID field by using a part of bits of the value of the BSS color of the BSS operated by the base wireless communication terminal. In more detail, the base wireless communication terminal may set a value of the partial AID field by using the following equation.

AID[5:8] = bin[(BCB[0:3] - (BSSID[44:47] XOR BSSID[40:43])) mod 2^4,4]

BCB [0: 3] may represent a value (4 LSBs) from bit index 0 to bit index 3 of the BSS color of the BSS. In addition, bin [x, 4] may be a value representing a decimal value x as a 4-bit binary vector. As described above, the base wireless communication terminal may set the Partial BSS Color field of the HE Operation element to 1, and then set the value of the Partial AID field using some bits of the value of the BSS color. The wireless

communication terminal may determine whether the PPDU received by the wireless communication terminal is an Inter-BSS PPDU or an Inter-BSS PPDU using the value of the Partial AID field according to the above-described Inter-BSS PPDU and Intra-BSS PPDU determination methods. Specifically, when the value of the Group ID field is 63 and the value of the Partial AID field is not 0, the wireless communication terminal may determine whether the PPDU received by the wireless communication terminal is an Inter-BSS PPDU or an Inter-BSS PPDU using the value of the Partial AID field.

FIG. 19 is a view of determining whether a VHT PPDU received by a wireless communication terminal according to an embodiment of the present invention is an Inter-BSS PPDU or an Intra-BSS PPDU using the value of the Partial AID field of the signaling field of the VHT PPDU received by the wireless communication terminal.

In the embodiment described with reference to FIG. 18, when the value of the BSS color is 48(b110000) or 16(b010000), 4 LSBs of the Partial AID field of the PPDU are set to 0. In addition, when the base wireless communication terminal transmits the VHT PPDU to a wireless communication terminal unassociated with the base wireless communication terminal, the base wireless communication terminal sets the Group ID field to 63 and sets 4 LSBs of the Partial AID field to 0. The wireless communication terminal that is included in a BSS in which a value of the BSS color is 48(b110000) or 16(b010000) and is unassociated with the base wireless communication terminal may determine that the PPDU is an Intra-BSS PPDU even though the PPDU is an Inter-BSS PPDU. In the embodiment of FIG. 19, the value of the partial BSS color of the first BSS BSS1 is 0. Therefore, when an AP other than the AP operating the first BSS BSS1 transmits the VHT PPDU by setting the value of the Group ID field of the VHT PPDU to 63 and the 4 LSBs of the Partial AID

field to 0, the station included in the first BSS BSS1 may determine the VHT PPDU as an intra-BSS PPDU. Accordingly, the station included in the first BSS BSS1 may perform CCA by applying a PD threshold other than the OBSS PD threshold to the corresponding VHT PPDU. In addition, when the value of the BSS color of the BSS operated by the base wireless communication terminal is 48(b110000) or 16(b010000), even when the base wireless communication terminal transmits the VHT PPDU to the wireless communication terminal associated with the base wireless communication terminal, the base wireless communication terminal sets 4 LSBs of the Partial AID field of the VHT PPDU to 0. Accordingly, the wireless communication terminal capable of performing the SR operation may not perform the OBSS PD based SR operation according to the Partial AID field of the VHT PPDU.

Therefore, when the value of the Group ID field of the VHT PPDU received by the wireless communication terminal is 63 and the value of the Partial AID field is not 0, it may be determined whether 4 LSBs of the Partial AID field are equal to the value of the BSS color of the BSS including the wireless communication terminal. If the value of the Group ID field of the VHT PPDU received by the wireless communication terminal is 63, the value of the Partial AID field is not 0, and 4 LSBs of the Partial AID field are equal to the value of the BSS color of the BSS including the wireless communication terminal, the wireless communication terminal may determine the VHT PPDU as an Intra-BSS PPDU. In a specific embodiment, when the Partial BSS Color field of the recent HE Operation element indicates that Partial BSS Color is available, the wireless communication terminal can determine whether 4 LSBs of the partial AID field are equal to the value of the BSS color of the BSS including the wireless communication terminal.

A method of setting a value of a TXOP Duration field of a PPDU by a wireless communication terminal will be described with reference to FIGS. 20 to 21.

FIG. 20 shows that a wireless communication terminal sets a TXOP Duration field of a PPDU according to an embodiment of the present invention.

As described above, the wireless communication terminal may set the NAV based on the duration information indicated by the TXOP Duration field of the HE-SIG-A of the PPDU. In this case, when the TXOP Duration field of the HE-SIG-A of the PPDU indicates duration information, the wireless communication terminal may set the NAV based on the TXOP Duration field of the HE-SIG-A of the PPDU. For example, when all bits of the TXOP Duration field of the HE-SIG-A of the PPDU are set to 1, the wireless communication terminal may not set the NAV based on the TXOP Duration field of the HE-SIG-A of the PPDU. In a specific embodiment, when the wireless communication terminal transmits a PPDU including a PS-Poll frame, the wireless communication terminal may set a value of the TOXP Duration field so that the TOXP Duration field does not indicate duration information. In addition, when the TXOP Duration field of the PPDU soliciting the response does not indicate duration information, the wireless communication terminal, which is a TXOP responder, may set a value of the TOXP Duration field so that the TOXP Duration field does not indicate duration information. In addition, when the PPDU soliciting the response does not include the TXOP Duration field, the wireless communication terminal, which is the TXOP responder, may set a value of the TOXP Duration field so that the TOXP Duration field does not indicate duration information. In this case, the PPDU soliciting the response may be a non-HE PPDU.

In addition, the base wireless communication terminal may signal, to the wireless communication terminal included in the BSS operated by the base communication terminal,

not to determine whether the PPDU received by the wireless communication terminal is an Inter-BSS PPDU or an Intra-BSS PPDU using a BSS color value. For this, the base wireless communication terminal may set the value of the BSS Color Disabled field of the HE operation element to 1. For example, since the number of values that the BSS Color bits can represent is smaller than the number of values that the BSSID can have, the same BSS color value may be used for different BSSs. At this point, the base wireless communication terminal may set the value of the BSS Color Disabled field of the HE operation element to 1. If the value of the BSS Color Disabled field of the HE Operation element obtained by the wireless communication terminal is 1, the wireless communication terminal may determine whether the PPDU received by the wireless communication terminal is an Inter-BSS PPDU or an Intra-BSS PPDU using the MAC header Address field instead of the value of the BSS color indicated by the PPDU. In addition, when the base wireless communication terminal sets the value of the BSS Color Disabled field of the HE Operation element to 1, the base wireless communication terminal may set a value of the TOXP Duration field so that the TOXP Duration field does not indicate duration information.

However, when the TXOP Duration field of the trigger-based PPDU does not indicate duration information, the wireless communication terminal that is not the intended receiver of the trigger-based PPDU may not obtain the duration information from the trigger-based PPDU or the frame included in the trigger-based PPDU. This is because a wireless communication terminal that is not an intended recipient of a trigger based PPDU cannot decode a trigger based PPDU frame.

In the embodiment of FIG. 20, the AP operating the first BSS BSS1 set the TXOP Duration field of the PPDU including the trigger frame not to indicate duration information.

At this point, when the second station supports PPDU reception, the second station may obtain duration information from a frame included in the PPDU. Since the TXOP Duration field of the PPDU does not indicate duration information, the second station set so that the TXOP Duration field of the trigger-based PPDU transmitted in response to the PPDU including the trigger frame does not indicate duration information. The first station STA1 receives a trigger-based PPDU but cannot obtain duration information from a trigger-based PPDU or a frame included in the trigger-based PPDU. Therefore, the first station STA1 does not set the NAV and the frame exchange sequence between the AP and the second wireless communication terminal may not be adequately protected. Therefore, a method for solving these problems is needed. This will be described with reference to FIG. 21.

[00208] FIG. 21 shows that a wireless communication terminal sets a TXOP Duration field of a PPDU according to another embodiment of the present invention.

[00209] When the wireless communication terminal transmits a trigger-based PPDU, the wireless communication terminal may set a value of the TXOP Duration field so that the TXOP Duration field always indicates duration information. Specifically, when a wireless communication terminal that is a TXOP responder transmits a trigger-based PPDU, regardless of whether the TXOP Duration field of the PPDU soliciting a response indicates duration information, the wireless communication terminal may set a value of the TXOP Duration field so that the TXOP Duration field of the PPDU that is transmitted always indicates the duration information. However, when a wireless communication terminal that is a TXOP responder transmits a HE SU PPDU or HE ER PPDU, the wireless communication terminal may set the TXOP Duration field so that the TXOP Duration field of the transmitting PPDU does not indicate duration information.

[00210] In the embodiment of FIG. 21, the AP operating the first BSS BSS1 configures the TXOP Duration field of the PPDU including the trigger frame not to indicate duration information. At this point, when the second station supports PPDU reception, the second station may obtain duration information from a frame included in the PPDU. Although the TXOP Duration field of the PPDU does not indicate duration information, the second station sets a value of the TXOP Duration field so that the TXOP Duration field of the trigger-based PPDU transmitted in response to the PPDU including the trigger frame indicates duration information. The first station STA1 may receive a trigger-based PPDU but may configure a NAV by obtaining duration information from the trigger-based PPDU. Therefore, even when the first station STA1 does not receive the PPDU including the trigger frame, the frame exchange sequence between the AP and the second station may be protected.

When the base wireless communication terminal changes the BSS color of the BSS, even the wireless communication terminal included in the same BSS may use different BSS colors. Specifically, before the base wireless communication terminal changes the BSS color of the BSS, the base wireless communication terminal may transmit signaling information on the BSS color change as described above. In this case, the signaling information on the BSS color change may be a HE BSS Color Change Announcement element. However, when the wireless communication terminal included in the corresponding BSS fails to obtain signaling information on the BSS color change and fails to obtain the HE Operation Element after the BSS Color is changed, even wireless communication terminals included in the same BSS may use different BSS colors. In this case, a problem that may occur will be described with reference to FIG. 22.

FIG. 22 shows that a wireless communication terminal performs UL MU transmission according to an embodiment of the present invention.

The wireless communication terminal receiving the PPDU including the trigger information may set the value of the BSS color indicated by the trigger-based PPDU to the value of the BSS Color field of the HE Operation element most recently received by the wireless communication terminal. Specifically, when the PPDU including the trigger information does not include a field indicating the BSS color, the wireless communication terminal receiving the PPDU including the trigger information may set the value of the BSS color indicated by the trigger-based PPDU to the value of the BSS Color field of the HE Operation element most recently received by the wireless communication terminal. In addition, when the wireless communication terminal receiving the PPDU including the trigger information cannot use the value of the BSS color indicated by the PPDU including the trigger information, the wireless communication terminal receiving the PPDU including the trigger information may set the value of the BSS color indicated by the trigger-based PPDU to the value of the BSS Color field of the HE Operation element most recently received by the wireless communication terminal. In these embodiments, if the wireless communication terminal does not obtain the HE Operation Element after the BSS Color is changed, the wireless communication terminal may transmit a modulated signal of a HE-SIG-A field different from that of another wireless communication terminal simultaneously transmitting a trigger-based PPDU. As a result, the base wireless communication terminal may fail to receive a trigger-based PPDU.

In the embodiment of FIG. 22, the AP transmits a beacon frame including the HE BSS Color Change Announcement element. In this case, the value of the New BSS Color field of the HE Color Change Announcement element is y, the value of the BSS Color field

of the HE Operation element is x, and the Color Switch Countdown field represents 3. The first station STA1 and the second station STA2 receive the beacon frame to obtain the HE BSS Color Change Announcement element. Each time the AP transmits a beacon frame including the HE BSS Color Change Announcement element, the AP decreases the value of the Color Switch Countdown field and repeatedly transmits a beacon frame including the HE BSS Color Change Announcement element. When the value of the Color Switch Countdown field becomes 0, the AP starts using the value of the new BSS color. Therefore, when the AP transmits a PPDU whose value of the Color Switch Countdown field is 0, the AP sets the value of the BSS Color field of the HE Operation element to y.

Since the BSS color change time point signaled by the HE BSS Color Change Announcement element elapses, both the first station STA1 and the second station change the value of the active BSS color to y. However, the first station SAT1 receives the beacon frame after the BSS color is changed, but the second station STA2 fails to receive the beacon frame after the BSS color is changed. Thereafter, the AP transmits a trigger frame using a PPDU instead of a HE PPDU. In this case, since the value of the BSS Color field of the HE operation element most recently received by the first station STA1 is y, the first station STA1 transmits a trigger-based PPDU indicating the BSS color y. Since the value of the BSS Color field of the HE operation element most recently received by the second station SAT2 is x, the second station STA2 transmits a trigger-based PPDU indicating the BSS color x. Accordingly, the AP may fail to receive the trigger-based PPDU transmitted by the first station STA1 and the second station STA2.

FIG. 23 shows that a wireless communication terminal performs a UL MU transmission by according to another embodiment of the present invention.

When the wireless communication terminal transmits a trigger based PPDU, the wireless communication terminal may configure the trigger based PPDU to indicate an active BSS color of the wireless communication terminal. In more detail, when the wireless communication terminal transmits a trigger-based PPDU, the wireless communication terminal may set a value of the BSS Color field of the HE-SIG-A field of the trigger-based PPDU to the active BSS color of the wireless communication terminal. According to a specific embodiment, when the wireless communication terminal receives a PPDU that includes a trigger frame and does not indicate a value of a BSS color, the wireless communication terminal may set the value of the BSS Color field of the HE-SIG-A field of the trigger-based PPDU to the active BSS color of the wireless communication terminal. A PPDU that includes a trigger frame and does not indicate a value of a BSS color may indicate a non-HE PPDU. As mentioned above, after receiving the BSS Color Change Announcement element, when the BSS color change time point elapses, the wireless communication terminal may set the value of the New BSS Color field of the BSS Color Change Announcement element to the value of the active BSS color.

In the embodiment of FIG. 23, in addition to the operation of transmitting the trigger-based PPDU by the first station STA1 and the second station STA2, the operations of the AP, the first station STA1, and the second station STA2 are identical to those in the embodiment of FIG. 22. The second station STA2 did not receive the HE Operation element from the AP after the BSS color change. However, both the first station SAT1 and the STA2 set the value of the BSS Color field of the HE-SIG-A of the trigger-based PPDU according to the active BSS color. Therefore, both the first station SAT1 and the second station STA2 transmit a trigger-based PPDU indicating that the value of the BSS color is y, and the AP thus succeeds in trigger-based reception transmitted from each of the first

station SAT1 and the second station STA2.

Through FIGS. 24 to 25, a method of transmitting a trigger-based PPDU to a base wireless communication terminal by a wireless communication terminal unassociated with the base wireless communication terminal will be described. Especially, a method of signaling information of an operating channel operated by a base wireless communication terminal to a base wireless communication terminal unassociated with the base wireless communication terminal is shown.

FIG. 24 shows an encoding value of an RU Allocation field used by a wireless communication terminal according to an embodiment of the present invention.

When the trigger frame indicates the RU, the trigger frame may indicate the relative position and size of the RU in the operating channel of the BSS in which the frame is transmitted. In this case, the relative position and size of the RU may be a combination of a predetermined relative position and size. For example, the trigger frame may indicate to which RU among RUs of a specific size it corresponds.

In more detail, the trigger frame may indicate the relative position and size of the RU using the RU Allocation field described with reference to FIG. 8. A bit corresponding to bit index 12 of the RU Allocation field may indicate whether the RU is located in a primary 80 MHz channel. A bit corresponding to bit index 12 of the RU Allocation field may indicate whether the RU is located in a primary 80 MHz channel. In addition, when the RU is located in the secondary 80 MHz channel, the value of the bit corresponding to bit index 12 of the RU Allocation field may be 1. When the RU is in a 160 MHz size (2*996-tone RU), the value of the bit corresponding to bit index 12 of the RU Allocation field may be a predetermined value. In another specific embodiment, when the RU is in a

160 MHz size (2*996-tone RU), the value of the bit corresponding to bit index 12 of the RU Allocation field may be set to any value. In addition, a value corresponding to bit index 19 to bit index 13 of the RU Allocation field may indicate the index of the RU and the size of the RU. When the value corresponding to bit index 19 to bit index 13 of the RU Allocation field is 0 to 36, a value corresponding to bit index 19 to bit index 13 of the RU Allocation field may indicate the number of cases in which a 26-tone RU may be located in a frequency band having an 80 MHz bandwidth. In addition, whenthe value corresponding to bit index 19 to bit index 13 of the RU Allocation field is 37 to 52, a value corresponding to bit index 19 to bit index 13 of the RU Allocation field may indicate the number of cases in which a 52-tone RU may be located in a frequency band having an 80 MHz bandwidth. In more detail, a value corresponding to bit index 19 to bit index 13 of the RU Allocation field and the location of the RU may be mapped as shown in FIG. 24.

FIG. 25 shows a UL MU transmission for a base wireless communication terminal unassociated with a wireless communication terminal according to an embodiment of the present invention.

As described above, the wireless communication terminal unassociated with the base wireless communication terminal may perform transmission for the random access based base wireless communication terminal without obtaining the HE Operation element or the VHT Operation element. In more detail, the wireless communication terminal unassociated with the base wireless communication terminal may perform transmission for the UORA-based base wireless communication terminal using a default UORA parameter set without obtaining a HE Operation element. However, the HE operation element may indicate information on the operation channel of the BSS operated by the base wireless

communication terminal in addition to the information on the UORA parameter set. In more detail, the HE Operation element may signal information on a primary 20 MHz channel used by the base wireless communication terminal. In addition, the HE Operation element may signal information on the center frequency of the 80MHz segment. In addition, as described with reference to FIG. 24, the trigger frame may indicate a relative position of an RU to be used by a wireless communication terminal triggered by the trigger frame. Therefore, when a wireless communication terminal unassociated with the base wireless communication terminal does not obtain the HE Operation element, the trigger frame may not accurately determine the location of the RU indicating the random access.

As in the embodiment of FIG. 25, the AP may transmit a PPDU including a trigger frame using a frequency band having a bandwidth greater than 20 MHz. In this case, the station unassociated with the AP receives a trigger frame on a channel other than the 20 MHz primary channel used by the base wireless communication terminal. In this case, the trigger frame may be transmitted as a non-HT duplicate PPDU. In addition, the trigger frame may be transmitted through a HE PPDU in which the legacy preamble and the HE-SIG-A field are repeated every 20 MHz. In such cases, the station unassociated with the AP may receive the trigger frame but cannot determine the position of the primary 20 MHz channel used by the base wireless communication terminal. Accordingly, the station unassociated with the AP may not accurately determine the location of the RU in which the trigger frame indicates random access. As a result, a station unassociated with the AP may attempt random access to the RU in which the trigger frame does not indicate random access. Also, even if a station unassociated with an AP succeeds in transmitting a trigger-based PPDU, since the station cannot accurately determine the location of the primary 20 MHz channel, the station may not receive an ACK for the trigger based PPDU.

In relation to these problems, the base wireless communication terminal may insert information on the operating channel of the BSS operated by the base wireless communication terminal in the trigger frame. Specifically, the base wireless communication terminal may insert information on the primary channel used by the base wireless communication terminal in the trigger frame. In a specific embodiment, the base wireless communication terminal may insert information on a 20 MHz primary channel used by the base wireless communication terminal in a trigger frame. In addition, the base wireless communication terminal may insert information on the 80 MHz primary channel used by the base wireless communication terminal in the trigger frame. The information on the 80 MHz primary channel may be a 1-bit indicator indicating whether the RU in which the trigger frame is transmitted is the primary 80 MHz channel. In addition, the information on the 80MHz primary channel may be information indicating the center frequency of the 80MHz frequency band. In addition, when the trigger frame triggers random access of a wireless communication terminal unassociated with the base wireless communication terminal, the base wireless communication terminal may insert information on the operating channel of the BSS operated by the base wireless communication terminal in the trigger frame. In addition, the wireless communication terminal unassociated with the base wireless communication terminal may obtain information on the operating channel of the BSS from the trigger frame, and determine the location of the RU indicated by the trigger frame based on the information on the operating channel of the BSS.

In another specific embodiment, the base wireless communication terminal may not transmit a PPDU including a trigger frame using a 160 MHz or 80 MHz frequency band. In another specific embodiment, the base wireless communication terminal may set a value of the RU Allocation field of the trigger frame such that only the RU whose trigger frame is

not the 160 MHz or 80 MHz frequency band is indicated to the RU to be used for the transmission triggered by the trigger frame. In another specific embodiment, the base wireless communication terminal may set a value of the RU Allocation field of the trigger frame such that only the RU not in the secondary 80 MHz frequency band is indicated to the RU to be used for the transmission triggered by the trigger frame. When the trigger frame triggers random access of a wireless communication terminal unassociated with the base wireless communication terminal, the base wireless communication terminal may determine the RU indicated by the trigger frame according to the constraints of any one of the above-described embodiments. In addition, the base wireless communication terminal may indicate the RU to be used for random access of the wireless communication terminal unassociated with the base wireless communication terminal in the RU located in the 80 MHz segment in which the trigger frame is transmitted.

In addition, the base wireless communication terminal may prevent the wireless communication terminal unassociated with the base wireless communication terminal from not receiving a response to the trigger-based PPDU through the following embodiments. In more detail, the base wireless communication terminal may transmit a response to a trigger-based PPDU transmitted by a wireless communication terminal unassociated with the base wireless communication terminal using a non-HT duplication PPDU. This is because when a response to a trigger-based PPDU is transmitted to a non-HT duplication PPDU, a wireless communication terminal unassociated with the base wireless communication terminal may receive a non-HT duplication PPDU transmitted by the base wireless communication terminal regardless of which 20 MHz channel is received. In this case, the base wireless communication terminal may transmit a response to the trigger-based PPDU transmitted by the wireless communication terminal unassociated with the

base wireless communication terminal in the frequency band in which the base wireless communication terminal transmits a trigger frame or in a frequency band including a frequency band in which the base wireless communication terminal transmits a trigger frame.

In addition, the base wireless communication terminal may transmit a response to a trigger-based PPDU transmitted by a wireless communication terminal unassociated with the base wireless communication terminal using a wideband frequency band having a frequency bandwidth greater than 20 MHz. In this case, the wideband frequency band having a frequency bandwidth greater than 20 MHz may include a frequency band used for trigger-based PPDU transmission by a wireless communication terminal unassociated with the base wireless communication terminal. In addition, the base wireless communication terminal may transmit a response to the trigger-based PPDU transmitted by the wireless communication terminal unassociated with the base wireless communication terminal to the HE SU PPDU or the HE MU PPDU. In such an embodiment, the base wireless communication terminal may transmit a response to the trigger-based PPDU transmitted by the wireless communication terminal unassociated with the base wireless communication terminal in the frequency band in which the base wireless communication terminal transmits a trigger frame or in a frequency band including a frequency band in which the base wireless communication terminal transmits a trigger frame. When the base wireless communication terminal transmits a response to the trigger-based PPDU in the frequency band having a 160MHz or 80+80MHz bandwidth, the base wireless communication terminal may transmit a response to the trigger-based PPDU using a predetermined 80 MHz segment. In this case, the predetermined 80 MHz segment may be an 80 MHz segment including a frequency band in which the base wireless communication terminal

transmits a trigger frame.

In the above-described embodiments, the response to the trigger based PPDU may be an immediate response to the trigger based PPDU. In addition, the response to the trigger-based PPDU may be a response transmitted after the TXOP in which the trigger-based PPDU is transmitted. For example, the trigger-based PPDU may include at least one of a Probe Request Frame, a (Re)association Request Frame, and an Authentication Request Frame. The response to the trigger-based PPDU may include at least one of a Probe Response Frame, a (Re)association Response Frame, and an Authentication Response Frame.

When a contention procedure is performed every time one MPDU is transmitted, as the number of MPDUs to be transmitted increases, transmission efficiency may drop rapidly. In order to improve the transmission efficiency of the wireless communication terminal, a plurality of MPDUs may be combined to generate one aggregated MPDU (A-MPDU) and transmit the generated A-MPDUs. This will be described with reference to FIGS. 26 to 27.

FIG. 26 shows a method for generating an A-MPDU by aggregating MPDUs through a wireless communication terminal according to an embodiment of the present invention.

When the wireless communication terminal generates the A-MPDU, the wireless communication terminal may identify an individual MPDU and insert a delimiter for signaling information on the MPDUs before an individual MPDU. The delimeter may include an End Of Frame (EOF) field indicating whether it is the last MPDU of the A-MPDU, a Length field indicating the length of the MPDU, a CRC field for detecting an

error of a delimeter, and a Delimiter Signature field for detecting a delimeter. A delimeter with a value of 0 in the EOF field and a non-zero value in the Length field indicates that the MPDU located after the delimeter is an MPDU including data corresponding to the TID that agrees on the BlockACK transmission. In such a way, one or more MPDUs indicated by the delimeter may be referred to as Pre EOF padding A-MPDUs. A delimeter with a value of 1 in the EOF field and a value of 0 in the Length field indicates the end of the A-MPDU after the Pre EOF padding A-MPDU. One or more of these delimeters may be referred to as an EOF padding delimeter. FIG. 26(a) shows specific examples of Pre EOF padding A-MPDU and EOF padding.

When the transmitter transmits an A-MPDU, the receiver may need to transmit a BlockAck based response frame including a BlockAck (BA) bitmap. Therefore, when the A-MPDU includes only one MPDU, the response frame transmission efficiency for the A-MPDU may be reduced. In addition, in the 802.11ac standard, the wireless communication terminal should transmit all MPDUs included in the VHT PPDU to the A-MPDU. In order to improve such inefficiency, an ACK frame response to an A-MPDU including one MPDU may be allowed. Specifically, when the value of the EOF field of the delimeter is one and the value of the Length field is not 0, the delimeter may indicate that the MPDU after the delimeter is a single MPDU (S-MPDU) in the A-MPDU. The EOF padding described above may be located after the S-MPDU. When receiving the A-MPDU indicating the S-MPDU, the wireless communication terminal may transmit an ACK frame other than BlockAck as a response to the A-MPDU regardless of whether or not the BA agrees on the TID corresponding to the received MPDU. FIG. 26(b) shows a specific example of an A-MPDU including an S-MPDU.

FIG. 27 shows a method for generating an A-MPDU by a wireless communication terminal according to another embodiment of the present invention.

In a specific embodiment, the wireless communication terminal can generate an A-MPDU by combining only MPDUs having the same traffic identifier (TID). In such an embodiment, the wireless communication terminal may not aggregate MPDUs corresponding to a plurality of TIDs in the A-MPDU and thus may not transmit the maximum size that can be transmitted using the A-MPDU. Therefore, the efficiency of transmission through the A-MPDU may be reduced. In another specific embodiment, the wireless communication terminal may aggregate a plurality of MPDUs having different TIDs to generate one A-MPDU. For convenience of explanation, an A-MPDU including a plurality of MPDUs corresponding to a plurality of different TIDs is referred to as a Multi-TID A-MPDU or an A-MPDU with Multiple TIDs. In this embodiment, the number of types of A-MPDUs and the number of response methods for the A-MPDUs become larger than those in the previously described embodiments.

In more detail, the wireless communication terminal may generate an A-MPDU by aggregating a plurality of MPDUs having a value of 1 in the EOF field. In this case, each of the plurality of MPDUs may correspond to different TIDs and may be a unique MPDU corresponding to each TID. When an MPDU including Quality of Service (QoS) data corresponding to a TID with a BA agreement is the only MPDU corresponding to a specific TID within that A-MPDU, the wireless communication terminal may set the value of the EOF field of the delimeter corresponding to the MPDU to 1. FIG. 27(a) shows a specific example of an A-MPDU in which a plurality of MPDUs having an EOF field value of 1 is aggregated. In addition, when the action frame requesting the response of the ACK frame is unique in the corresponding A-MPDU, the value of the EOF field of the

delimeter corresponding to the action frame may be set to 1. FIG. 27(b) shows a specific example of an A-MPDU in which an MPDU having an EOF field value of 1 and an action frame having an EOF field value of 1 are aggregated. When an MPDU corresponding to a delimeter having an EOF field of 1 is transmitted alone, the receiver may transmit an ACK frame in response to the MPDU. FIG. 27(c) shows a case in which an A-MPDU includes only one MPDU corresponding to a delimeter having an EOF field of 1.

When an MPDU corresponding to a delimeter with an EOF field of 1 is transmitted with another MPDU requiring an immediate response, the receiver may transmit a per AID TID field in which a BA bitmap is omitted in a Multi-BA (M-BA) in response to an MPDU corresponding to a delimeter having an EOF field of 1. In this case, the receiver may set a value of the Ack type field of the per AID TID field, in which the BA bitmap is omitted, differently from a value of the Ack type field of the other per AID TID field including the BA bitmap. In more detail, the receiver may set a value of the Ack type field of the per AID TID field to 1. In addition, a per AID TID field in which a BA bitmap is omitted is referred to as an Ack context, and a per AID TID field including a BA bitmap is referred to as a BA context.

The wireless communication terminal sets a value of the EOF field of the corresponding delimeter to 1, and aggregates and transmits the MPDU corresponding to the TID without the BA agreement with the MPDU corresponding to another TID. In this case, the receiver may transmit the M-BA including the Ack context response in response to the MPDU corresponding to the TID without the BA agreement. When a wireless communication terminal transmits an MPDU corresponding to a TID without a BA agreement by using an A-MPDU, it can be assured that an MPDU corresponding to a TID without a BA agreement is the only MPDU corresponding to that TID in the corresponding

A-MPDU. Accordingly, the wireless communication terminal may set the value of the EOF field of the delimeter of the MPDU corresponding to the TID without the BA agreement to 0. In this case, when another MPDU of the A-MPDU requires an immediate response, the receiver may transmit the M-BA including the Ack context response in response to the MPDU corresponding to the TID without BA agreement. In addition, the wireless communication terminal may set the value of the EOF field of the delimeter of the MPDU corresponding to the TID with the BA agreement to 0. In such embodiments, even if the value of the EOF field of the delimeter is 1, the receiver cannot determine with only the corresponding delimiter that the MPDU corresponding to the delimeter is the only MPDU S-MPDU in the A-MPDU. In this case, the receiver may determine that the MPDU is the only MPDU in the corresponding A-MPDU based on data and other delimeters included in the MPDU.

As described above, in a frequency band commonly used by various wireless communication devices, such as an unlicensed band, a wireless communication terminal can access the channel through a contention procedure. Specifically, when the channel to be accessed by the wireless communication terminal is idle for a predetermined time, the wireless communication terminal starts the backoff procedure. In the backoff procedure, the wireless communication terminal obtains a random integer value in a Contention Window (CW) and sets the random integer value as a backoff timer. When the corresponding channel is idle during a predetermined slot time, the wireless communication terminal decreases the backoff timer. When the value of the backoff timer is 0, the wireless communication terminal accesses the corresponding channel. In this case, when the corresponding channel is busy, the wireless communication terminal stops the

backoff procedure. When the channel to be accessed by the wireless communication terminal is idle for a predetermined time, the wireless communication terminal resumes the backoff procedure again.

Further, the wireless communication terminal may access the channel according to the priority of the data to be transmitted. Specifically, the wireless communication terminal may use the CW determined according to the priority of the data to be transmitted. In this case, the minimum value CWmin and the maximum value CWmax of CW are determined according to the priority of data to be transmitted by the wireless communication terminal. In addition, the predetermined time at which the wireless communication terminal waits to start the backoff procedure is determined according to the priority of the data to be transmitted by the wireless communication terminal. Also, the wireless communication terminal may wait for a designated time according to the priority of the data to be transmitted, and then start the backoff procedure. The designated time according to the priority is referred to as arbitration interframe space (AIFS). This operation is referred to as enhanced distributed channel access (EDCA). In addition, the priority of data may be determined according to an Access Category (AC).

As described above, the base wireless communication terminal may trigger uplink transmission to the base wireless communication terminal of one or more wireless communication terminals. In this case, the base wireless communication terminal accesses the channel for uplink transmission of one or more wireless communication terminals. In addition, one or more wireless communication terminals access the channel for uplink transmission of each of the one or more wireless communication terminals. Therefore, when the uplink transmission of one or more wireless communication terminals is scheduled for uplink transmission by the base wireless communication terminal, the uplink

transmission of one or more wireless communication terminals has a higher priority than transmission of other wireless communication terminals that transmit data having the same priority. In addition, since the base wireless communication terminal and one or more wireless communication terminals simultaneously access the channel for the same transmission, the channel access efficiency may decrease. Therefore, when the uplink Multi-User (UL-MU) transmission is scheduled, it is necessary to adjust the EDCA parameter value. This will be described with reference to FIGS. 28 to 31.

FIG. 28 shows a control method of an EDCA parameter used by a wireless communication terminal during MU UL transmission according to an embodiment of the present invention.

When a wireless communication terminal scheduled for UL MU transmission succeeds in UL MU transmission, the wireless communication terminal may use a channel access method that guarantees channel access success with a lower probability than when it is not scheduled for UL MU transmission. In more detail, the wireless communication terminal may use a separate EDCA parameter set. In a specific embodiment, a corresponding wireless communication terminal may use an EDCA parameter set that attempts to access the channel with a lower probability than the previously used EDCA parameter set in channel access for transmitting the same data. In this case, the EDCA parameter set is a set of parameters used in the EDCA operation according to the priority of the data transmitted by the wireless communication terminal. Specifically, the EDCA parameter set may include parameters for CW. In this case, the parameter for CW may include at least one of CWmin and CWmax. In addition, the EDCA parameter set may include a parameter value related to a predetermined time at which the wireless communication terminal waits to start the backoff procedure. In this case, the

predetermined time may be the AIFS described above. For convenience of description, when a wireless communication terminal scheduled for UL MU transmission succeeds in UL MU transmission, a separate EDCA parameter set used by the corresponding wireless communication terminal is referred to as a MU EDCA parameter set.

In addition, when a wireless communication terminal scheduled for UL MU transmission succeeds in UL MU transmission, it may represent a case where all of the following conditions are satisfied. 1) The wireless communication terminal transmits information on data to be transmitted to the base wireless communication terminal. In this case, the wireless communication terminal may transmit information on data to be transmitted to the base wireless communication terminal by transmitting a Buffer Status Report (BSR). 2) The wireless communication terminal receives trigger information including a User Info field indicating the AID of the wireless communication terminal. In this case, the trigger information may be a trigger frame. 3) The wireless communication terminal transmits QoS data in response to the trigger information. 4) The wireless communication terminal determines that QoS data transmission is successful. In this case, when the wireless communication terminal receives the immediate response to the QoS data transmission, the wireless communication terminal may determine that the QoS data transmission is successful.

The base wireless communication terminal may transmit information on the MU EDCA parameter set to the wireless communication terminal. In more detail, the base wireless communication terminal may transmit an MU EDCA parameter set element including information on the MU EDCA parameter set to the wireless communication terminal. In this case, the base wireless communication terminal may transmit the MU EDCA parameter set element using a beacon frame.

When the wireless communication terminal receives the MU EDCA parameter set element and the conditions described above are satisfied, the wireless communication terminal may update the EDCA parameter values of all ACs corresponding to the QoS data transmitted through the trigger-based PPDU by the wireless communication terminal. Specifically, the wireless communication terminal may update the end time point of the PPDU including the immediate response to the trigger-based PPDU or the end value of the trigger-based PPDU including the QoS data that does not request the immediate response with the EDCA parameter values of all ACs corresponding to QoS data.

When the MU EDCA parameter set application condition is not satisfied until a predetermined time elapses from when the timer is set, the wireless communication terminal can set an MU EDCA timer for terminating the MU EDCA parameter set application. Specifically, the wireless communication terminal can set the MU EDCA timer when receiving the trigger information. In this case, if the MU EDCA parameter set application condition is not satisfied for a certain period after setting the MU EDCA timer, the wireless communication terminal can terminate the MU EDCA parameter set application. In this case, the MU EDCA timer may be applied for each AC. In addition, the MU EDCA timer value may also be included in the MU EDCA parameter set. Accordingly, the base wireless communication terminal may transmit a MU EDCA parameter set element including information on the MU EDCA timer value to the wireless communication terminal.

In the embodiment of FIG. 28, the AP transmits a trigger frame to the first station STA1. The first station STA1 receives a trigger frame from the AP and transmits a trigger-based PPDU in which an AC includes QoS data corresponding to the BE based on the trigger frame. The AP receives a trigger based PPDU from the first station STA1 and

transmits an M-BA in response to the MPDU including the trigger based PPDU. The first station STA1 receives the M-BA from the base wireless communication terminal and applies the MU EDCA parameter set for QoS data in which an AC is a BE. In this case, the first station STA1 sets a MU EDCA timer for QoS data in which an AC is a BE. The first station STA1 does not succeed in transmitting the UL MU until the MU EDCA timer expires. Accordingly, the first station STA1 terminates the application of the MU EDCA parameter set when the MU EDCA timer expires.

FIG. 29 shows a method of transmitting a BSR by a wireless communication terminal according to an embodiment of the present invention.

As described above, it is important for the base wireless communication terminal to determine a buffer status of the wireless communication terminal associated with the base wireless communication terminal. For this, the wireless communication terminal can transmit the BSR to the base wireless communication terminal using various methods. In more detail, the wireless communication terminal may transmit a buffer status report (BSR) using the Queue Size subfield of the QoS Control field of the QoS data. In this case, the BSR is information indicating a buffer state.

The wireless communication terminal may set a 2-bit Most Significant bits (MSB) as an SF subfield indicating a scaling factor in the Queue Size subfield, and set the remaining 6 bits as a UV subfield indicating an unscaled value. The specific format of the Queue Size subfield may be as shown in FIG. 29. In this case, the wireless communication terminal may obtain an approximation value for the total amount of the MPDU included in the A-MPDU currently being transmitted and the data stored in the buffer of the same TID according to a formula specified for each scaling factor, and insert the obtained

approximation value into the Queue Size subfield. The wireless communication terminal may perform a round up operation while obtaining an approximation value for the total amount of data. The base wireless communication terminal may estimate the total amount of buffered data of the wireless communication terminal based on the queue size subfield received from the wireless communication terminal. In this case, since the wireless communication terminal determines the value of the queue size subfield based on the rounded-up total amount value of buffered data, even if the buffer of the wireless communication terminal corresponding to a specific TID is empty, the base wireless communication terminal may determine that data is buffered by a value within an error range due to a rounding up operation on a buffer of the wireless communication terminal corresponding to a specific TID. Accordingly, the base wireless communication terminal may additionally schedule the UL transmission of the wireless communication terminal unnecessarily. Therefore, the wireless communication terminal may obtain an approximation value for the total amount of the MPDU included in the A-MPDU currently being transmitted and the data stored in the buffer of the same TID by using a rounding down operation. In more detail, the base wireless communication terminal may obtain a value to be inserted into the queue size subfield according to the following rule.

- When the value of the scaling factor is 0, the wireless communication terminal may round down the actual queue size to the nearest 16 octets and insert it into the UV subfield.

- When the value of the scaling factor is 1, the wireless communication terminal may round down a value obtained by subtracting 1024 from the actual queue size to the nearest 256 octets and insert it into the UV subfield.

- When the value of the scaling factor is 2, the wireless communication terminal

may round down a value obtained by subtracting 17,408 from the actual queue size to the nearest 2048 octets and insert it into the UV subfield.

- When the value of the scaling factor is 3, the wireless communication terminal can round down a value obtained by subtracting 148,480 from the actual queue size to the nearest 32,768 octets and insert it into the UV subfield.

In this case, the actual queue size may indicate the total amount of the MPDU included in the A-MPDU currently being transmitted and the data stored in the buffer of the same TID.

In this embodiment, even though the data transmitted from an AP to a terminal remains in the buffer of the wireless communication terminal, the base wireless communication terminal may not schedule UL transmission of the corresponding wireless communication terminal. However, the wireless communication terminal may transmit the data stored in the buffer through the SU transmission, and may transmit the data stored in the buffer together when uplink transmission for another TID is scheduled. Therefore, compared to a case where the wireless communication terminal inserts the value obtained based on the rounding up operation into the queue size subfield, a case where the wireless communication terminal inserts a value obtained based on a rounding down operation into the queue size subfield may be more efficient in terms of resource management.

In another specific embodiment, when the wireless communication terminal transmits all buffered data of the TID indicated by the Queue Size subfield, the wireless communication terminal may set the value of the Queue Size subfield to a predetermined value. In this case, the predetermined value may be 11111110.

FIG. 30 shows a Target Wake Time (TWT) operation of a wireless communication

terminal according to an embodiment of the present invention.

In the 802.11ah standard, a wireless communication terminal sets a TWT and a Service Period (SP) of a TWT, separately from a base wireless communication terminal. The base wireless communication terminal according to an embodiment of the present invention may signal information related to the TWT and the SP of the TWT to all wireless communication terminals of the BSS operated by the base wireless communication terminal. In more detail, the base wireless communication terminal may signal information related to the TWT and the SP of the corresponding TWT by using a beacon frame. The base wireless communication terminal may signal that it will transmit a trigger frame that triggers uplink transmission based random access in the SP of the TWT. In this case, the base wireless communication terminal sets the trigger field of the Request Type field to one in the TWT element and the TWT Flow Identifier field to a value other than one so that it may indicate that a trigger frame triggering uplink transmission based random access is to be transmitted in the SP of the TWT. In such an embodiment, the wireless communication terminal supporting random access may perform a TWT operation without additional negotiation with the base wireless communication terminal. In more detail, the wireless communication terminal may maintain a doze state until the TWT and transit to an awake state in the TWT. In this case, the wireless communication terminal may transmit a frame indicating that the wireless communication terminal is awake state to the base wireless communication terminal. In this case, the frame indicating the awake state may be a PS-poll frame or an Unscheduled Automatic Power Save Delivery (U-APSD) trigger frame.

In addition, the base wireless communication terminal may transmit, in the TWT, a trigger frame for triggering the transmission of information on the buffer status of the

wireless communication terminal in the awake state. In this case, the information on the buffer state may be a bufferable unit (BU). In addition, the trigger frame for triggering the transmission of information on the buffer status may trigger uplink transmission based random access of all wireless communication terminals of the BSS operated by the base wireless communication terminal as well as the wireless communication terminal performing the TWT operation. Therefore, the random access success rate of the wireless communication terminal performing the TWT operation can be very low. Accordingly, the wireless communication terminal may set the Receiver Address (RA) field of the trigger frame transmitted at the TWT as a group address for the wireless communication terminal participating in the TWT operation. In more detail, the base wireless communication terminal may set the RA field of the trigger frame transmitted at the TWT as shown in 1) of FIG. 30. In addition, the base wireless communication terminal may signal a group address for the wireless communication terminal participating in the TWT operation using the TWT element. In this embodiment, when the wireless communication terminal receives a trigger frame in which the value of the RA field is a group address for the wireless communication terminal participating in the TWT operation, only the wireless communication terminal that is to exchange a frame with the base wireless communication terminal in the TWT SP may attempt random access based on the trigger frame.

In another specific embodiment, the base wireless communication terminal may set the value of the AID12 subfield of the User Info field of the trigger frame transmitted at the TWT to a predetermined value indicating the wireless communication terminal participating in the TWT operation. In this case, the predetermined value may be a reserved value that is not allocated for another purpose. For example, the predetermined value may be 2044. In more detail, the base wireless communication terminal may set the

value of the AID12 subfield of the User Info field transmitted at the TWT as shown in 2) of FIG. 30. When the value of the AID12 subfield of the User Info field of the trigger frame received by the wireless communication terminal is a predetermined value, only a wireless communication terminal for exchanging a frame with the base wireless communication terminal in the TWT SP may attempt random access in the RU indicated by the corresponding User Info field.

In another specific embodiment, the base wireless communication terminal may set a value of a specific subfield of the Trigger Dependent User Info field of the User Info field of the trigger frame transmitted at the TWT to a predetermined value. In this case, a specific subfield of the Trigger Dependent User Info field may be a TID Aggregation Limit field. In this case, the TID Aggregation limit field may be a field used to indicate the limit of the number of TIDs corresponding to data that can be aggregated in the A-MPDU transmitted based on the trigger frame. For example, the base wireless communication terminal may set the value of the TID Aggregation Limit field to six. In more detail, the base wireless communication terminal may set the TID Aggregation Limit field of the Trigger Dependent User Info field of the trigger frame transmitted in the TWT as shown in 3) of FIG. 30. In addition, a specific subfield of the Trigger Dependent User Info field may be one of the reserved fields. When the value of a specific subfield of the Trigger Dependent User Info field of the User Info field received by the wireless communication terminal is a predetermined value, only a wireless communication terminal for exchanging a frame with the base wireless communication terminal in the TWT SP may attempt random access in the RU indicated by the corresponding User Info field.

In the above embodiments, the wireless communication terminal that is to exchange a frame with the base wireless communication terminal in the TWT SP may transmit only a

frame indicating that the wireless communication terminal is in an awake state by using random access. In this case, the frame indicating that the wireless communication terminal is in the awake state may be a PS-poll frame or a U-APSD trigger frame.

FIG. 31 shows that a wireless communication terminal sets a MU EDCA parameter in a TWT operation according to an embodiment of the present invention.

In the TWT operation, the wireless communication terminal may perform an Opportunistic Power Saving (OPS) operation under a predetermined condition. The base wireless communication terminal sets the TWT Flow Identifier field to three so that it may indicate that the base wireless communication terminal supports the OPS operation. The base wireless communication terminal may signal scheduling information on all wireless communication terminals participating in the OPS TWT using the TIME element at the start time point of the OPS TWT SP. The base wireless communication terminal deactivates the bit corresponding to the AID of the wireless communication terminal in the bitmap of the TIM element to indicate a wireless communication terminal for which transmission is not scheduled in the corresponding OPS TWT. Also, the base wireless communication terminal may signal identically to the existing TIM element for the wireless communication terminal not participating in the OPS TWT. A wireless communication terminal in which transmission is not scheduled in the corresponding OPS TWT may maintain a doze state until the next OPS TWT. When the corresponding wireless communication terminal needs additional uplink transmission, the corresponding wireless communication terminal may attempt UL SU transmission by individually operating an EDCA.

In this case, when the wireless communication terminal uses the MU EDCA

parameter set, the wireless communication terminal may not expect UL MU scheduling, and the probability of channel access success of the wireless communication terminal may be too low. Therefore, a situation in which the wireless communication terminal cannot transmit data to be urgently transmitted may occur. In a specific embodiment, when the wireless communication terminal receives a TIM element including a bitmap in which a bit corresponding to the wireless communication terminal is inactivated in the OPS TWT SP, the wireless communication terminal may stop using the MU EDCA parameter set. In more detail, when the wireless communication terminal receives a TIM element including a bitmap in which a bit corresponding to the wireless communication terminal is inactivated in the OPS TWT SP, the wireless communication terminal may set the MU EDCA timer to 0. In a specific embodiment, in more detail, when the wireless communication terminal receives a TIM element including a bitmap in which a bit corresponding to the wireless communication terminal is inactivated in the OPS TWT SP, the wireless communication terminal may stop the application of the MU EDCA parameter set for an AC whose value of the MU EDCA timer is faster than the next OPS TWT. In a specific embodiment, in more detail, when the wireless communication terminal receives a TIM element including a bitmap in which a bit corresponding to the wireless communication terminal is inactivated in the OPS TWT SP, the wireless communication terminal may set the MU EDCA timer to 0 at an AC whose value of the MU EDCA timer is faster than the next OPS TWT. This is because there may be too many wireless communication terminals for which no UL transmission is scheduled in the OPS TWT SP. Accordingly, this is because when all the wireless communication terminals not scheduled for UL transmission stop the application of the MU EDCA parameter, the channel access probability of the base wireless communication terminal may be too low.

In the above embodiments, when the wireless communication terminal stops applying the MU EDCA parameter set, the wireless communication terminal may set the EDCA parameter set according to the most recently received EDCA parameter set element. When the wireless communication terminal does not receive the EDCA parameter set element, the wireless communication terminal may set the EDCA parameter set according to the default EDCA parameter set.

In the embodiment of FIG. 31, the first station STA1 applies the MU EDCA parameter set. The first station STA1 receives a TIM/FILS discovery frame including a TIM element from the AP. In this case, the bit corresponding to the first station STA1 in the bitmap of the TIM element is set to 0. Therefore, the wireless communication terminal stops the application of the MU EDCA parameter set by setting the MU EDCA parameters of all ACs to 0.

FIG. 32 shows operations of a base wireless communication terminal and a wireless communication terminal according to an embodiment of the present invention.

The base wireless communication terminal 3201 transmits a PPDU including a trigger frame for triggering transmission of at least one wireless communication terminal 3203 (S3201). In more detail, the base wireless communication terminal 3201 may generate a trigger frame for triggering uplink transmission based random access of at least one wireless communication terminal 3203, and may insert and transmit the trigger frame. In this case, the trigger frame may trigger uplink transmission based random access of the wireless communication terminal 3203 unassociated with the BSS operated by the base wireless communication terminal 3201.

When the trigger frame triggers uplink transmission based random access of the

wireless communication terminal 3203 unassociated with the BSS operated by the base wireless communication terminal 3201, the base wireless communication terminal 3201 may transmit a PPDU including a trigger frame using a PPDU format including a field indicating a BSS color. In more detail, when the trigger frame triggers uplink transmission based random access of the wireless communication terminal 3203 unassociated with the BSS operated by the base wireless communication terminal 3201, the base wireless communication terminal 3201 may insert the trigger frame into the HE PPDU. In the above embodiments, the method for setting a value of the field indicating the BSS color may follow the embodiments described with reference to FIGS. 14 to 15.

Further, when the trigger frame triggers random access of the wireless communication terminal 3203 unassociated with the BSS operated by the base wireless communication terminal 3201, the base wireless communication terminal 3201 may insert a field indicating the BSS color in the trigger frame. In this case, the base wireless communication terminal 3201 may insert a field indicating a BSS color into a User Info field signaling information individually applied to one or more wireless communication terminals 3203 for which a trigger frame triggers transmission. In another specific embodiment, the base wireless communication terminal 3201 may insert a field indicating the BSS color into a Common Info field signaling information commonly applied to one or more wireless communication terminals 3203 for which a trigger frame triggers transmission.

The base wireless communication terminal 3201 may set a specific field of the trigger frame to a value of a predetermined AID so that it may trigger random access of the wireless communication terminal 3203 that is unassociated with the BSS operated by the base wireless communication terminal 3201.

The base wireless communication terminal 3201 may trigger uplink transmission based random access of the wireless communication terminal 3203 that is unassociated with the BSS operated by the base wireless communication terminal 3201 according to the embodiments described with reference to FIG. 16.

Also, the base wireless communication terminal 3201 may transmit a trigger frame based on a predetermined schedule. In more detail, the base wireless communication terminal 3201 may transmit a trigger frame according to the TWT operation described above. The trigger frame may trigger random access uplink based transmission of the wireless communication terminal 3203 performing a power saving operation based on a predetermined schedule. In this case, the wireless communication terminal 3203 that performs the power saving operation based on the predetermined schedule may maintain the doze state until the TWT and change to the awake state in the TWT as described above. The base wireless communication terminal 3201 may set the receiver address field of the trigger frame to a group address indicating the wireless communication terminal 3203 performing a power saving operation based on the predetermined schedule. In another specific embodiment, the base wireless communication terminal 3201 may set an AID value indicated by a User Info field corresponding to a frequency band allocated for uplink transmission based random access to a predetermined value indicating the wireless communication terminal 3203 that performs a power saving operation based on the predetermined schedule. For example, the predetermined value may be 2044. In this case, the predetermined value may be a reserved value that is not allocated for another purpose. In another specific embodiment, the base wireless communication terminal 3201 sets a value of one of the fields determined according to the type of the trigger frame of the User Info field corresponding to the frequency band allocated for uplink transmission based

random access to a predetermined value indicating the wireless communication terminal 3203 that performs a power saving operation based on a predetermined schedule. The base wireless communication terminal 3201 sets a TID aggregation limit field included in a User Info field corresponding to a frequency band allocated for uplink transmission based random access to a predetermined value indicating the wireless communication terminal 3203 that performs a power saving operation based on a predetermined schedule. In this case, the TID Aggregation limit field may be a field used to indicate the limit of the number of TIDs corresponding to data that can be aggregated in the A-MPDU transmitted based on the trigger frame. Specifically, the base wireless communication terminal 3201 may operate as in an embodiment described with reference to FIGS. 30 to 31.

The wireless communication terminal 3203 receives a PPDU including a trigger frame that triggers a transmission to the base wireless communication terminal 3201 from the base wireless communication terminal 3201. The wireless communication terminal 3203 transmits a trigger-based PPDU to the base wireless communication terminal 3201 based on the trigger frame (S3203). When the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, the wireless communication terminal 3203 may set a value of the BSS color indicated by the trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame. If the PPDU containing the trigger frame does not indicate BSS color, the wireless communication terminal 3203 may set a value of the BSS color indicated by the trigger-based PPDU according to the active BSS color of the wireless communication terminal 3203. In this case, the active BSS color may indicate the BSS color actually used by the wireless communication terminal 3203 as described above. In this embodiment, the wireless communication terminal 3203 may receive information on the BSS color change from the base wireless communication

terminal. In addition, when the BSS color change time point indicated by the information on the BSS color change is reached, the wireless communication terminal 3203 may set the active BSS color to a value of the BSS color indicated by the information on the BSS color change. In this case, the BSS color change time point may be set based on a target beacon transmission time transmitted by the base wireless communication terminal. In addition, specific operations of the wireless communication terminal 3203 may follow the embodiments described with reference to FIGS. 22 to 23.

When the PPDU indicates the partial BSS color, the wireless communication terminal 3203 may determine whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the value of the partial BSS color when the value of the Partial AID field is non-zero. In this case, specific operations of the wireless communication terminal 3203 may follow the embodiments described with reference to FIGS. 18 to 19. The embodiment in which the wireless communication terminal 3203 determines whether the Intra-BSS or the Inter-BSS may be applied to the PPDU not including the trigger frame as well as when receiving the PPDU including the trigger frame as described above.

Although the present invention is described by using wireless LAN communication as an example, it is not limited thereto and may be applied to other communication systems such as cellular communication. Additionally, while the method, device, and system of the present invention are described in relation to specific embodiments thereof, some or all of the components or operations of the present invention may be implemented using a computer system having a general purpose hardware architecture.

The features, structures, and effects described in the above embodiments are included in at least one embodiment of the present invention and are not necessary limited

to one embodiment. Furthermore, features, structures, and effects shown in each embodiment may be combined or modified in other embodiments by those skilled in the art. Therefore, it should be interpreted that contents relating to such combination and modification are included in the range of the present invention.

While the present invention is described mainly based on the above embodiments but is not limited thereto, it will be understood by those skilled in the art that various changes and modifications are made without departing from scope of the present invention. For example, each component specifically shown in the embodiments may be modified and implemented. It should be interpreted that differences relating to such modifications and application are included in the scope of the present invention defined in the appended claims.

**[Claims]**

1. A base wireless communication terminal communicating wirelessly, the base wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

generate a trigger frame for triggering uplink transmission based random access, of at least one wireless communication terminal, and

insert the trigger frame into a physical layer protocol data unit (PPDU) to transmit the PPDU.

2. The base wireless communication terminal of claim 1, wherein when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a Basic Service Set (BSS) operated by the base wireless communication terminal, the processor is configured to transmit the PPDU using a PPDU format including a field indicating a BSS color,

wherein the BSS color is a kind of identifier for identifying the BSS.

3. The base wireless communication terminal of claim 2, wherein when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a BSS operated by the base wireless communication terminal, the processor is configured to transmit the PPDU using a high efficiency (HE) PPDU format.

4. The base wireless communication terminal of claim 1, wherein when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a Basic Service Set (BSS) operated by the base wireless communication terminal, the processor is configured to insert a field indicating a BSS color in the trigger frame,

wherein the BSS color is a kind of identifier for identifying the BSS.

5. The base wireless communication terminal of claim 4, wherein the processor is configured to insert a field representing the BSS color into a User Info field signaling information that is individually applied to the one or more wireless communication terminals for which the trigger frame triggers transmission.

6. The base wireless communication terminal of claim 4, wherein a field indicating the BSS color is inserted into a Common Info field for signaling information that is commonly applied to the one or more wireless communication terminals for which the trigger frame triggers transmission.

7. The base wireless communication terminal of claim 1, wherein the processor is configured to set a specific field of the trigger frame to a value of a predetermined Association ID (AID) to trigger random access of a wireless communication terminal unassociated with a BSS operated by the base wireless communication terminal.

8. The base wireless communication terminal of claim 1, wherein the processor is configured to transmit the trigger frame based on a predetermined schedule,

wherein the trigger frame triggers uplink transmission based random access of a wireless communication terminal performing a power saving operation based on the predetermined schedule.

9. The base wireless communication terminal of claim 8, wherein the processor is configured to set a Receiver Address (RA) field of the trigger frame to a group address indicating a wireless communication terminal performing a power saving operation based on the predetermined schedule.

10. The base wireless communication terminal of claim 8, wherein the trigger frame comprises a User Info field for signaling information that is individually applied to the one or more wireless communication terminals to trigger transmission,

wherein the processor is configured to set a value of an association ID (AID) indicated by a User Info field corresponding to a frequency band allocated to the uplink transmission based random access to a predetermined value indicating a wireless communication terminal performing a power saving operation based on the predetermined schedule.

11. The base wireless communication terminal of claim 10, wherein the predetermined value is a reserved value that is not allocated for another purpose.

12. The base wireless communication terminal of claim 11, wherein the trigger frame comprises a User Info field for signaling information that is individually applied to the one or more wireless communication terminals to trigger the transmission,

wherein the processor is configured to set a TID Aggregation limit field included in a User Info field corresponding to a frequency band allocated for the uplink transmission based random access to a predetermined value indicating a wireless communication terminal performing a power saving operation based on the predetermined schedule,

wherein the TID Aggregation limit field is a field used to indicate the limit of the number of TIDs corresponding to data that can be aggregated in an A-MPDU transmitted based on the trigger frame.

13. A wireless communication terminal wirelessly communicating with a base wireless communication terminal, the wireless communication terminal comprising:

a transceiver configured to transmit and receive wireless signals; and

a processor configured to process the wireless signals,

wherein the processor is configured to:

receive a physical layer protocol data unit (PPDU) including a trigger frame for triggering transmission to the base wireless communication terminal, and

transmit the trigger-based PPDU based on the trigger frame.

14. The wireless communication terminal of claim 13, wherein when the PPDU including the trigger frame indicates a Basic Service Set (BSS) color, the processor is configured to set a value of a BSS color indicated by the trigger-based PPDU based on the value of the BSS color indicated by the PPDU including the trigger frame,

wherein the BSS color is one of identifiers identifying a BSS.

15. The wireless communication terminal of claim 14, wherein when the PPDU

including the trigger frame does not indicate a BSS color, the processor is configured to set a value of a BSS color indicated by the trigger-based PPDU according to an active BSS color of the wireless communication terminal,

wherein the active BSS color indicates a BSS color actually used by the wireless communication terminal.

16. The wireless communication terminal of claim 15, wherein the processor is configured to: receive information on a BSS color change from the base wireless communication terminal, and when a BSS color change time point indicated by the information on the BSS color change is reached, set the active BSS color to a value of a BSS color indicated by the information on the BSS color change.

17. The wireless communication terminal of claim 16, wherein the BSS color change time point is set based on a target beacon transmission time transmitted by the base wireless communication terminal.

18. The wireless communication terminal of claim 13, wherein if the PPDU indicates a partial Basic Service Set (BSS) color using a Partial Association ID (AID) field, the processor determines whether the PPDU is an Intra-BSS PPDU or an Inter-BSS PPDU based on the partial BSS color when the value of the partial AID field is non-zero,

wherein the partial AID field is a signaling field used to indicate part of an AID value,

wherein the Intra-BSS PPDU is a PPDU transmitted from a BSS including the wireless communication terminal, and the Inter-BSS PPDU is a PPDU transmitted from a

BSS not including the wireless communication terminal.

19. An operation method of base wireless communication terminal communicating wirelessly, the method comprising:

generating a trigger frame for triggering uplink transmission based random access of at least one wireless communication terminal; and

inserting the trigger frame into a physical layer protocol data unit (PPDU) to transmit the PPDU.

20. The method of claim 19, wherein the transmitting the PPDU comprises, when the trigger frame triggers uplink transmission based random access of a wireless communication terminal unassociated with a Basic Service Set (BSS) operated by the base wireless communication terminal, inserting a field indicating a BSS color of a Basic Service Set (BSS) operated by the base wireless communication terminal into a signaling field of the PPDU,

wherein the BSS color is a kind of identifier for identifying a BSS.

**[ABSTRACT]**

Provided is a wireless communication terminal that wirelessly communicates. The wireless communication terminal includes a transceiver configured to transmit and receive wireless signals; and a processor configured to process the wireless signals. The processor is configured to: generate a trigger frame for triggering uplink transmission based random access of at least one wireless communication terminal, and insert the trigger frame into a physical layer protocol data unit (PPDU) to transmit the PPDU.

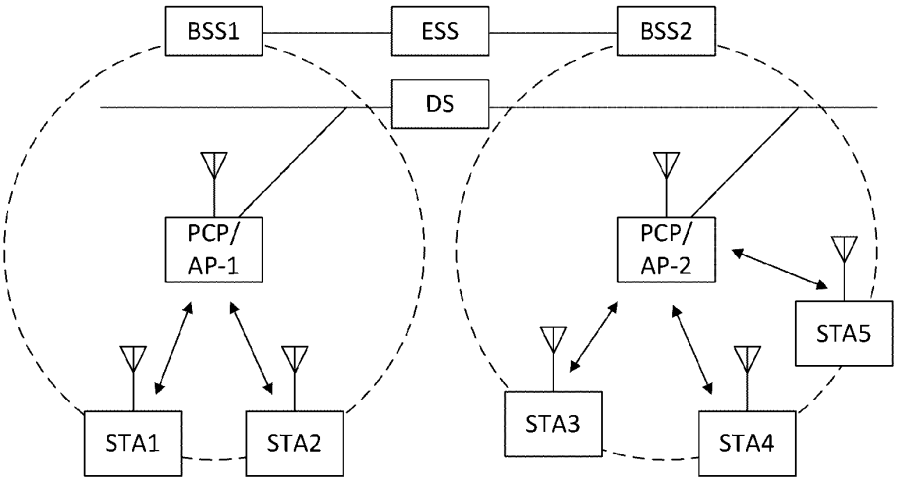

BSS1
ESS
BSS2
DS
PCP/
AP-1
PCP/
AP-2
STA5
STA1
STA2
STA3
STA4

*FIG. 1*

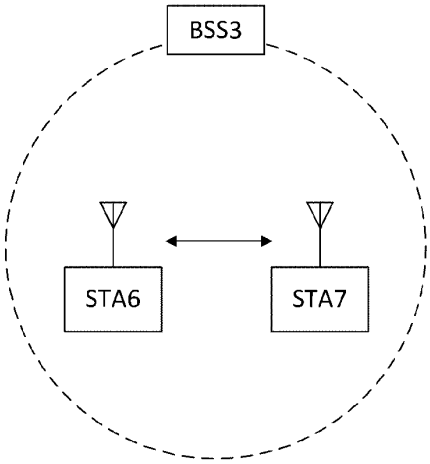

BSS3
STA6
STA7

*FIG. 2*

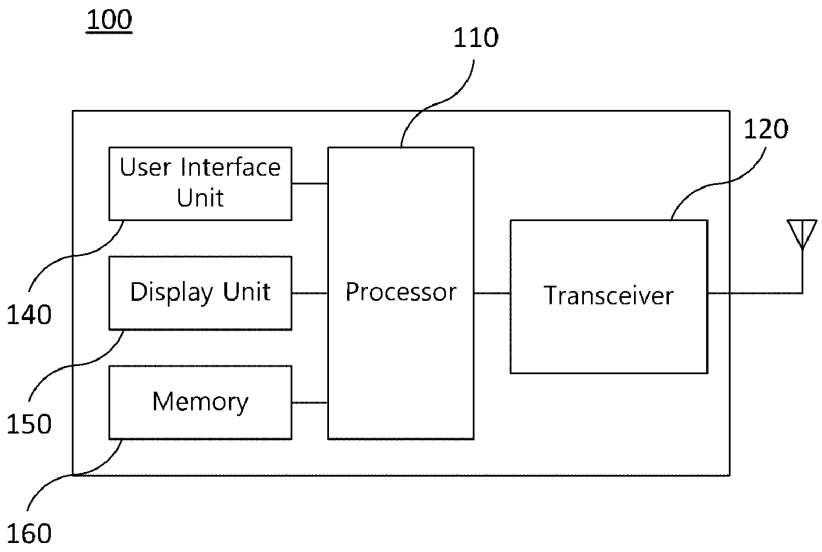



*FIG. 3*

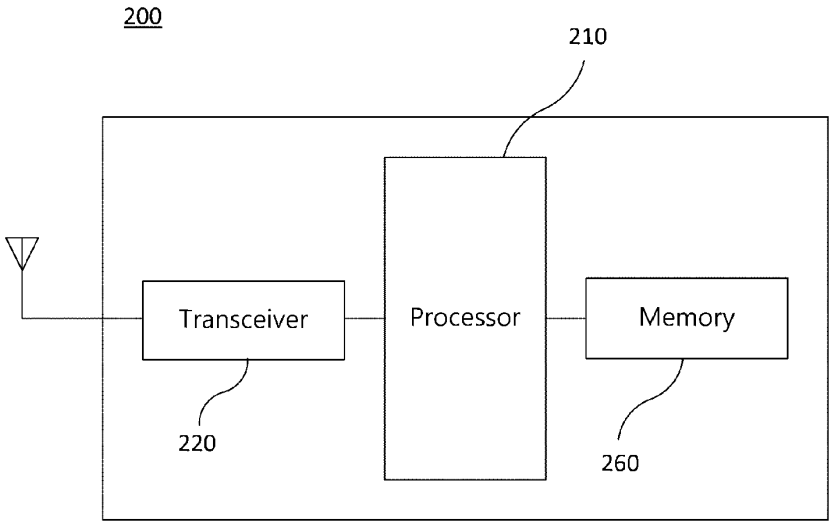



*FIG. 4*

110

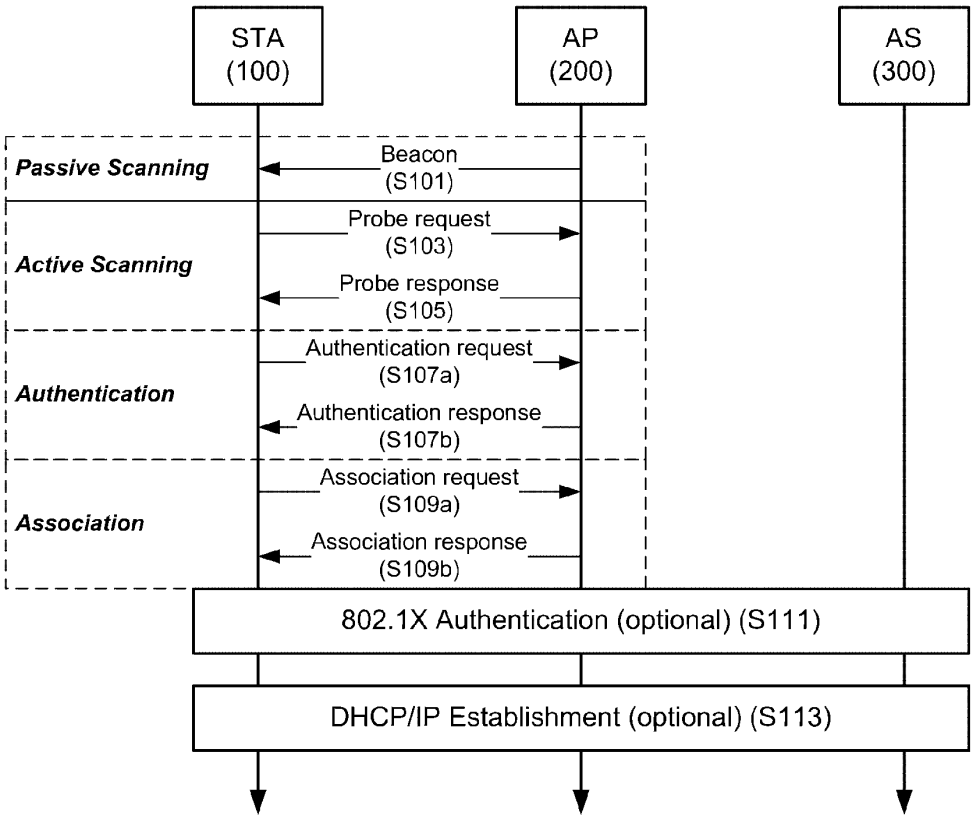

STA
(100)
AP
(200)
AS
(300)
Passive Scanning
Beacon
(S101)
Active Scanning
Probe request
(S103)
Probe response
(S105)
Authentication
Authentication request
(S107a)
Authentication response
(S107b)
Association
Association request
(S109a)
Association response
(S109b)
802.1X Authentication (optional) (S111)
DHCP/IP Establishment (optional) (S113)

*FIG. 5*

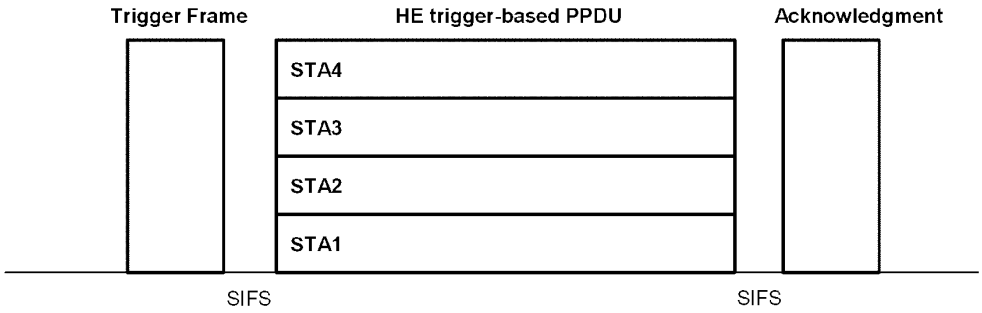

Trigger Frame
HE trigger-based PPDU
Acknowledgment
STA4
STA3
STA2
STA1
SIFS
SIFS

*FIG. 6*

886

| | Frame Control | Duration | RA | TA | Common Info | User Info | ... | User Info | Padding | FCS |
|---|---|---|---|---|---|---|---|---|---|---|
| Octets: | 2 | 2 | 6 | 6 | 8 or more | 5 or more | | 5 or more | variable | 4 |

*FIG. 7*

(a) Common Info

| B0 B3 | B4 B15 | B16 | B17 | B18 B19 | B20 B21 | B22 | B23 B25 | B26 |
|---|---|---|---|---|---|---|---|---|
| Trigger Type | Length | Cascade Indication | CS Required | BW | GI and LTF Type | MU-MIMO LTF Mode | Number of HE-LTF Symbols | STBC |
| Bits: 4 | 12 | 1 | 1 | 2 | 2 | 1 | 3 | 1 |

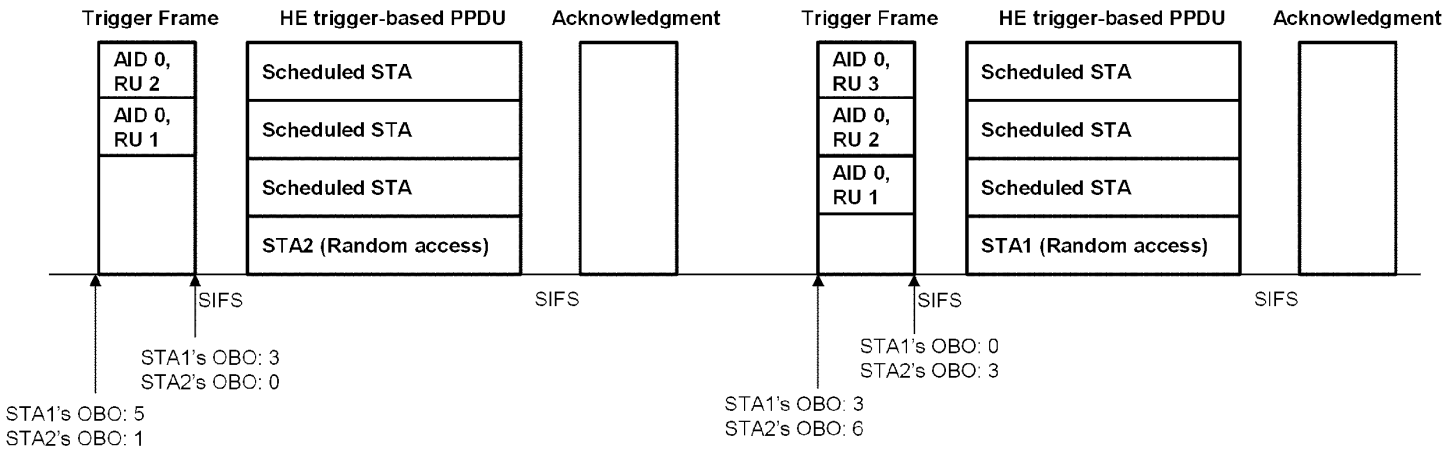
| B27 | B28 B33 | B34 B36 | B37 B52 | B53 | B54 B62 | B63 | |
|---|---|---|---|---|---|---|---|
| LDPC Extra Symbol | AP TX Power | Packet Extension | Spatial Reuse | Doppler | HE-SIG-A Reserved | Reserved | Trigger Dependent Common Info |
| Bits: 1 | 6 | 3 | 16 | 1 | 9 | 1 | variable |

(b) User Info

| B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|
| AID12 | RU Allocation | Coding Type | MCS | DCM | SS Allocation | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

887

*FIG. 8*


Trigger Frame
HE trigger-based PPDU
Acknowledgment
Trigger Frame
HE trigger-based PPDU
Acknowledgment
AID 0, RU 2
AID 0, RU 1
Scheduled STA
Scheduled STA
Scheduled STA
STA2 (Random access)
AID 0, RU 3
AID 0, RU 2
AID 0, RU 1
Scheduled STA
Scheduled STA
Scheduled STA
STA1 (Random access)
SIFS
SIFS
SIFS
SIFS
STA1's OBO: 3
STA2's OBO: 0
STA1's OBO: 5
STA2's OBO: 1
STA1's OBO: 3
STA2's OBO: 6
STA1's OBO: 0
STA2's OBO: 3

888

115

*FIG. 9*

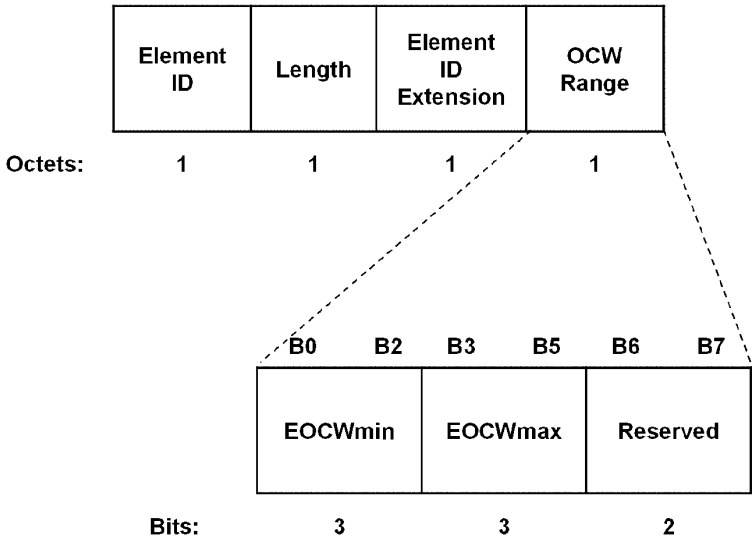

Element ID
Length
Element ID Extension
OCW Range
Octets:
1
1
1
1
B0
B2
B3
B5
B6
B7
EOCWmin
EOCWmax
Reserved
Bits:
3
3
2

*FIG. 10*

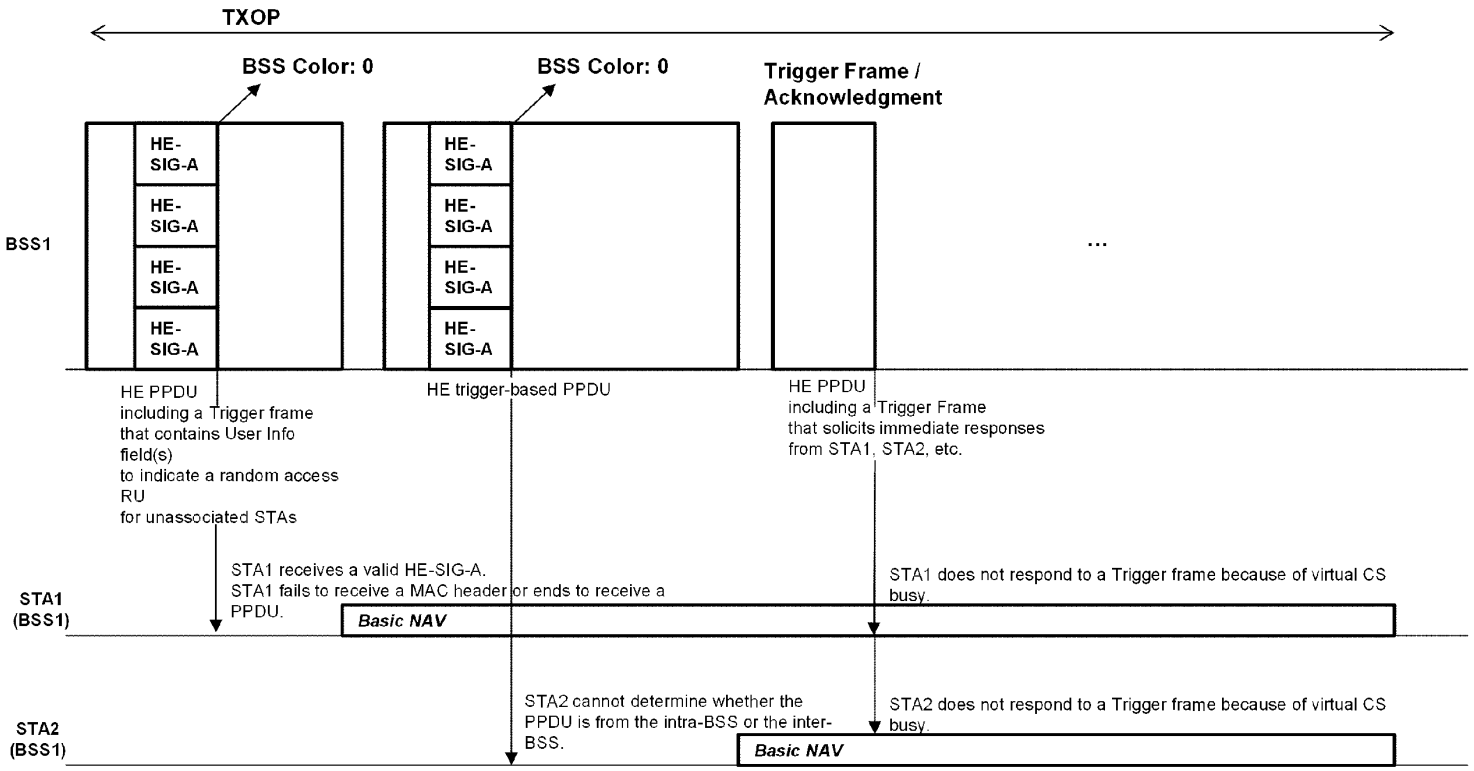

TXOP
BSS Color: 0
BSS Color: 0
Trigger Frame / Acknowledgment
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
...
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
HE PPDU including a Trigger Frame that solicits immediate responses from STA1, STA2, etc.
STA1 receives a valid HE-SIG-A. STA1 fails to receive a MAC header or ends to receive a PPDU.
STA1 does not respond to a Trigger frame because of virtual CS busy.
STA1 (BSS1)
Basic NAV
STA2 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS.
STA2 does not respond to a Trigger frame because of virtual CS busy.
STA2 (BSS1)
Basic NAV

*FIG. 11*

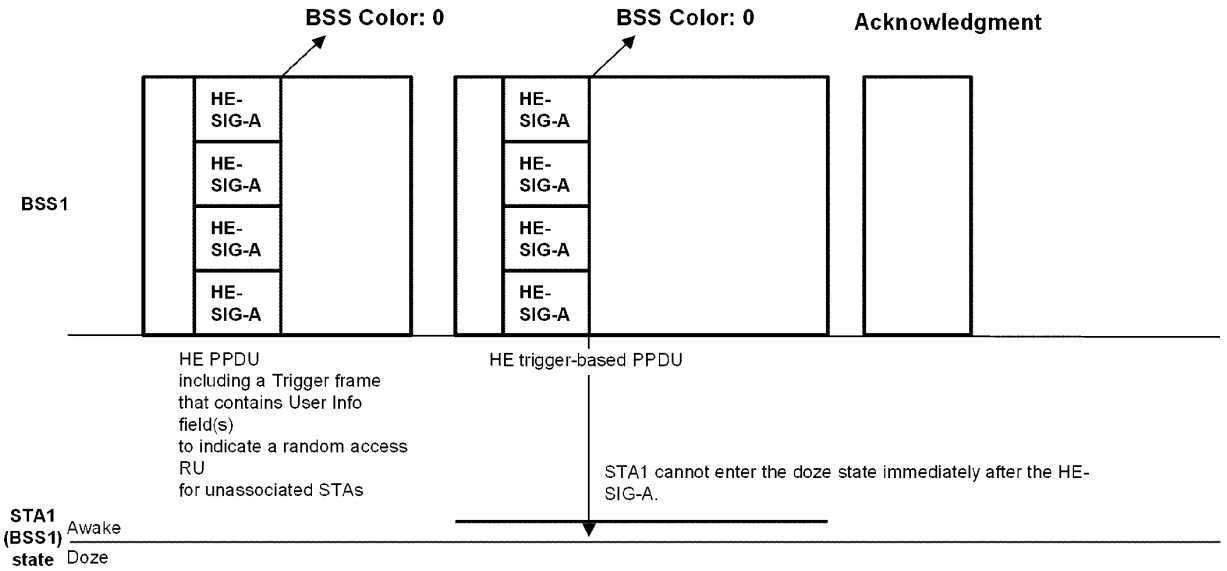

BSS Color: 0
BSS Color: 0
Acknowledgment
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
STA1 cannot enter the doze state immediately after the HE-SIG-A.
STA1 (BSS1) state
Awake
Doze

*FIG. 12*

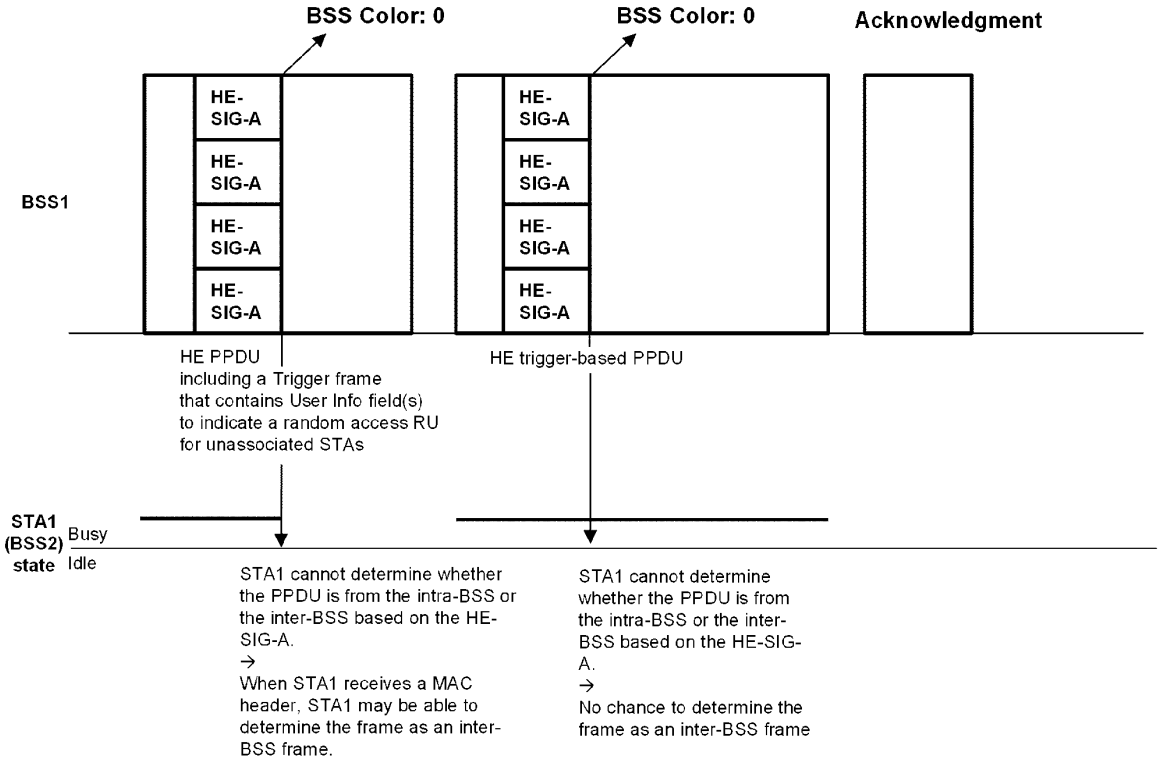
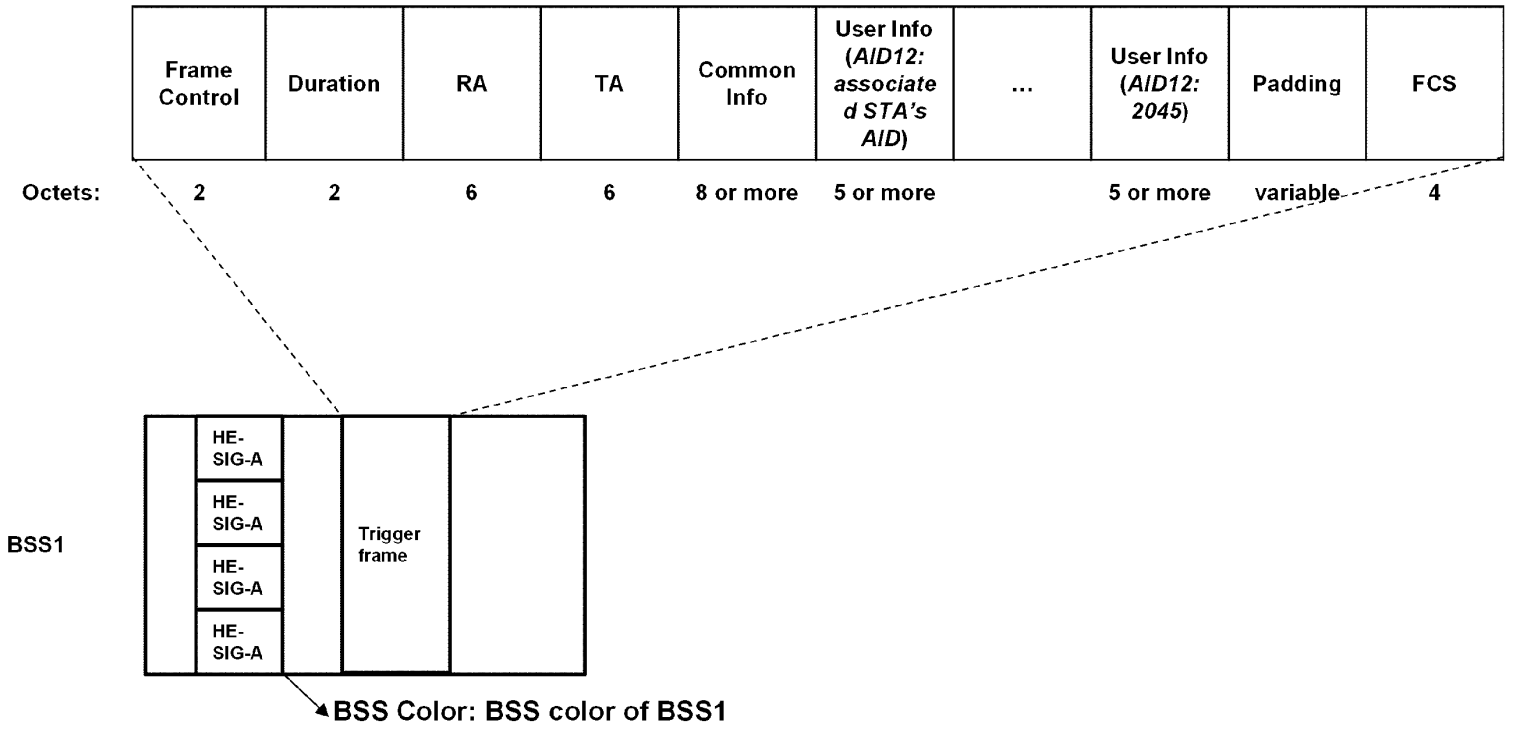

BSS Color: 0
BSS Color: 0
Acknowledgment
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE PPDU including a Trigger frame that contains User Info field(s) to indicate a random access RU for unassociated STAs
HE trigger-based PPDU
STA1 (BSS2) state
Busy
Idle
STA1 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS based on the HE-SIG-A.
→
When STA1 receives a MAC header, STA1 may be able to determine the frame as an inter-BSS frame.
STA1 cannot determine whether the PPDU is from the intra-BSS or the inter-BSS based on the HE-SIG-A.
→
No chance to determine the frame as an inter-BSS frame

*FIG. 13*


Frame Control
Duration
RA
TA
Common Info
User Info (AID12: associated STA's AID)
...
User Info (AID12: 2045)
Padding
FCS
Octets:
2
2
6
6
8 or more
5 or more
5 or more
variable
4
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
Trigger frame
BSS1
BSS Color: BSS color of BSS1

893

*FIG. 14*

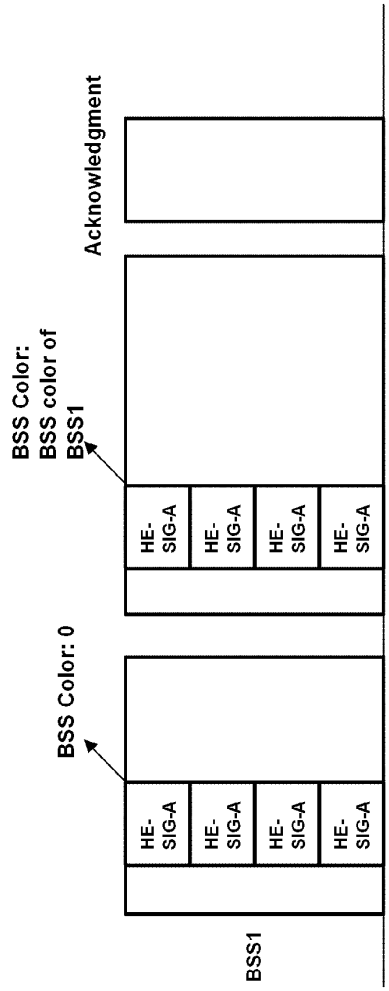

BSS1
BSS Color: 0
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE PPDU
including a Trigger frame
that contains User Info
field(s)
to indicate a random access
RU
for unassociated STAs
BSS Color:
BSS color of
BSS1
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE-SIG-A
HE trigger-based PPDU
Acknowledgment

*FIG. 15*

895

122

(a) User Info for the associated STA(s)

| B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|
| AID12 | RU Allocation | Coding Type | MCS | DCM | SS Allocation | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

(b) User Info not for the associated STA(s)

| B0 B11 | B12 B19 | B20 | B21 B24 | B25 | B26 B31 | B32 B38 | B39 | |
|---|---|---|---|---|---|---|---|---|
| AID12 | RU Allocation | Coding Type | MCS | DCM | BSS Color | Target RSSI | Reserved | Trigger Dependent User Info |
| Bits: 12 | 8 | 1 | 4 | 1 | 6 | 7 | 1 | variable |

*FIG. 16*

Trigger frame including a User Info field corresponding to a random access RU
AP
HE TB PPDU
- BSS Color in HE-SIG-A: the value in the BSS Color subfield in the most recently received HE Operation element from the AP that solicits this HE TB PPDU
Unassociated STA

*FIG. 17*

| Condition | GROUP_ID | PARTIAL_AID |
|---|---|---|
| Addressed to AP | 0 | BSSID[39:47] |
| Addressed to Mesh STA | 0 | RA[39:47] |
| Sent by an AP and addressed to a STA associated with that AP<br>or<br>Sent by a DLS or TDLS STA in a direct path to a DLS or TDLS peer STA | 63 | (AID + (BSSID[44:47] XOR BSSID[40:43]) * 2^5) mod 2^9 |
| Otherwise (see NOTE) | 63 | 0 |
| NOTE The last row covers the following cases:<br>- A PPDU sent to an IBSS STA<br>- A PPDU sent by an AP to a non associated STA<br>- Any other condition not explicitly listed elsewhere in the table | | |

*FIG. 18*

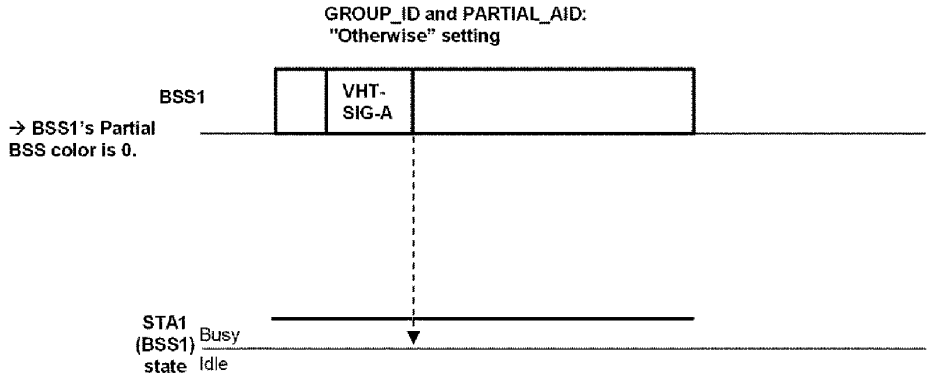



*FIG. 19*

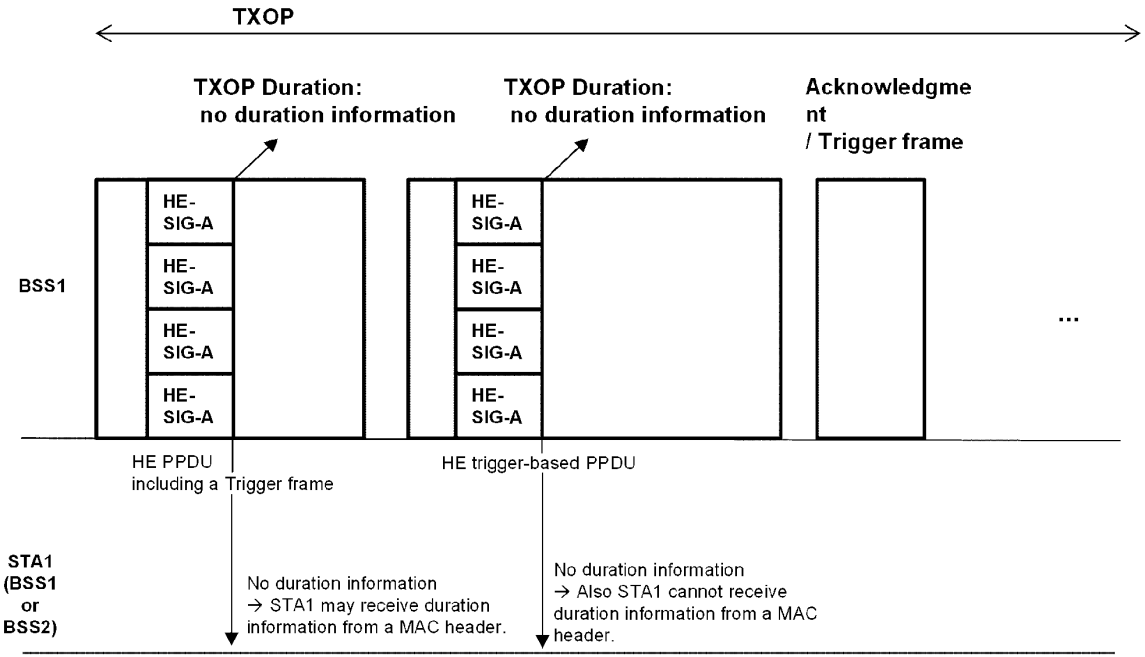

TXOP
TXOP Duration:
no duration information
TXOP Duration:
no duration information
Acknowledgme
nt
/ Trigger frame
BSS1
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
...
HE PPDU
including a Trigger frame
HE trigger-based PPDU
STA1
(BSS1
or
BSS2)
No duration information
→ STA1 may receive duration
information from a MAC header.
No duration information
→ Also STA1 cannot receive
duration information from a MAC
header.

*FIG. 20*

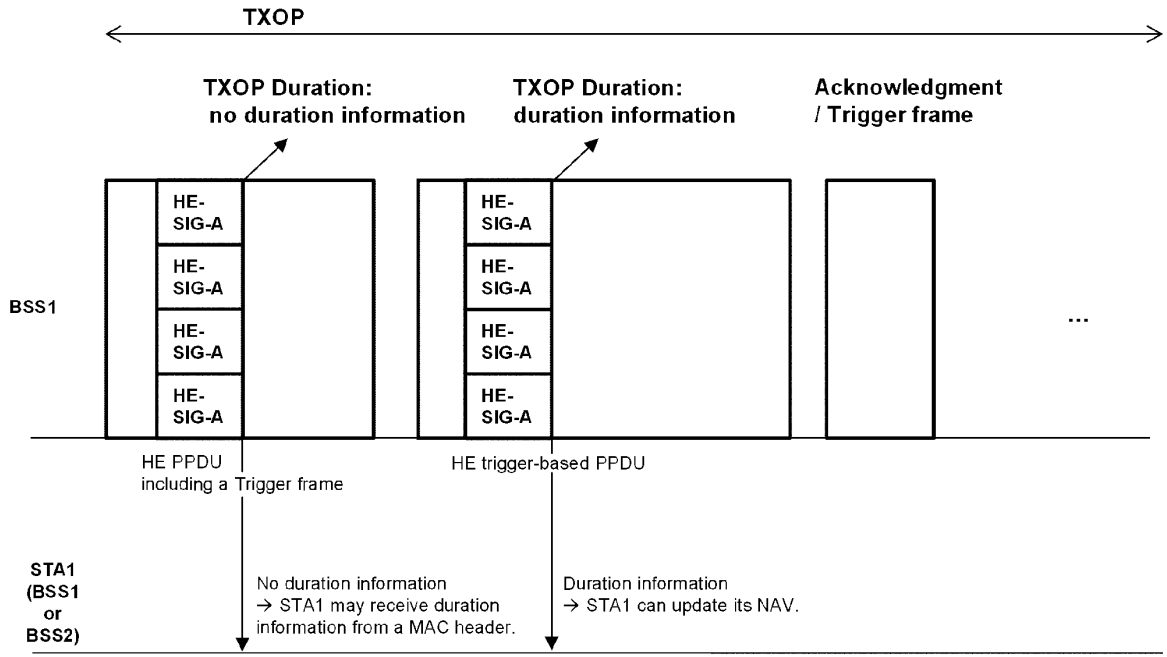
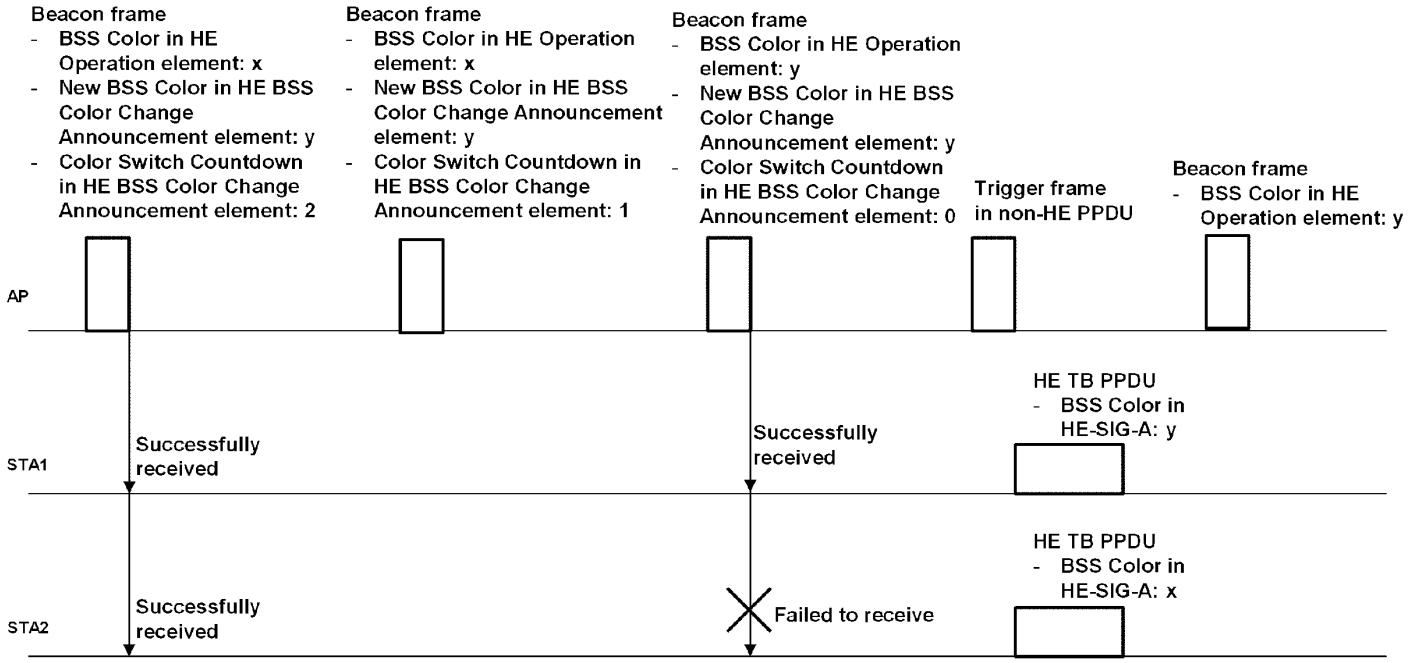

TXOP
TXOP Duration:
no duration information
TXOP Duration:
duration information
Acknowledgment
/ Trigger frame
BSS1
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
HE-
SIG-A
...
HE PPDU
including a Trigger frame
HE trigger-based PPDU
STA1
(BSS1
or
BSS2)
No duration information
→ STA1 may receive duration
information from a MAC header.
Duration information
→ STA1 can update its NAV.

*FIG. 21*


Beacon frame
- BSS Color in HE Operation element: x
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 2
Beacon frame
- BSS Color in HE Operation element: x
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 1
Beacon frame
- BSS Color in HE Operation element: y
- New BSS Color in HE BSS Color Change Announcement element: y
- Color Switch Countdown in HE BSS Color Change Announcement element: 0
Trigger frame in non-HE PPDU
Beacon frame
- BSS Color in HE Operation element: y
AP
STA1
Successfully received
Successfully received
HE TB PPDU
- BSS Color in HE-SIG-A: y
STA2
Successfully received
Failed to receive
HE TB PPDU
- BSS Color in HE-SIG-A: x

127

*FIG. 22*

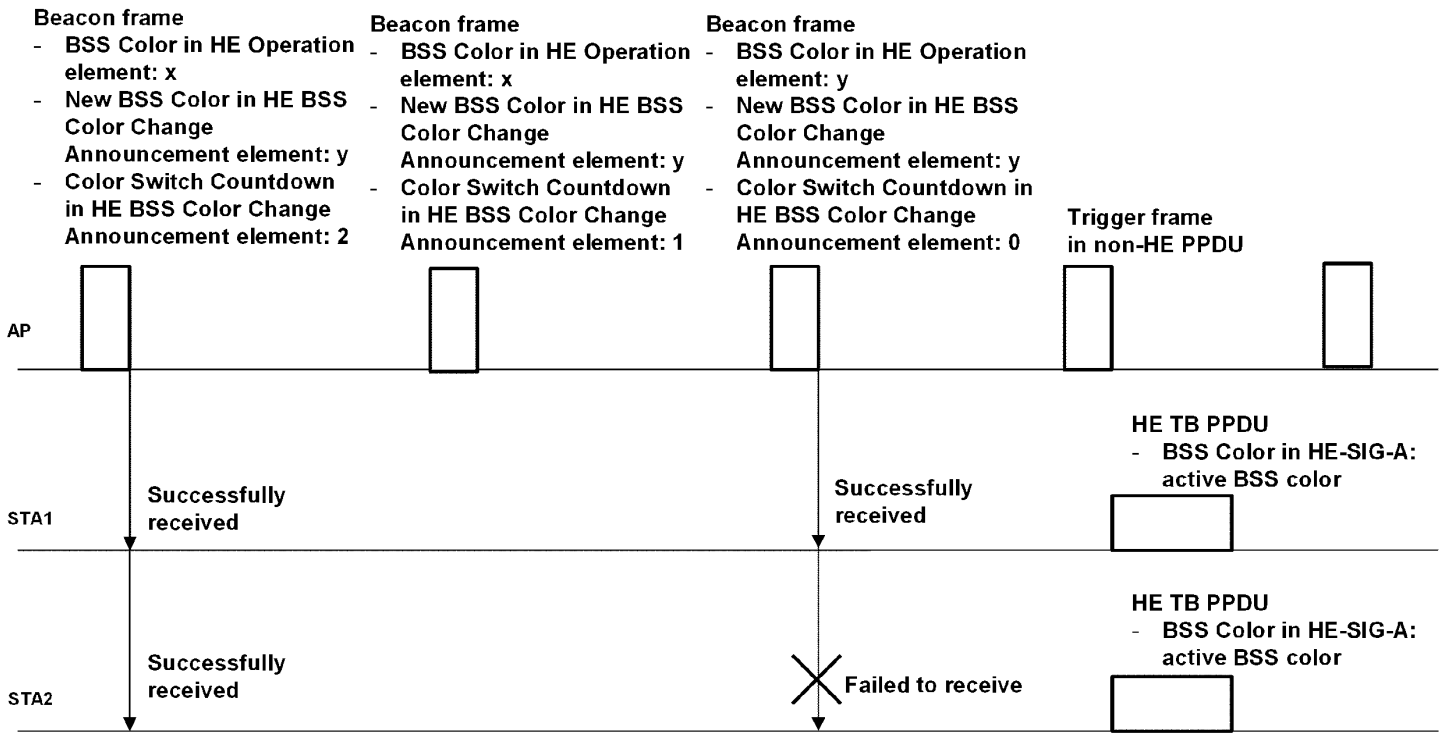



*FIG. 23*

901

128

| B19 – B13 | Description | Number of entries |
|---|---|---|
| 0–36 | Possible 26-tone RU cases in 80 MHz | 37 |
| 37–52 | Possible 52-tone RU cases in 80 MHz | 16 |
| 53–60 | Possible 106-tone RU cases in 80 MHz | 8 |
| 61–64 | Possible 242-tone RU cases in 80 MHz | 4 |
| 65–66 | Possible 484-tone RU cases in 80 MHz | 2 |
| 67 | 996-tone RU cases in 80 MHz | 1 |
| 68 | 2 996-tone RU case | 1 |
| 69–127 | Reserved | 59 |
| Total | | 128 |

*FIG. 24*

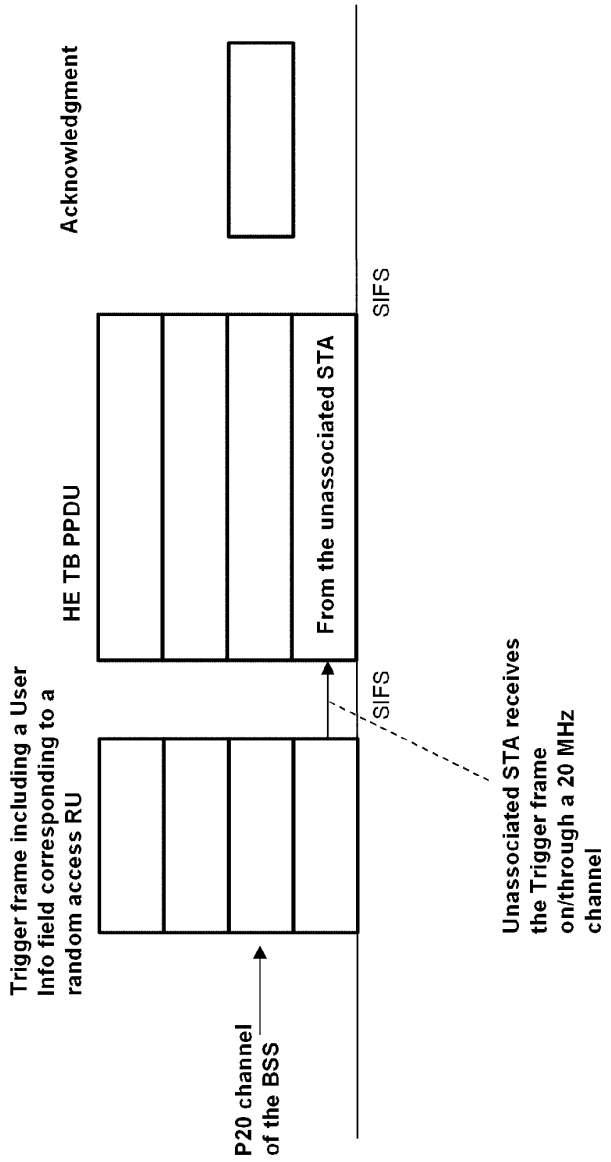
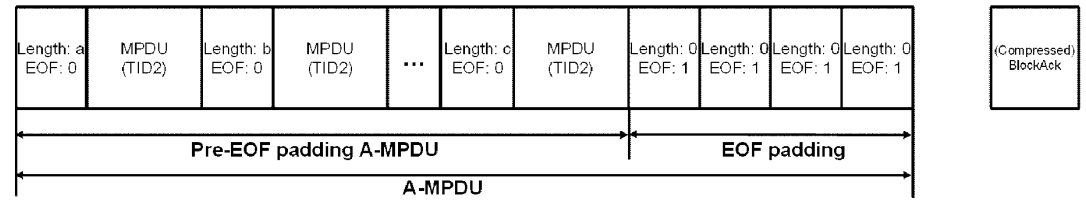
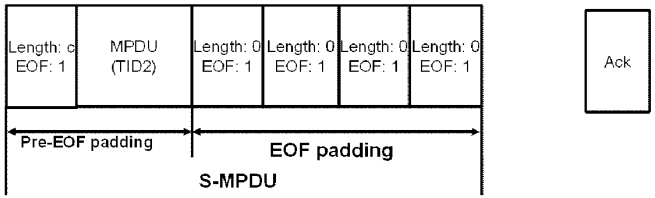

Trigger frame including a User Info field corresponding to a random access RU
HE TB PPDU
From the unassociated STA
Acknowledgment
SIFS
SIFS
P20 channel of the BSS
Unassociated STA receives the Trigger frame on/through a 20 MHz channel

*FIG. 25*




(a)




(b)

*FIG. 26*

904

131

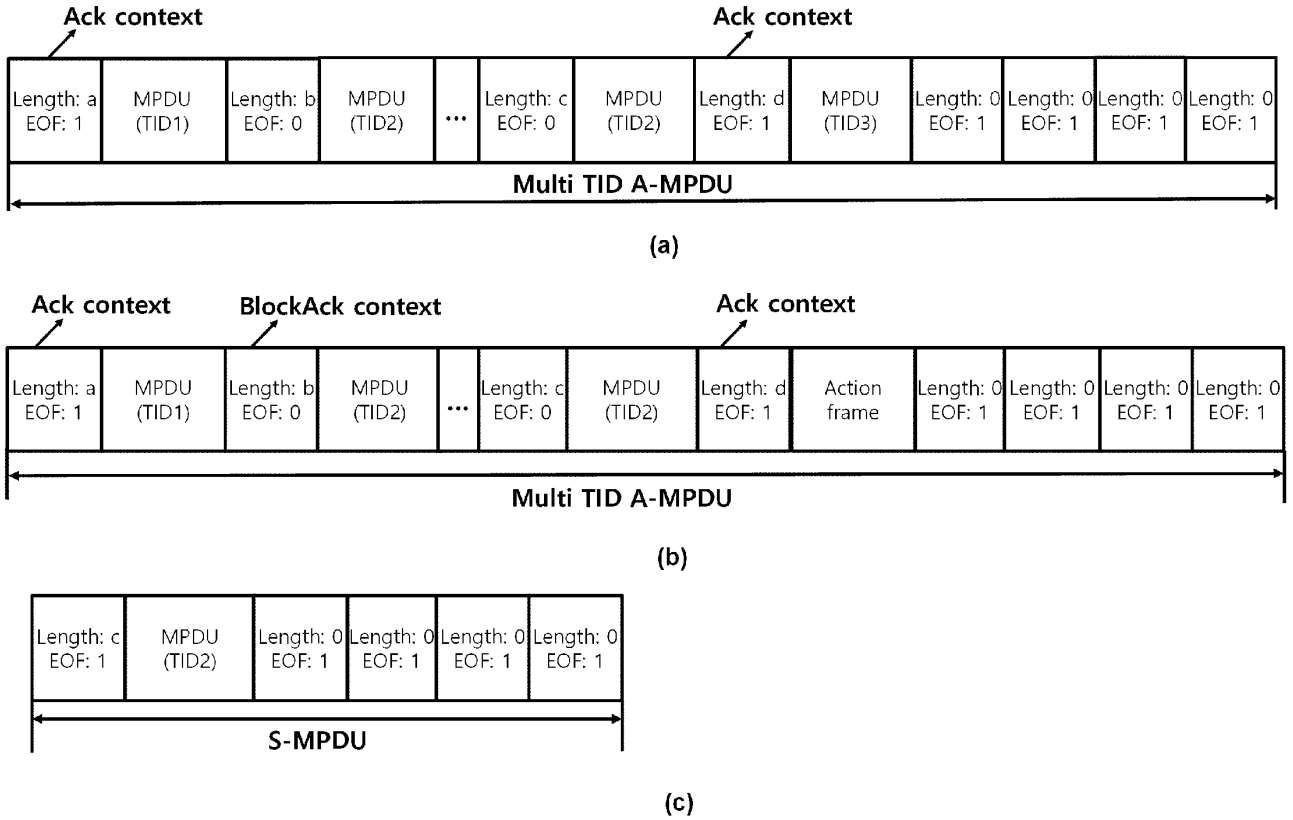



*FIG. 27*

905

132

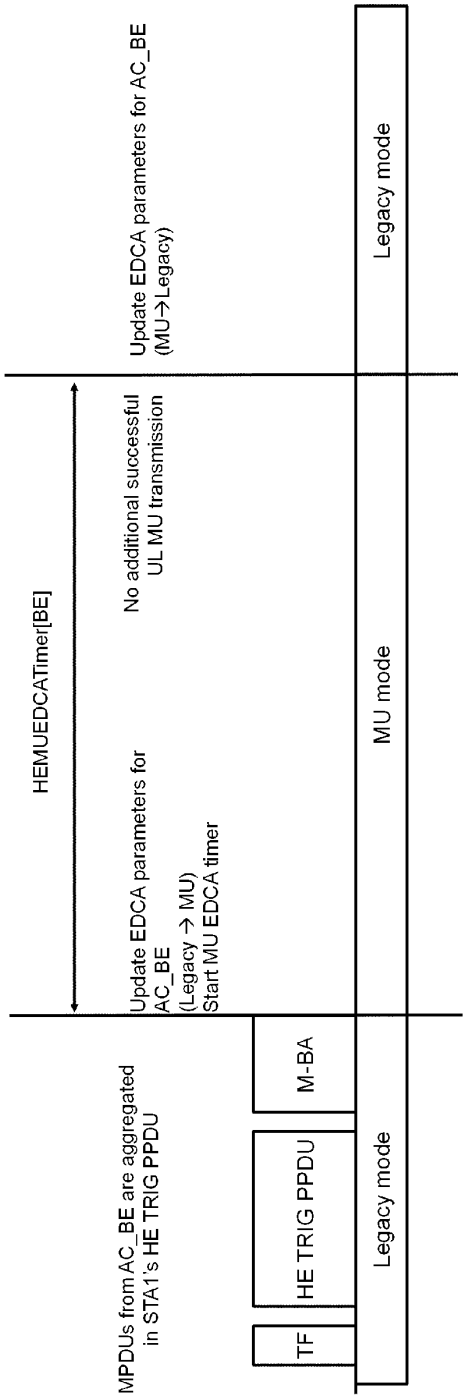

HEMUEDCATimer[BE]
MPDUs from AC_BE are aggregated in STA1's HE TRIG PPDU
Update EDCA parameters for AC_BE (Legacy → MU) Start MU EDCA timer
No additional successful UL MU transmission
Update EDCA parameters for AC_BE (MU→Legacy)
TF
HE TRIG PPDU
M-BA
Legacy mode
MU mode
Legacy mode

*FIG. 28*

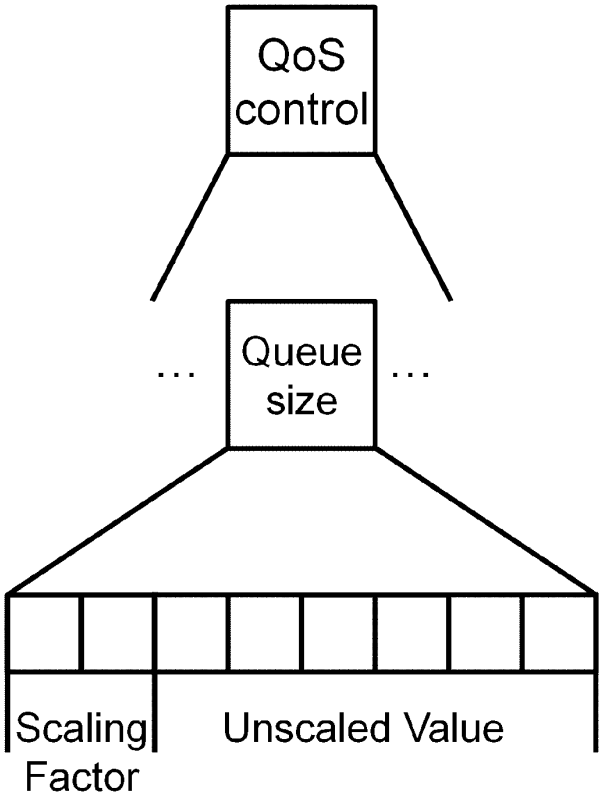



*FIG. 29*

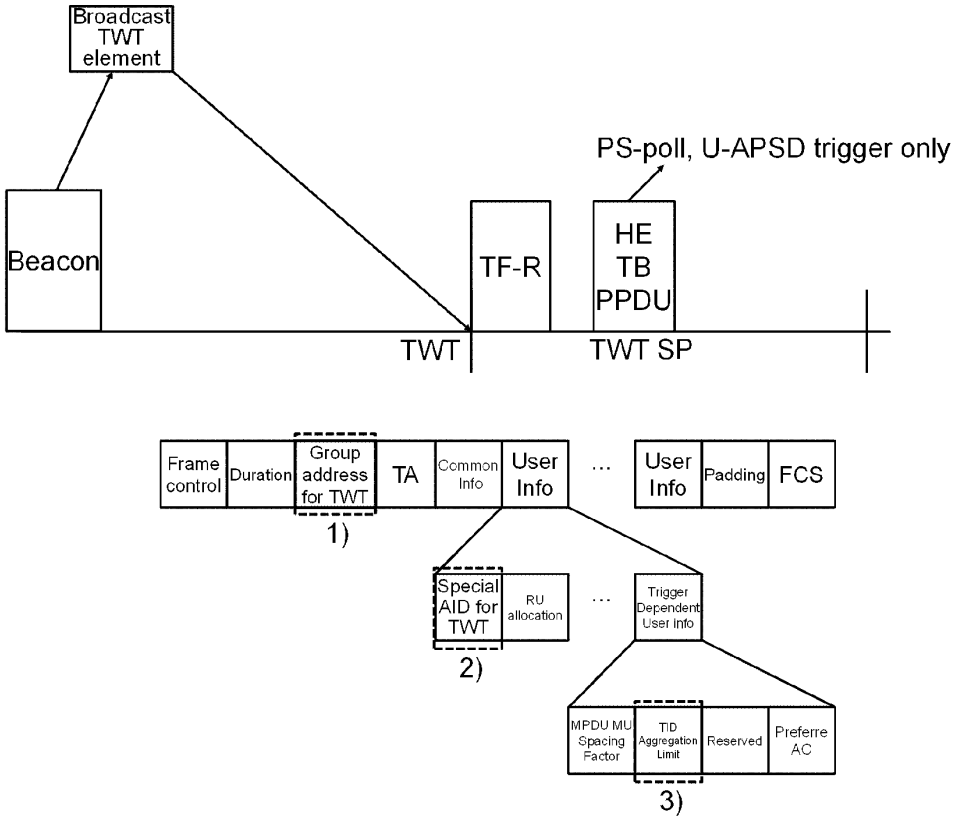
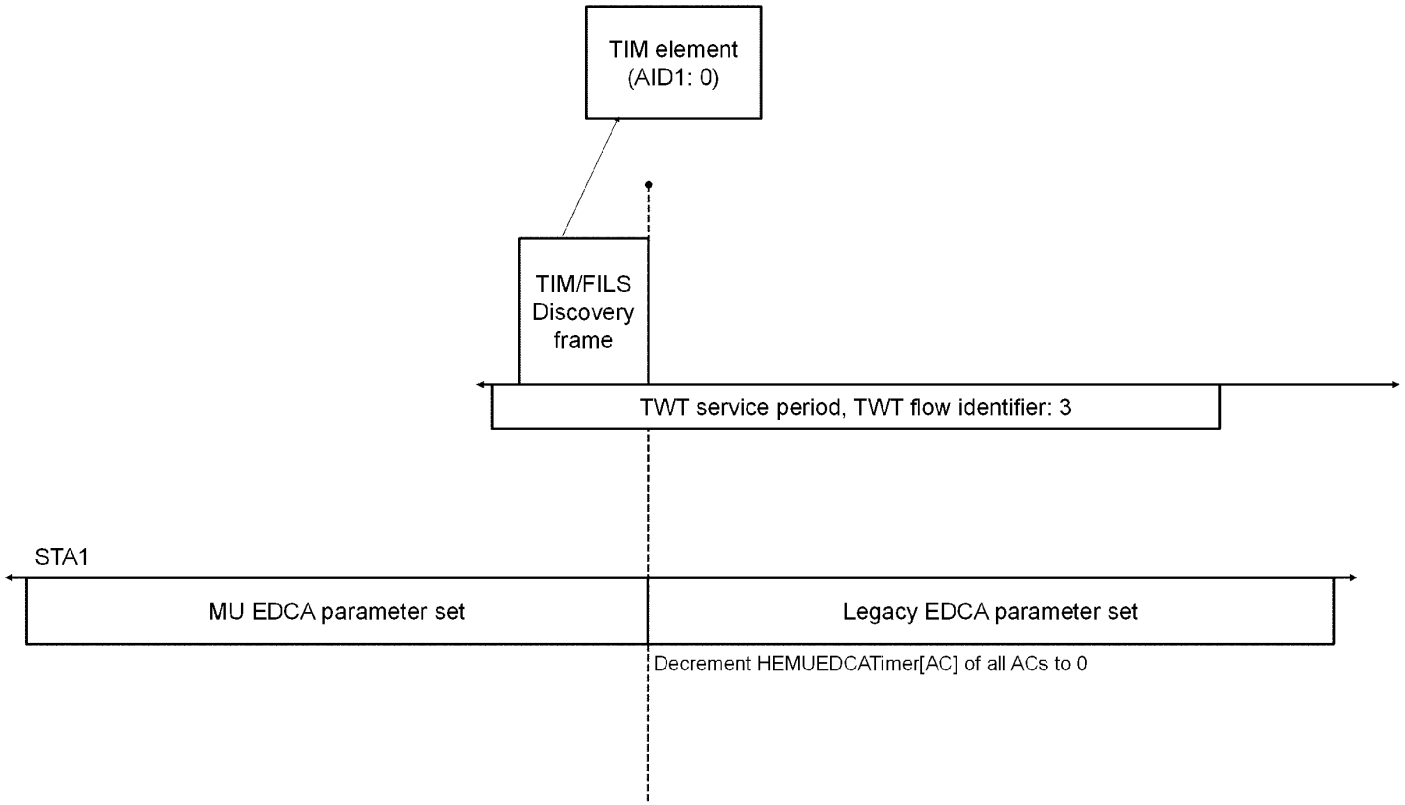

Broadcast TWT element
Beacon
TF-R
HE TB PPDU
PS-poll, U-APSD trigger only
TWT
TWT SP
Frame control
Duration
Group address for TWT
1)
TA
Common Info
User Info
...
User Info
Padding
FCS
Special AID for TWT
2)
RU allocation
...
Trigger Dependent User Info
MPDU MU Spacing Factor
TID Aggregation Limit
Reserved
Preferre AC
3)

*FIG. 30*




909

136

*FIG. 31*

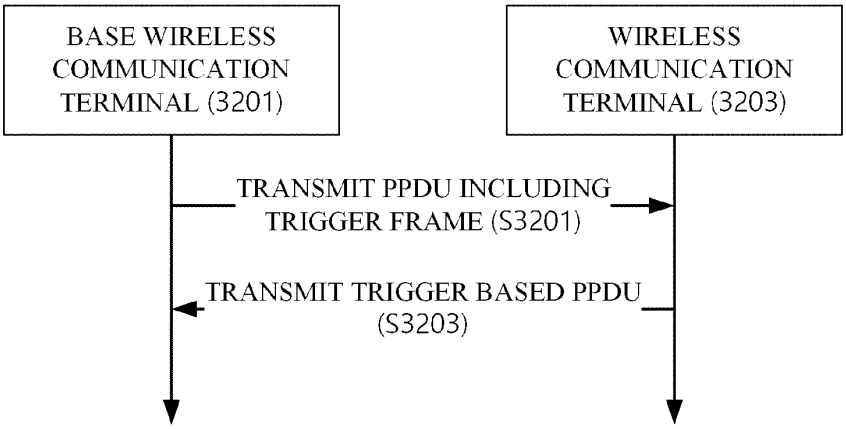

BASE WIRELESS COMMUNICATION TERMINAL (3201)
WIRELESS COMMUNICATION TERMINAL (3203)
TRANSMIT PPDU INCLUDING TRIGGER FRAME (S3201)
TRANSMIT TRIGGER BASED PPDU (S3203)

*FIG. 32*