

**CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION
UNDER 37 CFR 1.102(e) (Page 1 of 1)**

First Named Inventor:	Young Hoon KWON	Nonprovisional Application Number (if known):	Unassigned
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently \$0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.
2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.
3. The applicable box is checked below:

I. ☒ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

- i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.
---OR---
(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.
- ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, or the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

- i. A request for continued examination has been filed with, or prior to, this form.
- ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
- iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
- iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
- v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature <u>/Steve Y. Cho/</u>	Date <u>2016-03-23</u>
Name (Print/Typed) <u>Steve Y. Cho</u>	Practitioner Registration Number <u>44612</u>

Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.*

☒ *Total of 1 forms are submitted.

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.

DECLARATION AND ASSIGNMENT OF PATENT APPLICATION

As a below named inventor, I hereby declare that:

This declaration is directed to the application attached hereto, or if not attached hereto, the below-identified application:

Title of Invention: APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

Filing Date:

Application No.:

Attorney Docket No.: A303AA-012300US

The 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 statements 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.

WHEREAS, the below named individual(s), hereinafter referred to as "Assignors," are the inventor(s) of the invention described and set forth in the above-identified application for United States Letters Patent;

WHEREAS, Newracom, Inc., located at 9008 Research Drive, Irvine, CA 92618, hereinafter referred to as "ASSIGNEE," is desirous of acquiring ASSIGNORS' interest in the said invention and application and in any U.S. Letters Patent which may be granted on the same;

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN: Be it known that, for good and valuable consideration, receipt of which is hereby acknowledged by Assignors, Assignors have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the said Assignee, and Assignee's successors and assigns, all their right, title and interest in and to the said invention and application including any corresponding foreign application, and in and to any Letters Patent which may hereafter be granted on the same in the United States and any corresponding foreign application, the said interest to be held and enjoyed by said Assignee as fully and exclusively as it would have been held and enjoyed by said Assignors had this Assignment and transfer not been made, to the full end and term of any Letters Patent which may be granted thereon, or of any division, renewal, continuation in whole or in part, substitution, conversion, reissue, prolongation or extension thereof.

Assignors further agree that they will, without charge to Assignee, but at Assignee's expense, cooperate with Assignee in the prosecution of said application and/or applications, execute, verify, acknowledge and deliver all such further papers, including applications for Letters Patent and for the reissue thereof, and instruments of assignment and transfer thereof, and will perform such other acts as Assignee lawfully may request, to obtain or maintain Letters Patent for said invention and improvement, and to vest title thereto in Assignee, or Assignee's successors and assigns.

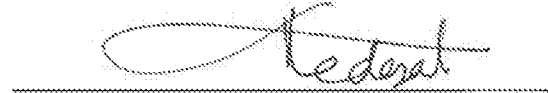
Assignors hereby authorize and request AMPACC Law Group, PLLC, 6100 219th Street SW, Suite 580, Mountlake Terrace, WA 98043, to insert herein above the title, application number, and filing date of said application when known.

IN TESTIMONY WHEREOF, each below named inventor, collectively Assignors,
has signed on the dates indicated.

3/23/2016
Date:

3/23/2016
Date:


Inventor's Name: Young Hoon KWON


Inventor's Name: Ahmad Reza HEDAYAT

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	Unassigned
Filing Date	Filed Herewith
First Named Inventor	Young Hoon KWON
Title	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	A303AA-012300US

SIGNATURE of Applicant or Patent Practitioner

Signature	/Steve Y. Cho/	Date (Optional)	2016-03-23
Name	Steve Y. Cho	Registration Number	44,612
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)	NEWRACOM, INC.		

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 _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 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.**

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 if 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:

83220

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) 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 patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

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 Customer Number: 83220

OR

Firm or Individual Name			
Address			
City	State	Zip	
Country			
Telephone	Email		

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

NEWRACOM, 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	<i>CHOONG WON CHO</i>	Date (Optional)	March 16, 2015
Name	CHOONG WON CHO		
Title	Vice President		

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.

This collection of information is required by 37 CFR 1.131, 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.

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 the Freedom of Information Act requires disclosure of these records.
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 inspections 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Young Hoon KWON et al.

Application No.: Unassigned

Filed: Herewith

For: APPARATUS AND METHOD FOR
DOWNLINK AND UPLINK MULTI-
USER TRANSMISSIONS

Customer No.: 83220

Confirmation No.: Unassigned

Examiner: Unassigned

Art Unit: Unassigned

INFORMATION DISCLOSURE
STATEMENT UNDER
37 CFR §1.97 and §1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The references cited on attached form PTO/SB/08B are being called to the attention of the Examiner. Copies of the references are enclosed in compliance with the requirements of 37 CFR §1.98(a)(2).

It is respectfully requested that the cited references be expressly considered during the prosecution of this application, and the references be made of record therein and appear among the “references cited” on any patent to issue therefrom.

As provided for by 37 CFR §1.97(g) and (h), no inference should be made that the information and references cited are prior art merely because they are in this statement and no representation is being made that a search has been conducted or that this statement encompasses all the possible relevant information.

Applicant believes that no fee is required for submission of this statement. However, if a fee is required, the Commissioner is authorized to deduct such fee from the undersigned’s

Deposit Account No. 50-4713. Please deduct any additional fees from, or credit any overpayment to, the above-noted Deposit Account.

Respectfully submitted,

/Steve Y. Cho/
Steve Y. Cho
Reg. No. 44,612

AMPACC Law Group, PLLC
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043
Tel: 425-348-3500
Fax: 425-348-3299

Substitute for form 1449B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	Unassigned
				Filing Date	Filed Herewith
				First Named Inventor	Young Hoon KWON
				Art Unit	Unassigned
				Examiner Name	Unassigned
Sheet	1	of	1	Attorney Docket Number	A303AA-012300US

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials *	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²	
	1	"Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications", IEEE Standards 802.11™ -2012 (Revision of IEEE Standard 802.11-2007), March 29, 2012, pp. 1-2695, IEEE (The Institute of Electrical and Electronic Engineers, Inc.), New York, NY, USA.	☐	
	2	"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", IEEE Standards 802.11ac™ -2013, 2013, pp. 1-395, IEEE (The Institute of Electrical and Electronic Engineers, Inc.), New York, NY, USA.	☐	
	3	"Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, Amendment 2: Sub 1 GHz License Exempt Operation", IEEE P802.11ah™/D5.0, March 2015, pp. 1-604, IEEE (The Institute of Electrical and Electronic Engineers, Inc.), New York, NY, USA.	☐	

Examiner Signature		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.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS			
First Named Inventor/Applicant Name:	Young Hoon KWON			
Filer:	Steve Yong Soo Cho			
Attorney Docket Number:	A303AA-012300US			
Filed as Small Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Request for Prioritized Examination	2817	1	2000	2000
Pages:				
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Publ. Fee- Early, Voluntary, or Normal	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2800

Electronic Acknowledgement Receipt

EFS ID:	25287716
Application Number:	15078920
International Application Number:	
Confirmation Number:	2806
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
First Named Inventor/Applicant Name:	Young Hoon KWON
Customer Number:	83220
Filer:	Steve Yong Soo Cho
Filer Authorized By:	
Attorney Docket Number:	A303AA-012300US
Receipt Date:	23-MAR-2016
Filing Date:	
Time Stamp:	19:44:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$2800
RAM confirmation Number	15335
Deposit Account	504713
Authorized User	CHO, STEVE Y.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 CFR 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees) ZYXEL-1002

Charge any Additional Fees required under 37 CFR 1.19 (Document supply fees)

Charge any Additional Fees required under 37 CFR 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	2016_03_23_ADS_A303AA-012300US.pdf	1793073	no	8
			a1bdf2f90cf5835d4b1a55fe2b11c9e6f9b71009		
Warnings:					
Information:					
2		2016_03_23_SPEC_A303AA-012300US.pdf	595619	yes	47
			588b7ddf85784a4cc855fd2199389f093b6af2b8		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	41	
	Claims		42	46	
	Abstract		47	47	
Warnings:					
Information:					
3	Drawings-only black and white line drawings	2016_03_23_DWGS_A303AA-012300US.pdf	2498824	no	13
			9caa841dcbe67f003b56fdf755b860b74840a11d		
Warnings:					
Information:					
4	TrackOne Request	2016_03_23_TRACK1_REQ_A303AA-012300US.pdf	114237	no	2
			2758a984523128320b1930c913e02d50a016f45e		
Warnings:					
Information:					
5	Oath or Declaration filed	2016_03_23_DEC_ASSGMT_A303AA-012300US.pdf	366813	no	2
			da23f1febdacabf5722e41d6ebde617d19406078		
Warnings:					
Information:					
6	Power of Attorney	2016_03_23_POA_A303AA-012300US.pdf	281711	no	3
			ccdd727c8924f8e5eae253827623fd4aa4fd8c8d		

Warnings:					
Information:					
7		2016_03_23_IDS_A303AA-012300US.pdf	389330 0a253831aa3b57dad57ea5991314c2c7401109bd	yes	3
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	3	
Warnings:					
Information:					
8	Non Patent Literature	2016_03_23_IDS_REF1_NPL1_A303AA-012300US.pdf	15621708 233700e101a1616ab8b82ac4ecaab792a78c71de	no	2793
Warnings:					
Information:					
9	Non Patent Literature	2016_03_23_IDS_REF2_NPL2_A303AA-012300US.pdf	3155593 3b19785941bca166c25e9bf721ab48910a56bfb4	no	425
Warnings:					
Information:					
10	Non Patent Literature	2016_03_23_IDS_REF3_NPL3_A303AA-012300US.pdf	5499455 09accf6e529596691b564c70bdd693c9dd64799d	no	632
Warnings:					
Information:					
11	Fee Worksheet (SB06)	fee-info.pdf	40558 e8884fe142e5a8337f17668ddda48ff8fe8e5231	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			30356921		

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.

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		
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	
	Young Hoon		KWON		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Irvine	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	9008 Research Drive				
Address 2					
City	Irvine	State/Province	CA		
Postal Code	92618	Country	US		

Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Ahmad	Reza	HEDAYAT		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Irvine	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	9008 Research Drive				
Address 2					
City	Irvine	State/Province	CA		
Postal Code	92618	Country	US		

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).

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

☐ An Address is being provided for the correspondence information of this application.

Customer Number	83220		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		
Attorney Docket Number	A303AA-012300US	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	13	Suggested Figure for Publication (if any)	1A

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	83220		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

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)
	Claims benefit of provisional	62137138	2015-03-23
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62140349	2015-03-30
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

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)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

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	Remove	
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	NEWRACOM, INC.		
Mailing Address Information For Applicant:			
Address 1	9008 Research Drive		
Address 2			
City	Irvine	State/Province	CA
Country	US	Postal Code	92618
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

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.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
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.				Add

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	/Steve Y. Cho/		Date (YYYY-MM-DD)	2016-03-23
First Name	Steve	Last Name	Cho	Registration Number
				44612
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	A303AA-012300US
		Application Number	
Title of Invention	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS		

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.**

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 the Freedom of Information Act requires disclosure of these records.
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 inspections 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.

APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority from U.S. Provisional Application No. 62/137,138, entitled “APPARATUS AND METHODS FOR DOWNLINK MULTI-USER TRANSMISSION,” filed March 23, 2015 and U.S. Provisional Application No. 62/140,349, entitled “APPARATUS AND METHODS FOR TRANSMITTING RESPONSE FRAMES,” filed March 30, 2015, which are incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present description relates in general to wireless communication systems and methods, and more particularly to, for example, without limitation, systems and methods for multi-user transmission of response frames.

BACKGROUND

[0003] Wireless local area network (WLAN) devices are deployed in diverse environments. These environments are generally characterized by the existence of access points and non-access point stations. In some systems, stations may utilize multi-user (MU) transmissions to more efficiently communicate data. In particular, an access point may transmit a single downlink (DL) Orthogonal Frequency Division Multiple Access (OFDMA) frame that assigns particular resource units (RUs) to separate stations in the wireless system. Each RU may include data and/or control information that is intended for a single station or a set of stations.

[0004] Although described in relation to OFDMA, MU transmissions may be implemented through the use of Multiple-Input and Multiple-Output (MIMO) techniques. MU-MIMO techniques utilize multiple transmit and receive antennas to exploit multipath propagation. MIMO may be used separately or jointly with OFDMA to transmit data and control information in both the downlink and uplink directions.

[0005] The description provided in the background section should not be assumed to be prior art merely because it is mentioned in or associated with the background section. The background section may include information that describes one or more aspects of the subject technology.

SUMMARY

[0006] A method, implemented by a network device in a wireless network, for coordinating an uplink multi-user response transmission to a downlink multi-user transmission is described herein. The method may comprise: generating, by the network device, a downlink multi-user frame addressed to a plurality of stations operating in the wireless network, the downlink multi-user frame including a plurality of resource units that are each assigned to a station in the plurality of stations, wherein generating the downlink multi-user frame comprises: including a set of MAC Protocol Data Units (MPDUs) in each resource unit of the plurality of resource units, wherein one or more MPDUs in each of the resource units in the downlink multi-user frame includes acknowledgement information for indicating properties of a multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame; and transmitting the downlink multi-user frame to the plurality of stations over a wireless channel.

[0007] In one embodiment, generating the downlink multi-user frame further comprises: including the acknowledgement information, for indicating properties of the multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame, in a header of the one or more MPDUs. In one embodiment, the header is a MAC header of the one or more MPDUs.

[0008] In one embodiment, one of the one or more MPDUs in each of the resource units in the downlink multi-user frame is a unicast trigger frame that contains the acknowledgement information for the respective station in the plurality of stations. In one embodiment, the trigger frame instigates each respective station in the plurality of stations to transmit the multi-user acknowledgement transmission after an interframe spacing period following receipt of the downlink multi-user frame.

[0009] In one embodiment, the method further comprises: generating, by the network device, a multi-user block acknowledgement request frame to solicit acknowledgements from two or more stations of the plurality of stations; and transmitting the multi-user block acknowledgement request frame following transmission of the downlink multi-user frame.

[0010] In one embodiment, the acknowledgement information includes one or more of: (1) whether the acknowledgement transmission is multi-user or single user, (2) whether the

acknowledgment transmission is immediate or non-immediate, and (3) resource scheduling information for the multi-user acknowledgement transmission.

[0011] A method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment is also described here. The method comprises: receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, and received from an access point in the wireless network; processing a first MAC Protocol Data Units (MPDU) in the downlink multi-user frame to determine acknowledgement information for indicating properties of a first multi-user acknowledgement frame to acknowledge the downlink multi-user frame by two or more stations; generating the first multi-user acknowledgment frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information.

[0012] In one embodiment, the first MPDU is located in a first resource unit of the downlink multi-user frame allocated to the first station, wherein the downlink multi-user frame includes a second resource unit that contains a second MPDU with acknowledgement information for a second station to transmit a second multi-user acknowledgement frame. In one embodiment, the first multi-user acknowledgement frame and the second multi-user acknowledgement frame together form a multi-user acknowledgement frame for acknowledging the downlink multi-user frame.

[0013] In one embodiment, processing the first MPDU comprises: extracting the acknowledgement information, for indicating properties of the first multi-user acknowledgement frame, in a header of the first MPDU. In one embodiment, the header is a MAC header of the first MPDU.

[0014] In one embodiment, processing the MPDU comprises: extracting the acknowledgement information, for indicating properties of the first multi-user acknowledgement frame transmission, from a payload of the first MPDU, wherein the first MPDU is a unicast trigger frame. In one embodiment, the method further comprises: processing a second MPDU in a same resource unit as the first MPDU, wherein the second MPDU includes data intended for the first station. In one embodiment, the trigger frame instigates the first station to transmit the first multi-user acknowledgement after an interframe spacing period following receipt of the downlink multi-user frame.

[0015] In one embodiment, the method further comprises: receiving a multi-user block acknowledgement request frame that solicits acknowledgements from two or more stations, wherein the first multi-user acknowledgement frame is transmitted after receipt of and in response to the multi-user block acknowledgement request frame.

[0016] In one embodiment, the acknowledgement information includes one or more of: (1) whether the first multi-user acknowledgement frame is part of multi-user or single user transmission, (2) whether the first multi-user acknowledgement frame is transmitted immediately following receipt of the downlink multi-user frame or upon receipt of a multi-user block acknowledgement request frame, and (3) resource scheduling information for an uplink multi-user acknowledgement transmission.

[0017] A method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment is described herein. In one embodiment, the method comprises: receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, wherein the downlink multi-user frame is received from an access point in the wireless network; receiving a multi-user block acknowledgement request frame that solicits acknowledgements from two or more stations, wherein the multi-user block acknowledgement request frame includes acknowledgement information for indicating properties of a first multi-user acknowledgement frame that acknowledges receipt of the downlink multi-user frame by the first station; generating the first multi-user acknowledgment frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information.

[0018] In one embodiment, the acknowledgement information includes one or more of: (1) whether the first multi-user acknowledgement frame is part of a multi-user or single user transmission and (2) resource scheduling information for the first multi-user acknowledgement transmission. In one embodiment, the acknowledgment scheduling information includes properties of a second multi-user acknowledgement frame generated and transmitted by a second station, wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement together form a multi-user transmission.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0019] **Figure 1A** depicts a multi-user (MU) transmission that solicits an immediate acknowledgement from one target station and delayed acknowledgements from other target stations according to one embodiment.
- [0020] **Figure 1B** depicts a MU transmission that solicits delayed acknowledgements from all target stations according to one embodiment.
- [0021] **Figure 2** illustrates a schematic diagram of an example of a wireless communication network according to one embodiment.
- [0022] **Figure 3** illustrates a schematic diagram of an example of a wireless communication device according to one embodiment.
- [0023] **Figure 4A** illustrates a schematic block diagram of an example of a transmitting signal processor in a wireless communication device according to one embodiment.
- [0024] **Figure 4B** illustrates a schematic block diagram of an example of a receiving signal processor in a wireless communication device according to one embodiment.
- [0025] **Figure 4C** illustrates an example of a high efficiency (HE) frame according to one embodiment.
- [0026] **Figure 5A** illustrates a method for coordinating an uplink (UL) MU acknowledgement/response transmission to a downlink (DL) MU transmission according to a first embodiment.
- [0027] **Figure 5B** illustrates a transmission diagram for coordinating an UL MU acknowledgement/response transmission according to the first embodiment.
- [0028] **Figure 6A** illustrates a method for coordinating an UL MU acknowledgement/response transmission to a DL MU transmission according to a second embodiment.
- [0029] **Figure 6B** illustrates a transmission diagram for coordinating an UL MU acknowledgement/response transmission according to the second embodiment.
- [0030] **Figure 7A** illustrates a method for coordinating an UL MU acknowledgement/response transmission to a DL MU transmission according to a third embodiment.
- [0031] **Figure 7B** illustrates a transmission diagram for coordinating an UL MU acknowledgement/response transmission according to the third embodiment.

[0032] **Figure 8A** illustrates a method for coordinating an UL MU acknowledgement/response transmission to a DL MU transmission according to a fourth embodiment.

[0033] **Figure 8B** illustrates a transmission diagram for coordinating an UL MU acknowledgement/response transmission according to the fourth embodiment.

[0034] **Figure 9** illustrates a trigger frame for coordinating an UL MU acknowledgement/response transmission to a DL MU transmission according to an embodiment.

[0035] **Figure 10** illustrates an example of a HE frame according to one embodiment.

[0036] **Figure 11** illustrates an example of coordinating the number of HE long training fields (HE-LTF) in an UL MU transmission according to one embodiment.

[0037] **Figure 12** illustrates an example of coordinating the number of HE-LTF in an UL MU transmission according to another embodiment.

[0038] In one or more implementations, not all of the depicted components in each figure may be required, and one or more implementations may include additional components not shown in a figure. Variations in the arrangement and type of the components may be made without departing from the scope of the subject disclosure. Additional components, different components, or fewer components may be utilized within the scope of the subject disclosure.

DETAILED DESCRIPTION

[0039] The detailed description set forth below is intended as a description of various implementations and is not intended to represent the only implementations in which the subject technology may be practiced. As those skilled in the art would realize, the described implementations may be modified in various different ways, all without departing from the scope of the present disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature and not restrictive.

[0040] During the standardization activities of the Institute of Electrical and Electronics Engineers (IEEE) 802.11, multi-user (MU) simultaneous transmission techniques such as Orthogonal Frequency Division Multiple Access (OFDMA) and Multi-User Multiple Input Multiple Output (MU-MIMO) are considered to improve network efficiency. For example, **Figure 1A** depicts an MU transmission that solicits an immediate acknowledgement from a station while **Figure 1B** depicts an MU transmission that does not solicit an immediate response from any of the participating/target stations.

[0041] In particular, as shown in **Figure 1A**, an access point (AP) transmits a downlink (DL) MU physical layer convergence procedure (PLCP) protocol data unit (PPDU) to a set of stations (STAs) (i.e., addressed, target, or receiving STAs) on a shared wireless channel. The PPDU may identify a particular STA in the set of addressed STAs to send back an immediate acknowledgement on the shared wireless channel or a portion of the shared wireless channel (i.e., an implicit block acknowledgment request (BAR)). As used herein, an “immediate” response or acknowledgement refers to a transmission that is the next transmission on the shared wireless channel or a portion of the shared wireless channel after the DL PPDU. Accordingly, the immediate acknowledgment/response and the preceding transmission may be separated by a period during which no activity/transmission is occurring on the shared channel or a designated portion of the shared channel. For examples, as shown in **Figure 1A**, the period between the DL PPDU/frame and the immediate acknowledgment may be a short interframe space (SIFS) period. However, in other embodiments, other IFS periods may be used. After receiving the acknowledgement frame from the specific STA for which an immediate response was requested, the AP polls acknowledgement frames from every other STA that the AP has sent the DL MU PPDU using a set of BAR frames (i.e., explicit BARs). Response to each corresponding BAR

frame, as shown in the **Figure 1A**, occur after an inactivity period on the channel and therefore would be considered immediate responses to the corresponding BAR frame.

[0042] Similarly, a DL MU transmission with no request for an immediate acknowledgement (i.e., no implicit BAR indication is present in the DL MU PPDU) requires the AP to poll each STA in the DL MU transmission for an acknowledgement that the DL MU PPDU was successfully received/processed. In particular, the AP may set an ACK Policy to be a block acknowledgement for every STA. As shown in **Figure 1B**, after sending the DL MU PPDU, the AP polls acknowledgement frames from each STA addressed by the MU PPDU using corresponding BAR frames.

[0043] Therefore, for both of the mechanisms described above and shown in **Figure 1A** and **Figure 1B**, even though DL data frames are sent in parallel in the spatial domain (e.g., using OFDMA or MIMO techniques), the acknowledgement frames from multiple STAs are transmitted and received in a serial (i.e., SU) manner. In particular, one or more BAR frames must be transmitted from the AP to one or more respective STAs such that each STA may sequentially send a corresponding acknowledgement or block acknowledgment back to the AP. This serial acknowledgement scheme consumes/requires a considerable amount of overhead (e.g., the time the shared wireless channel is devoted to acknowledgement transmissions) and reduces the overall gain/efficiency of DL MU transmissions. This inefficient serial acknowledgement mechanism is unavoidable in wireless systems in which MU uplink (UL) transmissions are prohibited or otherwise are not supported. However, several techniques are presented herein that facilitate a MU UL transmission scheme for acknowledgements to reduce or eliminate the inefficiencies of serial acknowledgements.

[0044] As used herein and where appropriate, acknowledgment frames/PPDUs/messages may either be individual acknowledgments (ACKs) or block acknowledgements (BAs). As defined in IEEE 802.11e, BAs acknowledge the receipt of multiple MAC Protocol Data Units (MPDUs) whereas ACKs acknowledge receipt of a single MPDU.

[0045] **Figure 2** illustrates a schematic diagram of an example of a wireless communication network 200 in which one or more of the methods, systems, and apparatuses described herein may operate or otherwise be implemented within. In the wireless communication network 200, such as a wireless local area network (WLAN), a basic service set (BSS) includes a plurality of wireless communication devices (e.g., WLAN devices). In one aspect, a BSS refers to a set of

STAs that can communicate in synchronization, rather than a concept indicating a particular area. In the example, the wireless communication network 200 includes wireless communication devices 211-215, which may be referred to as stations (STAs).

[0046] Each of the wireless communication devices 211-215 may include a media access control (MAC) layer and a physical (PHY) layer according to an IEEE 802.11 standard or a modification of an IEEE 802.11 standard. In the example network 200, at least one wireless communication device (e.g., device 211) is an access point (AP). An AP may be referred to as an AP STA, an AP device, or a central station. The other wireless communication devices (e.g., devices 212-215) may be non-AP STAs. Alternatively, all of the wireless communication devices 211-215 may be non-AP STAs in an Ad-hoc networking environment.

[0047] An AP STA and a non-AP STA may be collectively called STAs. However, for simplicity of description, in some aspects, only a non-AP STA may be referred to as a STA. An AP may be, for example, a centralized controller, a base station (BS), a node-B, a base transceiver system (BTS), a site controller, a network adapter, a network interface card (NIC), a router, or the like. A non-AP STA (e.g., a client device operable by a user) may be, for example, a device with wireless communication capability, a terminal, a wireless transmit/receive unit (WTRU), a user equipment (UE), a mobile station (MS), a mobile terminal, a mobile subscriber unit, a laptop, a non-mobile computing device (e.g., a desktop computer with wireless communication capability) or the like. In one or more aspects, a non-AP STA may act as an AP (e.g., a wireless hotspot).

[0048] In one aspect, an AP is a functional entity for providing access to a distribution system, by way of a wireless medium, for an associated STA. For example, an AP may provide access to the Internet for one or more STAs that are wirelessly and communicatively connected to the AP. In **Figure 2**, wireless communications between non-AP STAs 212-215 are made by way of the AP 211. However, when a direct link is established between two or more non-AP STAs 212-215, the connected STAs 212-215 can communicate directly with each other (without using the AP 211).

[0049] In one or more implementations, OFDMA-based 802.11 technologies are utilized, and for the sake of brevity, a STA refers to a non-AP high efficiency (HE) STA, and an AP refers to an HE AP. In one or more aspects, a STA may act as an AP.

[0050] **Figure 3** illustrates a schematic diagram of an example of a wireless communication device 300. The wireless communication device 300 includes a baseband processor 310, a radio frequency (RF) transceiver 320, an antenna unit 330, a memory 340, an input interface unit 350, an output interface unit 360, and a bus 370, or subsets and variations thereof. The wireless communication device 300 can be, or can be a part of, any of the wireless communication devices 211-215.

[0051] In the example shown in **Figure 3**, the baseband processor 310 performs baseband signal processing, and includes a medium access control (MAC) processor 311 and a PHY processor 315. The memory 340 may store software (such as MAC software) including at least some functions of the MAC layer. The memory 340 may further store an operating system and applications.

[0052] In the illustration, the MAC processor 311 includes a MAC software processing unit 312 and a MAC hardware processing unit 313. The MAC software processing unit 312 executes the MAC software to implement some functions of the MAC layer, and the MAC hardware processing unit 313 may implement remaining functions of the MAC layer as hardware (MAC hardware). However, the MAC processor 311 may vary in functionality depending on implementation. The PHY processor 315 includes a transmitting (TX) signal processing unit 380 and a receiving (RX) signal processing unit 390. The term TX may refer to transmitting, transmit, transmitted, transmitter or the like. The term RX may refer to receiving, receive, received, receiver or the like.

[0053] The PHY processor 315 interfaces to the MAC processor 311 through, among others, transmit vector (TXVECTOR) and receive vector (RXVECTOR) parameters. In one or more aspects, the MAC processor 311 generates and provides TXVECTOR parameters to the PHY processor 315 to supply per-packet transmit parameters. In one or more aspects, the PHY processor 315 generates and provides RXVECTOR parameters to the MAC processor 311 to inform the MAC processor 311 of the received packet parameters.

[0054] In some aspects, the wireless communication device 300 includes a read-only memory (ROM) (not shown) or registers (not shown) that store instructions that are needed by one or more of the MAC processor 311, the PHY processor 315 and/or other components of the wireless communication device 300.

[0055] In one or more implementations, the wireless communication device 300 includes a permanent storage device (not shown) configured as a read-and-write memory device. The permanent storage device may be a non-volatile memory unit that stores instructions even when the wireless communication device 300 is off. The ROM, registers, and the permanent storage device may be part of the baseband processor 310 or be a part of the memory 340. Each of the ROM, registers, the permanent storage device, and the memory 340 may be an example of a memory or a computer-readable medium. A memory may be one or more memories.

[0056] The memory 340 may be a read-and-write memory, a read-only memory, a volatile memory, a non-volatile memory, or a combination of some or all of the foregoing. The memory 340 may store instructions that one or more of the MAC processor 311, the PHY processor 315, and/or another component may need at runtime.

[0057] The RF transceiver 320 includes an RF transmitter 321 and an RF receiver 322. The input interface unit 350 receives information from a user, and the output interface unit 360 outputs information to the user. The antenna unit 330 includes one or more antennas. When multi-input multi-output (MIMO) or multi-user MIMO (MU-MIMO) is used, the antenna unit 330 may include more than one antenna.

[0058] The bus 370 collectively represents all system, peripheral, and chipset buses that communicatively connect the numerous internal components of the wireless communication device 300. In one or more implementations, the bus 370 communicatively connects the baseband processor 310 with the memory 340. From the memory 340, the baseband processor 310 may retrieve instructions to execute and data to process in order to execute the processes of the subject disclosure. The baseband processor 310 can be a single processor, multiple processors, or a multi-core processor in different implementations. The baseband processor 310, the memory 340, the input interface unit 350, and the output interface unit 360 may communicate with each other via the bus 370.

[0059] The bus 370 also connects to the input interface unit 350 and the output interface unit 360. The input interface unit 350 enables a user to communicate information and select commands to the wireless communication device 300. Input devices that may be used with the input interface unit 350 may include any acoustic, speech, visual, touch, tactile and/or sensory input device (e.g., a keyboard, a pointing device, a microphone, or a touchscreen). The output interface unit 360 may enable, for example, the display or output of videos, images, audio, and

data generated by the wireless communication device 300. Output devices that may be used with the output interface unit 360 may include any visual, auditory, tactile, and/or sensory output device (e.g., printers and display devices or any other device for outputting information). One or more implementations may include devices that function as both input and output devices, such as a touchscreen.

[0060] One or more implementations can be realized in part or in whole using a computer-readable medium. In one aspect, a computer-readable medium includes one or more media. In one or more aspects, a computer-readable medium is a tangible computer-readable medium, a computer-readable storage medium, a non-transitory computer-readable medium, a machine-readable medium, a memory, or some combination of the foregoing (e.g., a tangible computer-readable storage medium, or a non-transitory machine-readable storage medium). In one aspect, a computer is a machine. In one aspect, a computer-implemented method is a machine-implemented method.

[0061] A computer-readable medium may include storage integrated into a processor and/or storage external to a processor. A computer-readable medium may be a volatile, non-volatile, solid state, optical, magnetic, and/or other suitable storage device (e.g., RAM, ROM, PROM, EPROM, flash memory, registers, a hard disk, removable memory, or a remote storage device).

[0062] In one aspect, a computer-readable medium includes/comprises instructions stored therein. In one aspect, a computer-readable medium is encoded with instructions. In one aspect, instructions are executable by one or more processors (e.g., 310, 311, 312, 313, 315, 380, 390) to perform one or more operations or a method. Instructions may include, for example, programs, routines, subroutines, data, data structures, objects, sequences, commands, operations, modules, applications, and/or functions. Those skilled in the art would recognize how to implement the instructions.

[0063] A processor (e.g., 310, 311, 312, 313, 315, 380, 390) may be coupled to one or more memories (e.g., one or more external memories such as the memory 340, one or more memories internal to the processor, one or more registers internal or external to the processor, or one or more remote memories outside of the device 300), for example, via one or more wired and/or wireless connections. The coupling may be direct or indirect. In one aspect, a processor includes one or more processors. A processor, including a processing circuitry capable of executing instructions, may read, write, or access a computer-readable medium. A processor

may be, for example, an application specific integrated circuit (ASIC), a digital signal processor (DSP), or a field programmable gate array (FPGA).

[0064] In one aspect, a processor (e.g., 310, 311, 312, 313, 315, 380, 390) is configured to cause one or more operations of the subject disclosure to occur. In one aspect, a processor is configured to cause an apparatus (e.g., a wireless communication device 300) to perform operations or a method of the subject disclosure. In one or more implementations, a processor configuration involves having a processor coupled to one or more memories. A memory may be internal or external to the processor. Instructions may be in a form of software, hardware or a combination thereof. Software instructions (including data) may be stored in a memory. Hardware instructions may be part of the hardware circuitry components of a processor. When the instructions are executed or processed by one or more processors, (e.g., 310, 311, 312, 313, 315, 380, 390), the one or more processors cause one or more operations of the subject disclosure to occur or cause an apparatus (e.g., a wireless communication device 300) to perform operations or a method of the subject disclosure.

[0065] **Figure 4A** illustrates a schematic block diagram of an example of a transmitting signal processing unit 380 in a wireless communication device 300. The transmitting signal processing unit 380 of the PHY processor 315 includes an encoder 381, an interleaver 382, a mapper 383, an inverse Fourier transformer (IFT) 384, and a guard interval (GI) inserter 385.

[0066] The encoder 381 encodes input data. For example, the encoder 381 may be a forward error correction (FEC) encoder. The FEC encoder may include a binary convolutional code (BCC) encoder followed by a puncturing device, or may include a low-density parity-check (LDPC) encoder. The interleaver 382 interleaves the bits of each stream output from the encoder 381 to change the order of bits. In one aspect, interleaving may be applied only when BCC encoding is employed. The mapper 383 maps the sequence of bits output from the interleaver 382 into constellation points.

[0067] When MIMO or MU-MIMO is employed, the transmitting signal processing unit 380 may use multiple instances of the interleaver 382 and multiple instances of the mapper 383 corresponding to the number of spatial streams (N_{SS}). In the example, the transmitting signal processing unit 380 may further include a stream parser for dividing outputs of the BCC encoders or the LDPC encoder into blocks that are sent to different interleavers 382 or mappers 383. The transmitting signal processing unit 380 may further include a space-time block code

(STBC) encoder for spreading the constellation points from the number of spatial streams into a number of space-time streams (N_{STS}) and a spatial mapper for mapping the space-time streams to transmit chains. The spatial mapper may use direct mapping, spatial expansion, or beamforming depending on implementation. When MU-MIMO is employed, one or more of the blocks before reaching the spatial mapper may be provided for each user.

[0068] The IFT 384 converts a block of the constellation points output from the mapper 383 or the spatial mapper into a time domain block (e.g., a symbol) by using an inverse discrete Fourier transform (IDFT) or an inverse fast Fourier transform (IFFT). If the STBC encoder and the spatial mapper are employed, the IFT 384 may be provided for each transmit chain.

[0069] When MIMO or MU-MIMO is employed, the transmitting signal processing unit 380 may insert cyclic shift diversities (CSDs) to prevent unintentional beamforming. The CSD insertion may occur before or after the inverse Fourier transform operation. The CSD may be specified per transmit chain or may be specified per space-time stream. Alternatively, the CSD may be applied as a part of the spatial mapper.

[0070] The GI inserter 385 prepends a GI to the symbol. The transmitting signal processing unit 380 may optionally perform windowing to smooth edges of each symbol after inserting the GI. The RF transmitter 321 converts the symbols into an RF signal and transmits the RF signal via the antenna unit 330. When MIMO or MU-MIMO is employed, the GI inserter 385 and the RF transmitter 321 may be provided for each transmit chain.

[0071] **Figure 4B** illustrates a schematic block diagram of an example of a receiving signal processing unit 390 in a wireless communication device. The receiving signal processing unit 390 of the PHY processor 315 includes a GI remover 391, a Fourier transformer (FT) 392, a demapper 393, a deinterleaver 394, and a decoder 395.

[0072] The RF receiver 322 receives an RF signal via the antenna unit 330 and converts the RF signal into one or more symbols. In some aspects, the GI remover 391 removes the GI from the symbol. When MIMO or MU-MIMO is employed, the RF receiver 322 and the GI remover 391 may be provided for each receive chain.

[0073] The FT 392 converts the symbol (e.g., the time domain block) into a block of the constellation points by using a discrete Fourier transform (DFT) or a fast Fourier transform (FFT) depending on implementation. In one or more implementations, the FT 392 is provided for each receive chain.

[0074] When MIMO or MU-MIMO is employed, the receiving signal processing unit 390 may be a spatial demapper for converting the Fourier transformed receiver chains to constellation points of the space-time streams, and a STBC decoder (not shown) for despreading the constellation points from the space-time streams into the spatial streams.

[0075] The demapper 393 demaps the constellation points output from the FT 392 or the STBC decoder to the bit streams. If the LDPC encoding is used, the demapper 393 may further perform LDPC tone demapping before the constellation demapping. The deinterleaver 394 deinterleaves the bits of each stream output from the demapper 393. In one or more implementations, deinterleaving may be applied only when BCC encoding is used.

[0076] When MIMO or MU-MIMO is employed, the receiving signal processing unit 390 may use multiple instances on the demapper 393 and multiple instances of the deinterleaver 394 corresponding to the number of spatial streams. In the example, the receiving signal processing unit 390 may further include a stream deparser for combining the streams output from the deinterleavers 394.

[0077] The decoder 395 decodes the streams output from the deinterleaver 394 and/or the stream deparser. For example, the decoder 395 may be an FEC decoder. The FEC decoder may include a BCC decoder or an LDPC decoder.

[0078] **Figure 4C** illustrates an example of a high efficiency (HE) frame 400. The HE frame 400 is a physical layer convergence procedure (PLCP) protocol data unit (or PPDU) format. An HE frame may be referred to as an OFDMA frame, a PPDU, a PPDU format, an OFDMA PPDU, an MU PPDU, another similar term, or vice versa. An HE frame may be simply referred to as a frame for convenience. In one or more implementations, an AP may transmit a frame for downlink (DL) using a frame format shown in this figure or a variation thereof (e.g., without any or some portions of an HE header). A STA may transmit a frame for uplink (UL) using a frame format shown in this figure or a variation thereof (e.g., without any or some portions of an HE header).

[0079] Referring to **Figure 4C**, the HE frame 400 contains a header and a data field. The header includes a legacy header comprised of a legacy short training field (L-STF), a legacy long training field (L-LTF), and a legacy signal (L-SIG) field. These legacy fields contain symbols based on an early design of an IEEE 802.11 specification. The L-STF, L-LTF, and L-SIG fields may be 8 μ s, 8 μ s, and 4 μ s, respectively. Presence of these symbols would make any new

design compatible with the legacy designs and products. The legacy header may be referred to as a legacy preamble. In one or more aspects, the term header may be referred to as a preamble.

[0080] In one or more implementations, the legacy STF, LTF, and SIG symbols are modulated/carried with FFT size of 64 on a 20 MHz sub-channel and are duplicated every 20 MHz if the frame has a channel bandwidth wider than 20 MHz. Therefore, the legacy field (i.e., the STF, LTF, and SIG fields) occupies the entire channel bandwidth of the frame. The L-STF field may be utilized for packet detection, automatic gain control (AGC), and coarse frequency-offset (FO) correction. In one aspect, the L-STF field does not utilize frequency domain processing (e.g., FFT processing) but rather utilizes time domain processing. Thus, in one aspect, the L-STF field is not affected by the channel dispersion. The L-LTF field may be utilized for channel estimation, fine frequency-offset correction, and symbol timing. The L-SIG field includes one orthogonal frequency division multiplexing (OFDM) symbol. Thus, in one aspect, the term L-SIG field may be used interchangeably with L-SIG symbol. In one or more aspects, the L-SIG field may contain information indicative of a data rate and a length (e.g., in bytes) associated with the HE frame 400, which may be utilized by a receiver of the HE frame 400 to calculate a time duration of a transmission of the HE frame 400.

[0081] The header may also include an HE header comprised of an HE-SIG-A field and an HE-SIG-B field. The HE-SIG-A field may sometimes be referred to simply as a SIG-A field. These fields contain symbols that carry control information that may be vital regarding each PLCP service data unit (PSDU) and regarding the radio frequency (RF), PHY, and MAC properties of a PPDU. Several sub-fields may be located either in the HE-SIG-A and/or HE-SIG-B fields. In one aspect, the HE-SIG-A field can be carried/modulated using an FFT size of 64. The HE-SIG-B field can be carried/modulated using an FFT size of e.g., 64 or 256 depending on implementation. The HE-SIG-A and HE-SIG-B fields may occupy the entire channel bandwidth of the frame. In some aspects, the size of the HE-SIG-A field and/or the HE-SIG-B field is variable. In other words, the number of symbols contained in the HE-SIG-A field and/or HE-SIG-B field can vary from frame to frame. An HE-SIG-B field is not always present in all frames. In some cases, single user (SU) packets and UL trigger-based packets do not contain the HE-SIG-B field. To facilitate decoding of the HE frame 400 by a receiver, the size of (e.g., number of symbols contained in) the HE-SIG-B field may be indicated in the HE-SIG-A

field. In some aspects, the HE header also includes a repeated L-SIG (RL-SIG) field, whose content is the same as the L-SIG field.

[0082] For a 20 MHz channel, an FFT size of 64 is associated with a discrete Fourier transform (DFT) period of 3.2 μ s and a subcarrier spacing of 312.5 kHz. For a 20 MHz channel, an FFT size of 256 is associated with a DFT period of 12.8 μ s and a subcarrier spacing of 78.125 kHz. The DFT period may also be referred to as an inverse DFT period (IDFT) or an IDFT/DFT period. The DFT period may be denoted as T_{DFT} . The subcarrier spacing may be referred to as a subcarrier frequency spacing and may be denoted as Δ_F . The DFT period may be obtained by dividing the channel bandwidth by the FFT size. The subcarrier spacing is the reciprocal of the DFT period.

[0083] The HE header may further include HE-STF and HE-LTF fields, which contain symbols used to perform necessary RF and PHY processing for each PSDU and/or for the whole PPDU. The HE-LTF symbols may be modulated/carried with an FFT size of 256 for 20 MHz bandwidth and modulated over the entire bandwidth of the frame. Thus, the HE-LTF field may occupy the entire channel bandwidth of the frame. The HE-STF symbols may have a fixed pattern and a fixed duration. For example, the HE-STF symbols may have a predetermined repeating pattern. In one aspect, the HE-STF symbols do not require FFT processing. The HE frame 400 may include the data field, represented as HE-DATA, that contains data symbols. The data field may also be referred to as a payload field, data, payload or PSDU.

[0084] In one or more aspects, additional one or more of the HE-STF and/or HE-LTF fields may be included in the header. For example, an additional HE-STF field and/or an additional HE-LTF field may be included between the HE-SIG-A field and the HE-SIG-B field. The additional HE-STF and HE-LTF fields may be, for example, modulated/carried with FFT size of 64 on a 20 MHz channel and may be included as part of the first part of the HE frame 400. In one or more implementations, a TX signal processing unit 380 (or an IFT 384) illustrated **Figure 4A** may carry out the modulation described in this paragraph as well as the modulations described in other paragraphs above. In one or more implementations, an RX signal processing unit 390 (or an FT 392) may perform demodulation for a receiver.

[0085] Each of the fields (e.g., L-LTF, HE-SIG-B, etc.) of the HE frame 400 includes one or more guard intervals and one or more OFDM symbols. The guard interval may be utilized to facilitate compensation of multi-path effects, which may cause inter-symbol interference (ISI).

In one or more implementations, a guard interval is a cyclic prefix (CP), and a guard interval duration is a CP length. In one or more aspects, the term duration may be referred to as a length. In one aspect, no guard interval is used for symbols in the L-STF field and/or HE-STF field. Each guard interval may be associated with a symbol and may be present between symbols (or between consecutive symbols). In some aspects, each OFDM symbol is preceded (or followed) by a guard interval. In some aspects, the OFDM symbol may be referred to as including the guard interval that precedes (or follows) the OFDM symbol.

[0086] In one or more implementations of a transmitter, a GI inserter 385 illustrated in **Figure 4A** may prepend a guard interval to an OFDM symbol. For a receiver, a GI remover 391 of **Figure 4B** may remove the prepended guard interval.

[0087] Turning now to **Figure 5A**, a method 500 will be described for coordinating UL MU acknowledgement/response transmissions to a DL MU transmission according to one embodiment. As will be explained in further detail below, the proposed method 500 facilitates UL MU acknowledgement/response transmissions for more advanced STAs (e.g., HE STAs), which support UL MU capabilities (e.g., UL OFDMA or UL MU-MIMO), while still being backwards compatible with legacy devices (e.g., High Throughput (HT) STAs, Very High Throughput (VHT) STAs, or other devices that do not support UL MU transmissions).

[0088] The method 500 may be performed by one or more devices in the network 200. For example, one or more operations or sub-operations of the method 500 may be performed by the device 211, which is operating as an AP in the network 200, and/or the device 212-215. In particular, in the method 500 the AP 211 may be in communication with two or more of the device 212-215, which operate as separate STAs in the network 200. In this configuration, the AP 211 and the STAs 212-215 may jointly performed the method 500 to efficiently acknowledge receipt of a DL MU PPDU/frame.

[0089] Each operation of the method 500 will be described by way of example below in relation to the transmission diagram shown in **Figure 5B**. Although one or more operations or sub-operations are described or shown in a particular sequential order, in other embodiments the operations/sub-operations may be rearranged in a different order, which may include performance of multiple operations/sub-operations in at least partially overlapping time periods.

[0090] The method 500 may commence at operation 501 with the generation of a DL MU PPDU/frame by an AP. The DL MU frame may be addressed to a set of target STAs operating

in a network. For example, as shown in **Figure 5B**, the DL MU frame may be addressed to STA1, STA2, and STA3. In this example, STA1 and STA2 are non-legacy devices that support UL MU transmissions and STA3 is a legacy device that does not support UL MU transmissions. For example, STA1 and STA2 may be HE devices (i.e., devices that operate according to the IEEE 802.11ax standard, which is currently in development) and STA3 may be a VHT STA (i.e., a device that operates according to the IEEE 802.11ac standard), a HT STA (i.e., a device that operates according to the IEEE 802.11n standard), or another device that operates according to a wireless standard that does not support UL MU transmissions. The generated DL MU frame may be a MU-MIMO frame and/or an OFDMA frame. The generation of the frame at operation 501 may include the sub-operations described below.

[0091] At sub-operation 501A the AP may generate one or more MAC Protocol Data Units (MPDUs) or aggregated-MPDUs (A-MPDUs) for each non-legacy STA. In the example, one or more MPDUs/A-MPDUs may be generated for STA1 and one or more MPDUs/A-MPDUs may be generated for STA2. Each MPDU may include data and/or control frames intended for each respective STA and may be placed in resource units within the DL MU frame assigned/allocated to each respective STA. The resource units may be particular spatial streams or sub-channels of a wireless channel upon which the DL MU frame will be transmitted.

[0092] In one embodiment, one or more MPDUs may include acknowledgement information that is used for indicating to respective STAs a scheme/technique used to transmit acknowledgement messages to the AP. For example, in one embodiment, generation of one or more MPDUs addressed to each STA may include setting an acknowledgement policy subfield (ACK policy subfield) in a header of the one or more MPDUs (i.e., a MAC header) such that STA1 and STA2 can identify which technique/scheme is to be used by each non-legacy STA for acknowledging successful receipt of the MPDUs by each respective STA. In one embodiment, the ACK policy subfield is two bits and is located in the Quality of Service (QoS) Control Field of the MAC header. However, in other embodiments, the ACK policy subfield may be located in different portions of the MAC header and may be of a different length (e.g., 1bit, 3bits, etc.).

[0093] In embodiments in which the ACK Policy subfield is two bits in length, the interpretation of these two bits may be given by **Table 1** below.

Bits in QoS Control field		Meaning
Bit 5	Bit 6	
0	0	Normal Ack or Implicit Block Ack Request. In a frame that is a non-A-MPDU frame or VHT single MPDU: The addressed recipient returns an Ack or QoS +CF-Ack frame after a short interframe space (SIFS) period, according to the procedures defined in 9.3.2.9 (Ack procedure) and 9.22.3.5 (HCCA transfer rules). A non-DMG STA sets the Ack Policy subfield for individually addressed QoS Null (no data) frames to this value. Otherwise: The addressed recipient returns a BlockAck frame, either individually or as part of an A-MPDU starting a SIFS after the PPDU carrying the frame, according to the procedures defined in 9.3.2.10 (Block ack procedure), 9.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG STA), 9.24.8.3 (Operation of HT-delayed block ack), 9.28.3 (Rules for RD initiator), 9.28.4 (Rules for RD responder), and 9.32.3 (Explicit feedback beamforming).
1	0	No Ack The addressed recipient takes no action upon receipt of the frame. More details are provided in 9.25 (No Acknowledgment (No Ack)). The Ack Policy subfield is set to this value in all individually addressed frames in which the sender does not require acknowledgment. The Ack Policy subfield is also set to this value in all group addressed frames that use the QoS frame format except with a TID for which a block ack agreement exists. This value of the Ack Policy subfield is not used for QoS Data frames with a TID for which a block ack agreement exists. The Ack Policy subfield for group addressed QoS Null (no data) frames is set to this value.
0	1	No explicit acknowledgment or PSMP Ack. When bit 6 of the Frame Control field (see 8.2.4.1.3 (Type and Subtype fields)) is set to 1: There may be a response frame to the frame that is received, but it is neither the Ack frame nor any Data frame of subtype +CF-Ack. The Ack Policy subfield for QoS CF-Poll and QoS CF-Ack +CF-Poll Data frames is set to this value. When bit 6 of the Frame Control field (see 8.2.4.1.3 (Type and Subtype fields)) is set to 0: The acknowledgment for a frame indicating PSMP Ack when it appears in a PSMP downlink transmission time (PSMP-DTT) is to be received in a later PSMP uplink transmission time (PSMP-UTT). The acknowledgment for a frame indicating PSMP Ack when it appears in a PSMP-UTT is to be received in a later PSMP-DTT. NOTE—Bit 6 of the Frame Control field (see 8.2.4.1.3 (Type and Subtype fields)) indicates the absence of a data payload. When equal to 1, the QoS Data frame contains no payload, and any response is generated in response to a QoS CF-Poll or QoS CF-Ack +CF-Poll frame, but does not signify an acknowledgment of data. When set to 0, the QoS Data frame contains a payload, which is acknowledged as described in 9.29.2.7 (PSMP acknowledgment rules).
1	1	Block Ack The addressed recipient takes no action upon the receipt of the frame except for recording the state. The recipient can expect a BlockAckReq frame in the future to which it responds using the procedure described in 9.34 (Block acknowledgment (block ack)).

Table1

[0094] In some embodiments, when the ACK Policy subfield is set to indicate an immediate acknowledgement, which in **Table 1** above corresponds to “Normal Ack or Implicit Block Ack Request” and a bit sequence “00”, another subfield (a second subfield or a MU ACK Policy subfield) indicates if the follow-up acknowledgement shall be a single user (SU) acknowledgement or an MU acknowledgement. Therefore, the MU acknowledgement that follows immediately after the DL MU PPDU transmission happens from those STAs for which

the ACK Policy subfield is set to an immediate acknowledgement and the MU ACK Policy subfield is set to an MU acknowledgement. For example, both STA1 and STA2 in **Figure 5B** received MPDUs in which the ACK Policy subfield is set to an immediate acknowledgment (e.g., “00”) and the MU ACK Policy subfield is set to “MU acknowledgement”. Accordingly, both STA1 and STA2 may participate in an UL MU acknowledgement immediately following the DL MU transmission. Both the DL and UL MU transmissions may be an OFDMA transmission and/or may incorporate MU-MIMO techniques.

[0095] Conversely, those STAs that the ACK Policy subfield is set to immediate acknowledgement and the MU ACK Policy subfield is not set to “MU acknowledgement” and instead is set to “SU acknowledgement”, or cannot interpret the MU ACK Policy subfield, will send acknowledgement frames in single user transmission manner as shown in the examples in **Figure 1A** and **Figure 1B**. For example, a STA may transmit an acknowledgment or a block acknowledgement in an SU manner immediately after the DL MU transmission or may wait for a BAR frame from the AP before transmitting an acknowledgment or a block acknowledgement in an SU manner.

[0096] In one embodiment, the QoS AP PS Buffer State subfield in the QoS Control field is used as the MU ACK Policy subfield. In particular, in one embodiment, the 8th bit (B8) of the QoS AP PS Buffer State subfield is used as the MU ACK Policy subfield. In one embodiment, if the MU ACK Policy subfield is set to a MU acknowledgement state, there is a second part in the DL MU PPDU that indicates (1) UL MU transmission method/scheme (e.g., MU-MIMO and/or OFDMA) and/or (2) resource allocation information for the MU acknowledgement frame transmission. In another embodiment, if the MU ACK Policy subfield is set to a MU acknowledgement state, resource allocation information regarding the UL MU transmission follows a pre-determined rule set and no explicit indication of the resource allocation information regarding UL MU transmission is included in the DL MU PPDU.

[0097] At sub-operation 501B, the AP may generate MPDUs for legacy STAs (e.g., VHT STAs, HT STAs, or any STA implementing a protocol that does not support UL MU transmissions). Similar to operation 501A for non-legacy STAs, operation 501B may include setting an ACK Policy subfield in a QoS Control Field of a MAC header. In one embodiment, the ACK Policy subfield for legacy STAs may be set to a state that indicates non-immediate acknowledgement, which in **Table 1** above corresponds to “Block Ack”. In particular, as shown

in **Figure 5B**, when “Block Ack” is selected, the AP may subsequently transmit a BAR frame to trigger STA3 to transmit an acknowledgment or a block acknowledgement in an SU manner. In another embodiment, the ACK Policy subfield for a legacy STA may be set to an immediate acknowledgement. In this embodiment, the ACK Policy subfield for all other scheduled STAs, including STAs that support UL MU transmissions, is to be a non-immediate acknowledgement. For example, STAs that are set to transmit a non-immediate MU acknowledgement will wait for a MU-BAR (i.e., a trigger frame) before transmitting.

[0098] Following generation of the DL MU frame/PPDU at operation 501, the method 500 may move to operation 503. At operation 503 the AP transmits the DL MU frame/PPDU to the addressed/targeted STAs. For example, as shown in **Figure 5B**, the DL MU PPDU may be transmitted to the non-legacy STA1 and STA2 and the legacy STA3. As noted above, the DL MU PPDU may utilize OFDMA and/or MIMO MU transmission techniques.

[0099] At operation 505 each STA addressed by the DL MU PPDU may receive and attempt to decode the DL MU PPDU. In particular, each targeted STA receives the DL MU PPDU and determines resource units or particular portions of the frame assigned to the STA by examining the preamble portion of the DL MU PPDU/frame. Further, the target STAs may examine decoded MPDUs to determine acknowledgement scheme information/properties/characteristics including (1) whether acknowledgement of the DL MU frame is immediate or non-immediate, (2) whether the acknowledgement is multi-user or single user, and/or (3) scheduling information (e.g., a resource unit within a UL transmission) when a multi-user acknowledgement is selected.

[0100] At operation 507, the STAs that successfully received and decoded the appropriate portions of the DL MU PPDU may acknowledge receipt through the generation and the transmission of acknowledgement frames by each respective STA according to the acknowledgement information extracted from the DL frame. Acknowledgment may be performed after a predetermined period has elapsed since receipt of the DL frame (e.g., a short interframe space (SIFS) period or another interframe space (IFS) period). As described above, non-legacy STAs may examine the ACK policy subfield and the MU ACK policy subfield in the corresponding MPDU to determine the acknowledgement scheme the STA should use. For example, as shown in **Figure 5B** and described above, ACK policy and the MU ACK policy subfields for STA1 and STA2 indicate that these devices are to participate in an immediate MU acknowledgement while STA3 is to perform a non-immediate (i.e., triggered by a BAR frame)

SU acknowledgement. On this basis, STA1 and STA2 may participate in the transmission of a MU acknowledgement while STA3 may await a BAR frame before transmitting a SU acknowledgement. The UL MU transmission may be an OFDMA transmission and/or may incorporate MU-MIMO techniques.

[0101] As described above, the method 500 allows non-legacy devices to acknowledge receipt of a DL PPDU in an efficient manner through the use of UL MU techniques while remaining backwards compatible with legacy devices.

[0102] Turning now to **Figure 6A**, a method 600 will be described for coordinating UL MU acknowledgement/response transmissions to a DL MU transmission according to another embodiment. As will be explained in further detail below, the proposed method 600 facilitates UL MU acknowledgement/response transmissions for more advanced STAs (e.g., HE STAs), which support UL MU capabilities (e.g., UL OFDMA or UL MU-MIMO).

[0103] Similar to the method 500, the method 600 may be performed by one or more devices in the network 200. For example, one or more operations or sub-operations of the method 600 may be performed by the device 211, which is operating as an AP in the network 200, and/or the devices 212-215, which are operating as STAs in the network 200.

[0104] Each operation of the method 600 will be described by way of example below in relation to the transmission diagram shown in **Figure 6B**. Although one or more operations or sub-operations are described or shown in a particular sequential order, in other embodiments the operations/sub-operations may be rearranged in a different order, which may include performance of multiple operations in at least partially overlapping time periods.

[0105] The method 600 may commence at operation 601 with the generation of a DL MU frame by an AP. The DL MU frame may be addressed to a set of STAs operating in a network. For example, as shown in **Figure 6B**, the DL MU frame may be addressed to STA1 and STA2. In this example, the AP schedules STA1 and STA2 for a DL OFDMA transmission, wherein STA1 is allocated a lower half of the transmission bandwidth and STA2 is allocated an upper half of the transmission bandwidth. In this example, STA1 and STA2 are HE STAs or other devices that support UL MU transmissions. Although shown as an OFDMA frame/PPDU, the generated DL MU frame may be a MU-MIMO frame/PPDU. The generation of the frame at operation 601 may include the sub-operations described below.

[0106] At sub-operation 601A, the AP may generate a data MPDU for each STA participating in the DL MU transmission. For example, as shown in **Figure 6B**, the DL MU PPDU/frame may include a data MPDU for STA1 and a data MPDU for STA2. The data MPDU may include any type of data (e.g., voice, video, best effort, background, or control data) that is specifically intended for the particular STA and may be placed in resource units within the DL MU frame assigned/allocated to each respective STA. The resource units may be particular spatial streams or sub-channels of a wireless channel upon which the DL MU frame will be transmitted. In one embodiment, the generation of the data MPDU at sub-operation 601A may include setting acknowledgment information in a header of the MPDU (e.g., the MAC header of the data MPDU). The acknowledgment information may describe/indicate properties of an acknowledgement technique/scheme used by the corresponding STA to acknowledge receipt of the MPDU. For example, the acknowledgment information may include an ACK Policy subfield and/or a MU ACK Policy subfield. As noted above in relation to the method 500, the ACK Policy subfield may indicate whether the acknowledgement is immediate or non-immediate (e.g., corresponding to values represented in **Table 1**) and the MU ACK Policy subfield may indicate whether the acknowledgment is MU or SU. In some embodiments, the MU ACK Policy subfield is optional in the data MPDU.

[0107] At sub-operation 601B, the AP may generate an ACK Info MPDU for each STA participating in the DL MU transmission that includes additional acknowledgement information. For example, the DL MU PPDU/frame may include an ACK Info MPDU for STA1 and an ACK Info MPDU for STA2 as both of these stations are participating in the UL MU acknowledgment transmission. The ACK Info MPDU further describes/indicates acknowledgement technique/scheme and other information/properties/characteristics (in addition to the acknowledgment information in the data MPDU) needed for each respective STA to acknowledge successful receipt of the DL MU transmission. For example, each ACK Info MPDU may indicate whether the acknowledgement is (1) immediate or non-immediate, (2) multi-user or single user, and/or (3) scheduling information (e.g., a resource unit within a UL transmission) when a multi-user acknowledgement is selected as shown in **Figure 6B**. For instance, in some embodiments the ACK Info MPDU may only be present when the MU ACK Info subfield of the corresponding data MPDU is set to indicate a MU UL acknowledgment. In another example embodiment, the data MPDU does not include acknowledgment information

and all acknowledgment information is included in the ACK Info MPDU. In still another example embodiment, the data MPDU includes an ACK Policy subfield and this subfield is interpreted by STAs to indicate immediate/non-immediate and MU/SU acknowledgment. In this embodiment, the ACK Info MPDU includes scheduling/trigger information when an MU acknowledgment is scheduled. As legacy STAs cannot participate in UL MU transmissions, legacy STAs will be assigned SU acknowledgements, while non-legacy STAs (i.e., STAs that support UL MU transmissions) can be assigned MU acknowledgements.

[0108] In one embodiment, the scheduling information for the UL MU acknowledgement frame transmission includes common information and a per-STA information. The common information is information that is the same for every STA in the UL MU acknowledgement frame transmission and the per-STA information is specific resource allocation for each STA. Thus, different STAs scheduled in the same DL MU PPDU have different per-STA information while each STA has the same common information.

[0109] In some embodiments, the data MPDU and ACK Info MPDU for each STA may be aggregated into an A-MPDU at operation 601C. Accordingly, the DL MU transmission includes a single A-MPDU for each STA that includes both data and acknowledgement scheduling information. In some embodiments, the ACK Info MPDU is the first MPDU in each A-MPDU while in other embodiments ACK Info MPDU is in another position in each A-MPDU, such as the last MPDU in each A-MPDU.

[0110] Although described and shown as including a single data MPDU, in other embodiments, each A-MPDU may include one or more data MPDUs. Further, in some embodiments, each STA may receive multiple A-MPDUs in a single DL MU frame/PPDU.

[0111] Following generation of the DL MU frame/PPDU at operation 601, the method 600 may move to operation 603. At operation 603, the AP transmits the DL MU frame/PPDU to the addressed/target STAs. For example, as shown in **Figure 6B**, the DL MU PPDU may be sent to the non-legacy STA1 and STA2. As noted above, the DL MU PPDU may utilize OFDMA and/or MIMO MU transmission techniques.

[0112] At operation 605, each STA addressed by the DL MU PPDU may receive and attempt to decode the DL MU PPDU. In particular, each targeted STA receives the DL MU PPDU and checks the preamble portion of the frame. In some embodiments, the preamble portion of the frame indicates the allocated resource for each target receiver in the MU transmission. Each

target STA may thereafter decode the PPDU/resource unit that is allocated to that particular STA, including the data MPDU and the ACK Info MPDU. Based on the ACK Info MPDUs and/or the header of the data MPDUs, each STA can identify the type of acknowledgement transmission that is to be employed (e.g., MU or SU and immediate or non-immediate) and resource assignment when a MU transmission is indicated.

[0113] At operation 607, the STAs that successfully received and decoded the appropriate portions of the DL MU PPDU may acknowledge receipt through the generation and the transmission of acknowledgement frames by each respective STA according to the acknowledgement information extracted from the DL frame. Acknowledgment may be performed after a predetermined period has elapsed since receipt of the DL frame (e.g., a short interframe space (SIFS) period or another interframe space (IFS) period). In one example shown in **Figure 6B**, STA1 and STA2 may participate in an UL MU acknowledgement based on scheduling information included in each respective ACK Info MPDU. As shown, STA1 is allocated the lower half of an UL OFDMA frame while STA2 is allocated the upper half of the UL OFDMA frame to carry an acknowledgement (e.g., a BA/ACK).

[0114] Turning now to **Figure 7A**, a method 700 will be described for coordinating UL MU acknowledgement/response transmissions to a DL MU transmission according to another embodiment. As will be explained in further detail below, the proposed method 700 facilitates UL MU acknowledgement/response transmissions for more advanced STAs (e.g., HE STAs), which support UL MU capabilities (e.g., UL OFDMA or UL MU-MIMO).

[0115] Similar to the methods 500 and 600, the method 700 may be performed by one or more devices in the network 200. For example, one or more operations or sub-operations of the method 700 may be performed by the device 211, which is operating as an AP in the network 200, and/or the devices 212-215, which are operating as STAs in the network 200.

[0116] Each operation of the method 700 will be described by way of example below in relation to the transmission diagram shown in **Figure 7B**. Although one or more operations or sub-operations are described or shown in a particular sequential order, in other embodiments the operations/sub-operations may be rearranged in a different order, which may include performance of multiple operations in at least partially overlapping time periods.

[0117] The method 700 may commence at operation 701 with the generation of a DL MU frame by an AP. The DL MU frame may be addressed to a set of STAs operating in a network.

For example, as shown in **Figure 7B**, the DL MU frame may be addressed to STA1 and STA2. In this example, the AP schedules a DL OFDMA transmission to STA1 and STA2, wherein STA1 is allocated a lower half of the transmission bandwidth and STA2 is allocated an upper half of the transmission bandwidth. In this example, STA1 and STA2 are HE STAs or other devices that support UL MU transmissions. Although shown as an OFDMA frame/PPDU, the generated DL MU frame may be a MU-MIMO frame/PPDU. The generation of the frame at operation 701 may include the sub-operations described below.

[0118] At sub-operation 701A the AP may select/set an acknowledgement scheme for each target STA of the DL MU frame. For instance, in the example shown in **Figure 7B**, an acknowledgement scheme may be selected for both STA1 and STA2 at sub-operation 701A. This information/properties/characteristics may indicate (1) whether the acknowledgement is immediate or non-immediate, (2) whether the acknowledgement is multi-user or single user, and/or (3) scheduling information (e.g., a resource unit within a UL transmission) when a multi-user acknowledgement is selected.

[0119] In one embodiment, the scheduling information for the UL MU acknowledgement frame transmission includes common information and a per-STA information. The common information is information that is the same for every STA in the UL MU acknowledgement frame transmission and the per-STA information is specific resource allocation for each STA. Thus, different STAs scheduled in the same DL MU PPDU have different per-STA information while each STA has the same common information.

[0120] However, in some embodiments, a distinction or division between common and per user information is not made. Since the acknowledgment/scheduling information is included in the header of the corresponding MPDU, it is understood that this information is intended for a specific STA.

[0121] Following selection of an acknowledgement scheme for each target STA, sub-operation 701B may generate one or more MPDUs for each target STA and may place each MPDU in resource units within the DL MU frame assigned/allocated to each respective STA. The resource units may be particular spatial streams or sub-channels of a wireless channel upon which the DL MU frame will be transmitted. For example, as shown in **Figure 7B**, one or more MPDUs may be generated for STA1 and one or more MPDUs may be generated for STA2. At least one MPDU for each target STA may include corresponding (1) information indicating the

acknowledgment scheme selected for each corresponding STA and (2) data (e.g., voice, video, best effort, background, or control data) that is specifically intended for the particular STA. In some embodiments, each MPDU for a particular STA may include the acknowledgment scheme information along with data.

[0122] In one embodiment, information indicating the acknowledgment scheme/information selected for each corresponding STA may be located in a header of each or at least one MPDU (e.g., a MAC header) and data may be located in a payload of the MPDU (e.g., MAC payload).

[0123] Using the above indications, since legacy STAs cannot participate in UL MU acknowledgement transmissions, legacy STAs may be assigned SU acknowledgements while non-legacy STAs may be assigned MU acknowledgements.

[0124] In some embodiments, the MPDUs for each STA may be separately aggregated into one or more A-MPDUs at operation 701C. Accordingly, the DL MU transmission includes one or more A-MPDUs for each STA. In one embodiment, the HT Control field in the MAC header of one or more MPDUs within each AMPDU of the DL MU PPDU for each scheduled STA has a first indication that the scheduling information for a UL MU acknowledgement frame transmission is included in the MPDU. When the first indication is set, the size of the HE variant of the HT Control field is longer than the size of HT Control field when the first indication is not set. In another embodiment, the lengths of the HE variant of the HT Control field and the HT Control field are the same.

[0125] Following generation of the DL MU frame/PPDU at operation 701, the method 700 may move to operation 703. At operation 703 the AP transmits the DL MU frame/PPDU to the addressed/target STAs. For example, as shown in **Figure 7B**, the DL MU PPDU may be transmitted to STA1 and STA2 over a wireless channel. As noted above, the DL MU PPDU may utilize OFDMA and/or MIMO MU transmission techniques.

[0126] At operation 705 each STA addressed by the DL MU PPDU may receive and attempt to decode the DL MU PPDU. In particular, each targeted STA receives the DL MU PPDU and checks the header portion of one or more MPDUs in the one or more A-MPDUs. As noted above, the header portion of the frame may include acknowledgement scheme information/properties/characteristics, including (1) whether the acknowledgement is immediate or non-immediate, (2) whether the acknowledgement is multi-user or single user, and/or (3)

scheduling information (e.g., a resource unit within a UL transmission) when a multi-user acknowledgement is selected.

[0127] At operation 707, the STAs that successfully received and decoded the appropriate portions of the DL MU PPDU may acknowledge receipt through the generation and the transmission of acknowledgement frames by each respective STA according to the acknowledgement information extracted from the DL frame. Acknowledgment may be performed after a predetermined period has elapsed since receipt of the DL frame (e.g., a short interframe space (SIFS) period or another interframe space (IFS) period). In one example shown in **Figure 7B**, STA1 and STA2 may participate in an UL MU acknowledgement based on scheduling information included in headers of respective MPDUs. As shown, STA1 is allocated the lower half of an UL OFDMA frame while STA2 is allocated the upper half of the UL OFDMA frame to carry an acknowledgement (e.g., a BA/ACK).

[0128] Turning now to **Figure 8A**, a method 800 will be described for coordinating UL MU acknowledgement/response transmissions to a DL MU transmission according to another embodiment. Similar to the methods 500, 600, and 700, the method 800 may be performed by one or more devices in the network 200. For example, one or more operations or sub-operations of the method 800 may be performed by the device 211, which is operating as an AP in the network 200, and/or the devices 212-215, which are operating as STAs in the network 200.

[0129] Each operation of the method 800 will be described by way of example below in relation to the transmission diagram shown in **Figure 8B**. Although one or more operations or sub-operations are described or shown in a particular sequential order, in other embodiments the operations/sub-operations may be rearranged in a different order, which may include performance of multiple operations in at least partially overlapping time periods.

[0130] The method 800 may commence at operation 801 with the generation of a DL MU PPDU/frame by an AP. The DL MU frame may be addressed to a set of target STAs operating in a network. For example, as shown in **Figure 8B**, the DL MU frame may be addressed to STA1 and STA2. In this example, the AP schedules a DL OFDMA transmission to STA1 and STA2, wherein STA1 is allocated a lower third of the transmission bandwidth and STA2 is allocated a middle third of the transmission bandwidth. As will be described in greater detail below, the upper third of the transmission bandwidth may be used for a multicast or broadcast transmission to both STA1 and STA2. In the example shown in **Figure 8B**, STA1 and STA2 are

HE STAs or other devices that support UL MU transmissions. Although shown as an OFDMA frame/PPDU, the generated DL MU frame may be a MU-MIMO frame/PPDU. The generation of the frame at operation 801 may include the sub-operations described below.

[0131] At operation 801A, the AP may generate an MPDU that includes an acknowledgement scheme for each target STA of the DL MU frame. For instance, in the example shown in **Figure 8B**, an acknowledgement scheme may be selected for both STA1 and STA2 and included in the MPDU generated at sub-operation 801A. This acknowledgement scheme information/properties/characteristics may indicate (1) whether the acknowledgement is immediate or non-immediate, (2) whether the acknowledgement is multi-user or single user, and/or (3) scheduling information (e.g., a resource unit within a UL transmission) when a multi-user acknowledgement is selected.

[0132] In one embodiment, the scheduling information for the UL MU acknowledgement frame transmission includes common information and a per-STA information. The common information is information that is the same for every STA in the UL MU acknowledgement frame transmission and the per-STA information is specific resource allocation information for each STA. Thus, different STAs scheduled in the same DL MU PPDU have different per-STA information while each STA has the same common information.

[0133] In one embodiment, the MPDU that includes an acknowledgement scheme for each target STA may be broadcast or multicast to target STAs. In one embodiment, the MPDU that includes an acknowledgement scheme for each target STA is multicast/broadcast to at least those STAs that are scheduled for an immediate MU acknowledgement transmission. For example, as shown in **Figure 8B**, acknowledgment information/scheduling MPDU may be transmitted to STA1 and STA 2 in a resource unit of an OFDMA frame (i.e., the upper third of the transmission bandwidth of the DL MU frame). However, in other embodiments, other multicast and broadcast techniques may be employed.

[0134] Although shown and described in relation to the STAs that participated in the DL MU transmission, in other embodiments, the DL MU transmission may request other STAs to participate in the UL MU acknowledgment transmission.

[0135] Following generation of an MPDU that includes an acknowledgement scheme for each target STA, sub-operation 801B may generate one or more data MPDUs for each target STA. For example, as shown in **Figure 8B**, one or more MPDUs may be generated for STA1

and one or more MPDUs may be generated for STA2. The one or more MPDUs for each target STA may include data (e.g., voice, video, best effort, background, or control data) that is specifically intended for the particular STA. In some embodiments, the data MPDUs for each STA may be separately aggregated into one or more A-MPDUs.

[0136] Accordingly, the DL MU transmission includes (1) a single MPDU that includes an acknowledgement scheme for each target STA and (2) one or more MPDUs or A-MPDUs for each STA. The MPDU that includes an acknowledgement scheme for each target STA may be broadcast or multicast to target STAs while the data MPDUs/A-MPDUs are each addressed to a corresponding STA. For example, using the example in **Figure 8B**, the single MPDU that includes an acknowledgement scheme for each target STA is addressed to both STA1 and STA2 in an upper third of the DL MU PPDU, data MPDUs/A-MPDUs addressed to STA2 are located in a middle third of the DL MU PPDU, and data MPDUs/A-MPDUs addressed to STA1 are located in a lower third of the DL MU PPDU.

[0137] Using the above indications, since legacy STAs cannot participate in UL MU acknowledgement transmissions, legacy STAs may be assigned a SU acknowledgement while non-legacy STAs may be assigned a MU acknowledgement. In some embodiments, the data MPDUs may include an ACK Policy subfield that is set according to **Table 1** and is consistent with the acknowledgment information in the broadcast/multicast frame in the DL MU PPDU.

[0138] Following generation of the DL MU frame/PPDU at operation 801, the method 800 may move to operation 803. At operation 803 the AP transmits the DL MU frame/PPDU to the addressed/target STAs. For example, as shown in **Figure 8B**, the DL MU PPDU may be transmitted to STA1 and STA2 over a wireless channel. As noted above, the DL MU PPDU may utilize OFDMA and/or MIMO MU transmission techniques.

[0139] At operation 805 each STA addressed by the DL MU PPDU may receive and attempt to decode the DL MU PPDU. In particular, each targeted STA receives the DL MU PPDU and determines resource units or particular portions of the frame assigned to the STA by examining the preamble portion of the DL MU PPDU/frame. In the example shown in **Figure 8B**, STA1 would determine that the lower third of the DL MU transmission bandwidth is a transmission intended for STA1 and the upper third of the DL MU transmission bandwidth is a multicast/broadcast transmission intended for STA1 and STA2. Specifically, as noted above, the upper third of the transmission bandwidth includes acknowledgement scheme information for

STA1 and STA2, including (1) whether acknowledgement of the DL MU frame is immediate or non-immediate, (2) whether the acknowledgement is multi-user or single user, and/or (3) scheduling information (e.g., a resource unit within a UL transmission) when a multi-user acknowledgement is selected. In contrast, the unicast transmission directed to STA1 is data specifically intended for this device. In some embodiments, the broadcast/multicast frame may include scheduling/trigger information for coordinating the UL MU acknowledgment transmission while one or more data MPDUs addressed to each STA may include indications of whether the acknowledgment transmission is immediate/non-immediate and/or MU/SU.

[0140] At operation 807, the STAs that successfully received and decoded the appropriate portions of the DL MU PPDU may acknowledge receipt through the generation and the transmission of acknowledgement frames by each respective STA according to the acknowledgement information extracted from the DL frame. Acknowledgment may be performed after a predetermined period has elapsed since receipt of the DL frame (e.g., a short interframe space (SIFS) period or another interframe space (IFS) period). In one example shown in **Figure 8B**, STA1 and STA2 may participate in an UL MU acknowledgement based on scheduling information included in a multicast/broadcast MPDU. As shown, STA1 is allocated the lower half of an UL OFDMA frame while STA2 is allocated the upper half of the UL OFDMA frame to carry an acknowledgement (e.g., a BA/ACK).

[0141] As described in methods 500, 600, 700, and 800, each target STA of a DL MU transmission may transmit an acknowledgement according to one or more schemes/techniques. In some embodiments, the acknowledgement schemes/techniques may involve a delayed acknowledgement. In these situations, the AP may transmit a trigger frame to trigger the STAs participating in the delayed acknowledgement to transmit a respective portion of the acknowledgement frame. For example, **Figure 9** show one example of this procedure.

[0142] As shown in **Figure 9**, an access point transmits a DL MU frame to a set of target STAs (e.g., STA1, STA2, STA3, and STA4). The DL MU frame may indicate that a non-immediate acknowledgement is to be transmitted by one or more of the target STAs. As shown in **Figure 9**, the ACK policy subfield for each target STA is set to “11”, which indicates that each STA is to participate in a non-immediate (i.e., block) acknowledgement.

[0143] The participating STAs may wait for a BAR or a MU BAR frame (hereinafter to be described in relation to MU BAR for simplicity). The MU BAR frame may be a trigger frame

that includes trigger information and per-STA BAR control and bitmap information. Upon receipt of the MU BAR, each STA retrieves corresponding scheduling information from the MU BAR frame. The BAR frame may be implemented using various schemes and techniques. For example, a single MU BAR frame may be constructed and transmitted by the AP, wherein the MU BAR frame comprises BAR information for each scheduled STA and UL BA transmission scheduling information for each scheduled STA. In another example embodiment, an AP sends an A-MPDU to each scheduled STA in the DL MU transmission and the A-MPDU comprises BAR information and UL BA transmission scheduling information. In another embodiment, an AP sends the following frames in a DL MU transmission: 1) one BAR frame to each STA and 2) one broadcast/multicast frame for UL MU BA transmission. Based on the scheduling information, each STA participates in the MU acknowledgement a predetermined period following receipt of the MU BAR (e.g., a SIFS period).

[0144] In some embodiments, either a SU or MU immediate acknowledgement may be scheduled by the DL MU frame and may be transmitted prior to the MU BAR and consequential MU delayed acknowledgement. In some embodiments, multiple delayed SU or MU acknowledgements may be triggered for one DL MU frame and different sets of STAs. For example, a DL MU frame may be addressed to a first set of STAs and a second set of STAs. The AP may transmit a first BAR to trigger an acknowledgment transmission from the first set of STAs and a second BAR to trigger an acknowledgement transmission from the second set of STAs.

[0145] Although the methods and techniques above are described and shown separately, in one or more embodiments, these methods and techniques may be combined. For example, in some embodiments, acknowledgment information for a first STA may be located in the header of a data MPDU while acknowledgment information for a second STA may be located in a separate MPDU. In this example, the acknowledgment information may facilitate/trigger both the first and second STA to participate in the same UL MU transmission or in separate UL SU/MU transmissions.

[0146] Although the methods and techniques above have been described in relation to pure acknowledgment transmissions, in some embodiments the UL MU acknowledgment transmission may allow data transmission from some STAs. For example, a first set of STAs may transmit a set of acknowledgements while a second set of STAs may transmit data (e.g.,

video, voice, etc.) in designated resource units of the same UL MU transmission. In another example, a STA (either participating in a SU or MU transmission) may transmit both an acknowledgement and data in the same PPDU.

[0147] As noted above, acknowledgements may be transmitted using several MU multiplexing techniques, including OFDMA and MU-MIMO. However, multiplexing acknowledgement frames together in an OFDMA manner may have several technical issues that need to be resolved. One of the issues is that multiplexed acknowledgement frames cannot use a non-HT frame format because non-HT frame formats do not support MU transmissions, such as MU-MIMO and OFDMA. Therefore, in some embodiments, multiplexed acknowledgement frames shall use the HE frame format as defined in 802.11ax and shown in **Figure 4C**.

[0148] **Figure 10** shows another example of an HE frame format. In **Figures 4C** and **10**, the legacy preamble may include fields that are needed to support backward compatibility with previous frame formats. These legacy fields may include a legacy-short training field (L-STF), a legacy-long training field (L-LTF), and a legacy-signaling field (L-SIG). A High Efficiency signaling field (HE-SIG) includes information required to interpret a HE PPDU. HE-SIG fields may include at least an HE-SIG-A field and optionally a HE-SIG-B field. The size of the HE-SIG-A field is fixed and the HE-SIG-A field indicates common control information for the frame. The HE-SIG-B field comprises per-STA specific information. After the HE-SIG fields, the HE-STF/LTF fields follow, wherein the HE-STF/LTF fields are needed for automatic gain control (AGC) settings, frequency offset compensation, channel estimation, etc. Further, the HE-LTF section may start at the same time and end at the same time across all users/STAs in case of MU transmission.

[0149] In case of a UL MU transmission, an UL MU PPDU (e.g., MU-MIMO and/or OFDMA frame) is sent as an immediate response to a trigger frame sent by an AP (as shown in **Figure 9**). In this case, the legacy preamble part of the UL MU PPDU is combined together in the air based on transmissions from all the participating STAs. Accordingly, all participating STAs need to have the same information/data in the legacy preamble to ensure proper combination in the air. In some embodiments, the trigger frame may indicate to each STA what information is needed in the legacy preamble portion of the frame such that each STA transmits identical information for the legacy preamble portion of the UL MU PPDU.

[0150] Similarly, the HE-SIG fields must use identical information to ensure proper in air combination. Accordingly, per-STA information in the HE-SIG fields can be removed as the target receiver of the UL MU PPDU already knows this information. Further, the HE-SIG-B field of the HE UL MU PPDU can be entirely omitted. Since no HE-SIG-B field exists in the UL MU PPDU, there will not be an explicit indication of per-STA information such as bandwidth, modulation and coding scheme (MCS), and number of space-time streams (NSTS) in the legacy preamble and HE-SIG fields of the UL MU PPDU.

[0151] In some UL MU transmissions that are sent as immediate responses to a DL trigger frame, because the trigger frame includes per-STA information such as MCS/NSTS/duration information for every STA, it is possible for each participating STA to identify how many LTFs to be used for the UL MU PPDU. In these cases, the number of HE-LTF symbols of a UL MU PPDU is equal to or greater than the required HE-LTF symbols for all participating STAs' transmissions. **Figure 11** illustrates one example on the number of required HE-LTF symbols. In this example, STA1 and STA2 are allocated for a MU transmission, wherein STA1 occupies the upper half of the channel bandwidth and STA2 occupies the lower half of the channel bandwidth. Further, the NSTS (e.g., the number of spatial streams) for STA1 is one and the NSTS for STA2 is four. In this case, to align the start and end point of the HE-LTF fields for both STAs, the number of HE-LTF symbols is set to four, which is the maximum required NSTS for STA1 and STA2.

[0152] However, in the case an acknowledgement frame is sent in a UL MU manner in response to DL MU transmission and there is no trigger information and/or no trigger frame (i.e., a frame separate and distinct from the DL MU transmission and that is sent to multiple STAs in the DL MU transmission in a broadcast/multicast manner to cause these STAs to participate in a UL MU acknowledgement), it is hard for each STA to figure out the other STA's transmission information. Therefore, it is hard for each STA to identify the NSTS of the acknowledgement frame as each STA's transmission information is not shared. As described above, this information is necessary such that each STA may transmit an appropriate number of HE-LTF sequences to accommodate the largest NSTS of other STAs.

[0153] To overcome this problem with acknowledgement frame transmissions that are in response to a DL MU frame transmission, mechanisms are proposed that select an MCS and a number of spatial streams (or space-time streams) for transmitting response frames.

[0154] In one embodiment, if a control response frame is to be transmitted in an UL MU PPDU, the number of spatial streams (or space-time streams) per STA shall be limited to one. Therefore, every STA participating a UL MU transmission in response to a DL MU transmission will send an ACK/BA frame having the same number of HE-LTF symbols regardless of other participating STAs' channel conditions. Since each STA transmits the same number of HE-LTF symbols (e.g., one), the HE-LTF section of the ACK/BA frame can start and end at the same time for all transmission without knowing the transmission conditions for other STAs.

[0155] In some embodiments, a UL MU transmission may include both acknowledgment frames from a first set of STAs and data frames from a second set of STAs. In this case, the first set of STAs would transmit using a single spatial stream.

[0156] This above concept may be achieved in multiple ways. Some of the possible implementations are described herein; however, embodiments mentioned herein do not limit the applicability of the above concept.

[0157] In one embodiment, if a control response frame is to be transmitted in a UL MU manner, all participating STAs transmit the control response frame at a predetermined time after receiving an eliciting frame (e.g., a SIFS period or another IFS period). Further, the transmission sets the number of HE-LTF symbols to a value corresponding to a single space-time stream. The HE-LTF symbols provide a means for the receiver to estimate the MIMO channel between the set of constellation mapper outputs and the receive chain. **Figure 12** shows an example of this embodiment. In this example, an AP transmits data frames to STA1 and STA2 in a DL OFDMA manner, wherein STA1's data is assigned to the upper half of the channel bandwidth and STA2's data is assigned to the lower half of the channel bandwidth. Due to different channel conditions, the AP uses a single stream transmission to STA1 and two stream transmissions (spatial multiplexing) to STA2. To align the transmission time, the AP uses HE-LTF symbols corresponding to a two stream transmission (i.e., the number of HE-LTF symbols is two) for both STA1 and STA2.

[0158] After successfully decoding the DL OFDMA frame, STA1 and STA2 send back acknowledgement (ACK or BA) frames in an OFDMA manner a predetermined time (e.g., SIFS) after receiving the DL OFDMA frame. When STA1 and STA2 construct the acknowledgement frame in an OFDMA manner, the number of HE-LTF symbols is set to a value corresponding to a single space-time stream (i.e., the number of HE-LTF symbols is equal to one). Although a

single space-time stream is used herein, in other embodiments, other numbers of space-time streams may be used (e.g., two space-time streams may be used, which would correspond to two HE-LTF symbols in the UL MU frame)

[0159] In some embodiments, Space-Time-Block-Coding (STBC) shall be disabled for the acknowledgement frame transmission. For example, STBC may be disabled when the number of space-time streams is equal to one.

[0160] In one embodiment in which the number of HE-LTF symbols in a UL MU transmission is set to a value, a first value is indicated by the transmitter of the eliciting frame as the length of the control response frame and the MCS of the control response frame is set such that the length of the control response frame is not greater than the first value.

[0161] For example, the first value may be included in the eliciting frame. In another example the first value is indicated before sending the eliciting frame (e.g., the first value is included in a first management frame (e.g., a beacon frame, a Probe Response frame, or an Association response frame) sent by the transmitter of the eliciting frame).

[0162] In one embodiment, if a control response frame is to be transmitted in a UL MU manner, an MCS shall be selected from a first set, wherein the MCS defines modulation/coding schemes and the number of space-time streams, wherein the number of space-time streams of the first set is limited to one. In one embodiment, all <VHT-MCS, NSS> tuples defined in the IEEE 802.11ac standard are further eliminated from the first set. In one embodiment, all MCSs that have a data rate greater than the data rate of the eliciting PPDU are further eliminated from the first set. In one embodiment, a transmitter of an eliciting frame for the control response frame further informs information related to the length of the control response frame. All MCSs that result in the encoded control response frame having a length that exceeds the informed length are further eliminated from the first set. In one embodiment, all MCSs that do not meet certain criteria are further eliminated from the first set and if the first set is empty, the MCS shall be selected from a second set.

[0163] In another embodiment, if a control response frame is to be transmitted in a UL MU manner, all participating STAs transmit the control response frame in a predetermined time (e.g., SIFS) after receiving an eliciting frame. In this embodiment, the eliciting frame may indicate that the number of HE-LTF symbols for the control response frame is a second value. In some embodiments, the second value is indicated by the transmitter of the eliciting frame and the HE-

LTF symbols provide a means for the receiver to estimate the MIMO channel between the set of constellation mapper outputs and the receive chain. In one embodiment, a first value is indicated by the transmitter of the eliciting frame as the length of the control response frame. The MCS of the control response frame is set such that the length of the control response frame is not greater than the first value. In one embodiment, the first value and/or the second value are included in the eliciting frame. In another embodiment, the first value and/or the second value are indicated before sending the eliciting frame. For example, the first value is included in a first management frame (e.g., a Beacon Frame, a Probe Response frame, or Association Response frame) sent by the transmitter of the eliciting frame.

[0164] In another embodiment, if a control response frame is to be transmitted in a UL MU manner, an MCS shall be selected from a first set, wherein the MCS defines modulation/coding schemes and the number of space-time streams. In this embodiment, the number of space-time streams of the first set is limited to a second value. In one embodiment, information on the second value is included in the eliciting frame. In another embodiment, the second value is indicated before sending the eliciting frame. For example, the second value is included in a first management frame (e.g., a Beacon Frame, a Probe Response frame, or an Association Response frame) sent by the transmitter of the eliciting frame. In one embodiment, all <VHT-MCS, NSS> tuples defined in the IEEE 802.11ac standard are further eliminated from the first set. In one embodiment, all MCSs that have a data rate greater than the data rate of the eliciting PPDU are further eliminated from the first set. In one embodiment, a transmitter of an eliciting frame for the control response frame further informs information related to the length of the control response frame, and all MCSs that the length of the encoded control response frame exceeds the informed length of the control response frame are further eliminated from the first set. In one embodiment, upon determining that the highest number of spatial streams (or space-time streams) value of the MCS in the first set is less than or equal to a third number of spatial streams (or space-time streams) value of the received frame, eliminating all MCSs from the first set that have the number of spatial streams (or space-time streams) value that is not equal to the third number of streams. In one embodiment, all MCSs that do not meet certain criteria are further eliminated from the first set and if the first set is empty, the MCS shall be selected from a second set.

[0165] As described above, an apparatus or a station comprising means (e.g., 310) may be adapted for performing one or more methods or operations described herein. Further, these apparatuses or stations may include a computer-readable storage medium (e.g., 340, one or more internal, external or remote memories, or one or more registers) comprising instructions stored therein, the instructions comprising code for performing one or more methods or operations described herein.

[0166] In one aspect, a method may be an operation, an instruction, or a function and vice versa. In one aspect, a clause may be amended to include some or all of the words (e.g., instructions, operations, functions, or components) recited in other one or more clauses, one or more sentences, one or more phrases, one or more paragraphs, and/or one or more claims.

[0167] To illustrate the interchangeability of hardware and software, items such as the various illustrative blocks, modules, components, methods, operations, instructions, and algorithms have been described generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application.

[0168] A reference to an element in the singular is not intended to mean one and only one unless specifically so stated, but rather one or more. For example, “a” module may refer to one or more modules. An element preceded by “a,” “an,” “the,” or “said” does not, without further constraints, preclude the existence of additional same elements.

[0169] Headings and subheadings, if any, are used for convenience only and do not limit the invention. The word exemplary is used to mean serving as an example or illustration. To the extent that the term include, have, or the like is used, such term is intended to be inclusive in a manner similar to the term comprise as comprise is interpreted when employed as a transitional word in a claim. Relational terms such as first and second and the like may be used to distinguish one entity or action from another without necessarily requiring or implying any actual such relationship or order between such entities or actions.

[0170] Phrases such as an aspect, the aspect, another aspect, some aspects, one or more aspects, an implementation, the implementation, another implementation, some implementations, one or more implementations, an embodiment, the embodiment, another embodiment, some embodiments, one or more embodiments, a configuration, the configuration, another

configuration, some configurations, one or more configurations, the subject technology, the disclosure, the present disclosure, other variations thereof and alike are for convenience and do not imply that a disclosure relating to such phrase(s) is essential to the subject technology or that such disclosure applies to all configurations of the subject technology. A disclosure relating to such phrase(s) may apply to all configurations, or one or more configurations. A disclosure relating to such phrase(s) may provide one or more examples. A phrase such as an aspect or some aspects may refer to one or more aspects and vice versa, and this applies similarly to other foregoing phrases.

[0171] A phrase “at least one of” preceding a series of items, with the terms “and” or “or” to separate any of the items, modifies the list as a whole, rather than each member of the list. The phrase “at least one of” does not require selection of at least one item; rather, the phrase allows a meaning that includes at least one of any one of the items, and/or at least one of any combination of the items, and/or at least one of each of the items. By way of example, each of the phrases “at least one of A, B, and C” or “at least one of A, B, or C” refers to only A, only B, or only C; any combination of A, B, and C; and/or at least one of each of A, B, and C.

[0172] It is understood that the specific order or hierarchy of steps, operations, or processes disclosed is an illustration of exemplary approaches. Unless explicitly stated otherwise, it is understood that the specific order or hierarchy of steps, operations, or processes may be performed in different order. Some of the steps, operations, or processes may be performed simultaneously. The accompanying method claims, if any, present elements of the various steps, operations or processes in a sample order, and are not meant to be limited to the specific order or hierarchy presented. These may be performed in serial, linearly, in parallel or in different order. It should be understood that the described instructions, operations, and systems can generally be integrated together in a single software/hardware product or packaged into multiple software/hardware products.

[0173] The disclosure is provided to enable any person skilled in the art to practice the various aspects described herein. In some instances, well-known structures and components are shown in block diagram form in order to avoid obscuring the concepts of the subject technology. The disclosure provides various examples of the subject technology, and the subject technology is not limited to these examples. Various modifications to these aspects will be readily apparent to those skilled in the art, and the principles described herein may be applied to other aspects.

[0174] All structural and functional equivalents to the elements of the various aspects described throughout the disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed under the provisions of 35 U.S.C. §112, sixth paragraph, unless the element is expressly recited using a phrase means for or, in the case of a method claim, the element is recited using the phrase step for.

[0175] The title, background, brief description of the drawings, abstract, and drawings are hereby incorporated into the disclosure and are provided as illustrative examples of the disclosure, not as restrictive descriptions. It is submitted with the understanding that they will not be used to limit the scope or meaning of the claims. In addition, in the detailed description, it can be seen that the description provides illustrative examples and the various features are grouped together in various implementations for the purpose of streamlining the disclosure. The method of disclosure is not to be interpreted as reflecting an intention that the claimed subject matter requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed configuration or operation. The following claims are hereby incorporated into the detailed description, with each claim standing on its own as a separately claimed subject matter.

[0176] The claims are not intended to be limited to the aspects described herein, but are to be accorded the full scope consistent with the language claims and to encompass all legal equivalents. Notwithstanding, none of the claims are intended to embrace subject matter that fails to satisfy the requirements of the applicable patent law, nor should they be interpreted in such a way.

CLAIMS

WHAT IS CLAIMED IS:

1. A method, implemented by a network device in a wireless network, for coordinating an uplink multi-user response transmission to a downlink multi-user transmission, the method comprising:

generating, by the network device, a downlink multi-user frame addressed to a plurality of stations operating in the wireless network, the downlink multi-user frame including a plurality of resource units that are each assigned to a station in the plurality of stations, wherein generating the downlink multi-user frame comprises:

including a set of MAC Protocol Data Units (MPDUs) in each resource unit of the plurality of resource units,

wherein one or more MPDUs in each of the resource units in the downlink multi-user frame includes acknowledgement information for indicating properties of a multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame; and

transmitting the downlink multi-user frame to the plurality of stations over a wireless channel.

2. The method of claim 1, wherein generating the downlink multi-user frame further comprises:

including the acknowledgement information, for indicating properties of the multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame, in a header of the one or more MPDUs.

3. The method of claim 2, wherein the header is a MAC header of the one or more MPDUs.

4. The method of claim 1, wherein one of the one or more MPDUs in each of the resource units in the downlink multi-user frame is a unicast trigger frame that contains the acknowledgement information for the respective station in the plurality of stations.

5. The method of claim 4, wherein the trigger frame instigates each respective station in the plurality of stations to transmit the multi-user acknowledgement transmission after an interframe spacing period following receipt of the downlink multi-user frame.
6. The method of claim 1, further comprising:
 - generating, by the network device, a multi-user block acknowledgement request frame to solicit acknowledgements from two or more stations of the plurality of stations; and
 - transmitting the multi-user block acknowledgment request frame following transmission of the downlink multi-user frame.
7. The method of claim 1, wherein the acknowledgement information includes one or more of: (1) whether the acknowledgement transmission is multi-user or single user, (2) whether the acknowledgment transmission is immediate or non-immediate, and (3) resource scheduling information for the multi-user acknowledgement transmission.
8. A method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment, the method comprising:
 - receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, and received from an access point in the wireless network;
 - processing a first MAC Protocol Data Units (MPDU) in the downlink multi-user frame to determine acknowledgement information for indicating properties of a first multi-user acknowledgement frame to acknowledge the downlink multi-user frame by two or more stations;
 - generating the first multi-user acknowledgment frame based on the acknowledgement information; and
 - transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information.
9. The method of claim 8, wherein the first MPDU is located in a first resource unit of the downlink multi-user frame allocated to the first station, wherein the downlink multi-user frame

includes a second resource unit that contains a second MPDU with acknowledgement information for a second station to transmit a second multi-user acknowledgement frame.

10. The method of claim 9, wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement frame together form a multi-user acknowledgement frame for acknowledging the downlink multi-user frame.

11. The method of claim 8, wherein processing the first MPDU comprises:
extracting the acknowledgement information, for indicating properties of the first multi-user acknowledgement frame, in a header of the first MPDU.

12. The method of claim 11, wherein the header is a MAC header of the first MPDU.

13. The method of claim 8, wherein processing the MPDU comprises:
extracting the acknowledgement information, for indicating properties of the first multi-user acknowledgement frame transmission, from a payload of the first MPDU, wherein the first MPDU is a unicast trigger frame.

14. The method of claim 13, further comprising:
processing a second MPDU in a same resource unit as the first MPDU, wherein the second MPDU includes data intended for the first station.

15. The method of claim 13, wherein the trigger frame instigates the first station to transmit the first multi-user acknowledgement after an interframe spacing period following receipt of the downlink multi-user frame.

16. The method of claim 8, further comprising:
receiving a multi-user block acknowledgement request frame that solicits acknowledgements from two or more stations, wherein the first multi-user acknowledgement frame is transmitted after receipt of and in response to the multi-user block acknowledgement request frame.

17. The method of claim 8, wherein the acknowledgement information includes one or more of: (1) whether the first multi-user acknowledgement frame is part of multi-user or single user transmission, (2) whether the first multi-user acknowledgement frame is transmitted immediately following receipt of the downlink multi-user frame or upon receipt of a multi-user block acknowledgement request frame, and (3) resource scheduling information for an uplink multi-user acknowledgement transmission.

18. A method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment, the method comprising:

receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, wherein the downlink multi-user frame is received from an access point in the wireless network;

receiving a multi-user block acknowledgement request frame that solicits acknowledgements from two or more stations, wherein the multi-user block acknowledgement request frame includes acknowledgement information for indicating properties of a first multi-user acknowledgement frame that acknowledges receipt of the downlink multi-user frame by the first station;

generating the first multi-user acknowledgment frame based on the acknowledgement information; and

transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information.

19. The method of claim 18, wherein the acknowledgement information includes one or more of: (1) whether the first multi-user acknowledgement frame is part of a multi-user or single user transmission and (2) resource scheduling information for the first multi-user acknowledgement transmission.

20. The method of claim 18, wherein the acknowledgment scheduling information includes properties of a second multi-user acknowledgement frame generated and transmitted by a second

station, wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement together form a multi-user transmission.

ABSTRACT

Methods and devices are described that facilitate uplink multi-user acknowledgment transmissions. In particular, acknowledgment information may be located in a media access control (MAC) header of a payload section of a MAC Protocol Data Unit within a downlink multi-user frame. The acknowledgment information may be present in each resource unit of the downlink multi-user frame to indicate to each corresponding station properties/characteristics of a subsequent acknowledgment transmission. The properties may include one or more of (1) whether the acknowledgement transmission is multi-user or single user, (2) whether the acknowledgement transmission is transmitted immediately following receipt of the downlink multi-user frame or upon receipt of a multi-user block acknowledgement request frame, and (3) resource scheduling information for an uplink multi-user acknowledgement transmission.

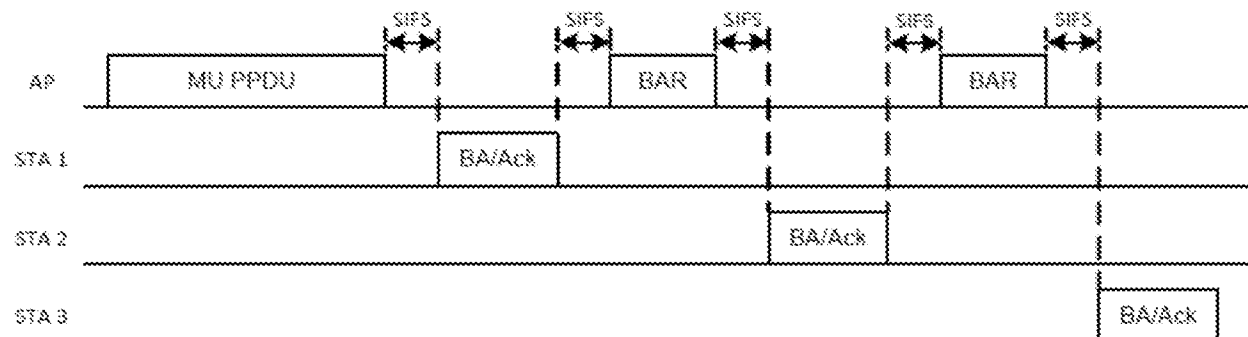


FIG. 1A

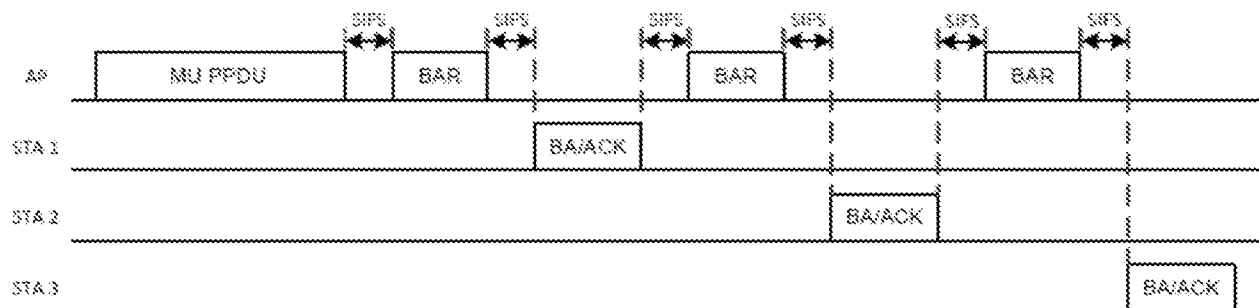


FIG. 1B

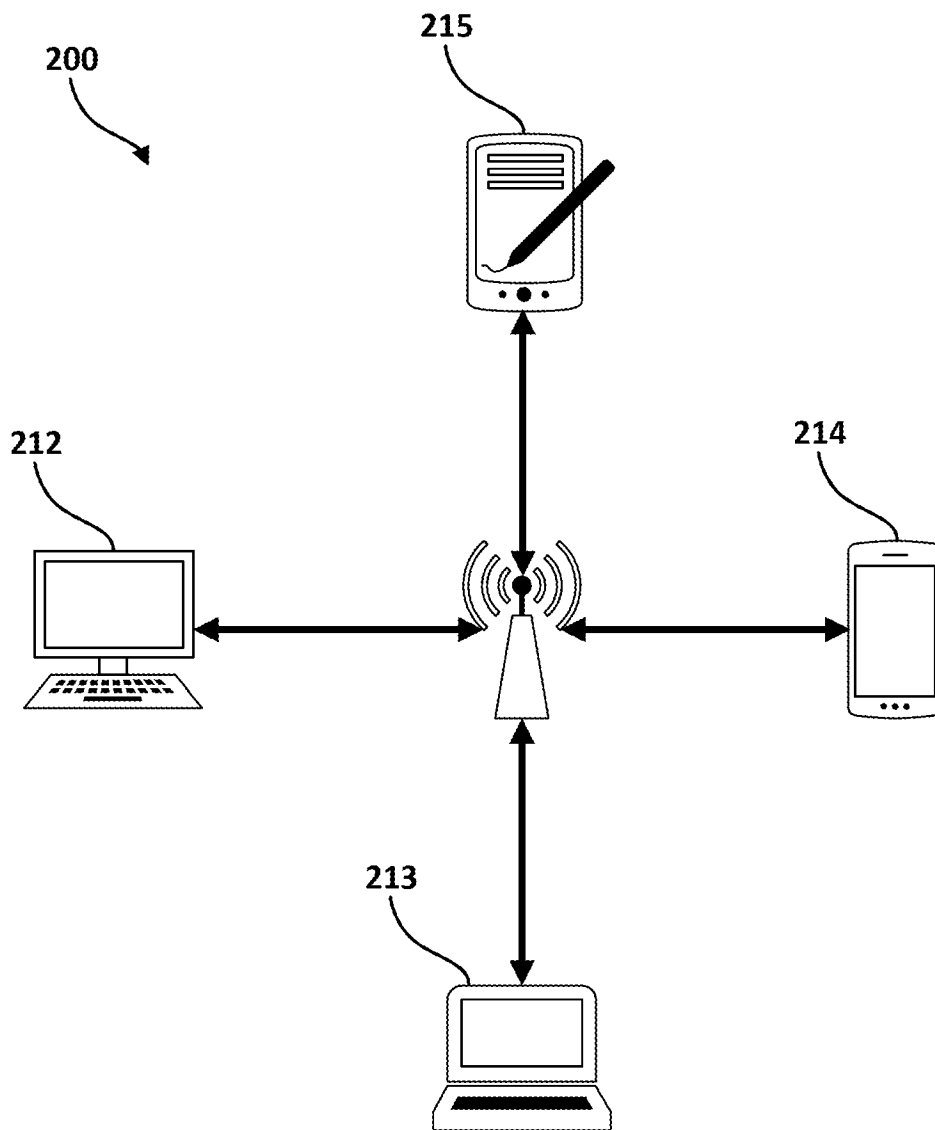


FIG. 2

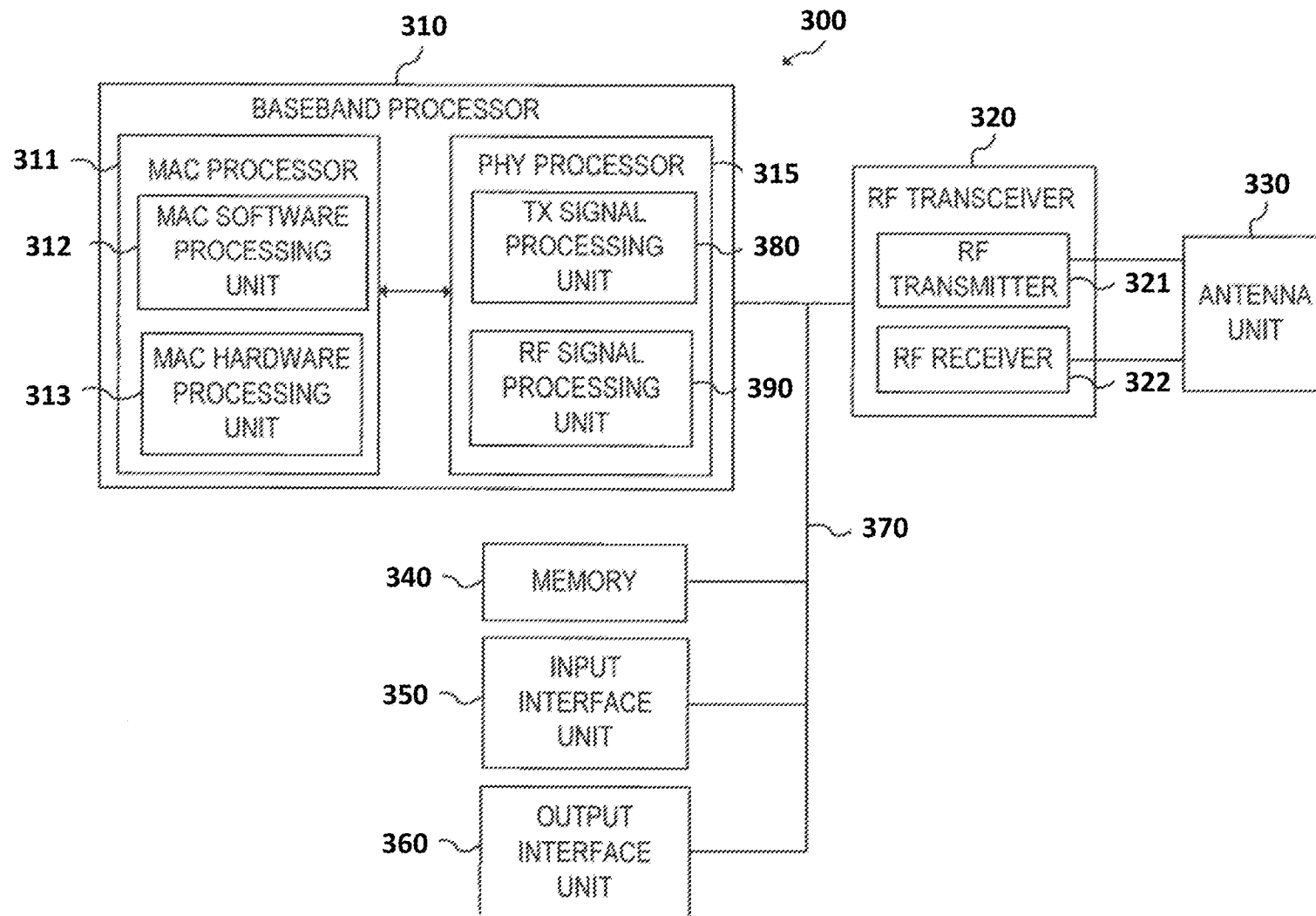


FIG. 3

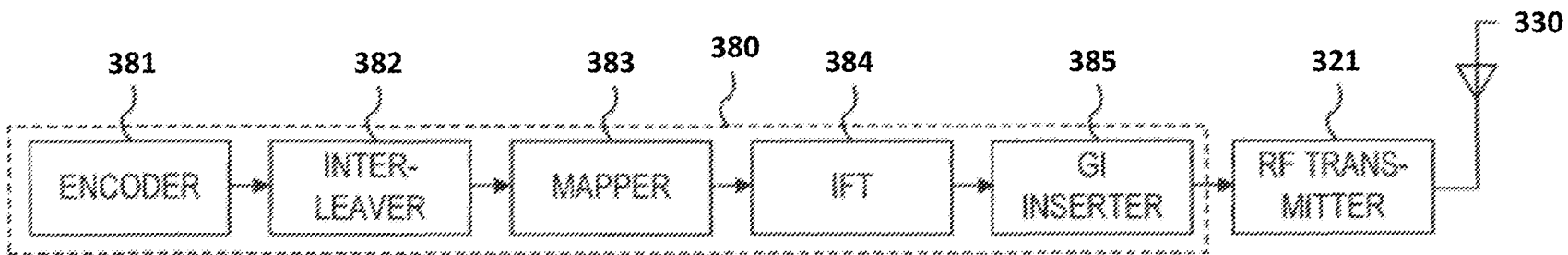


FIG. 4A

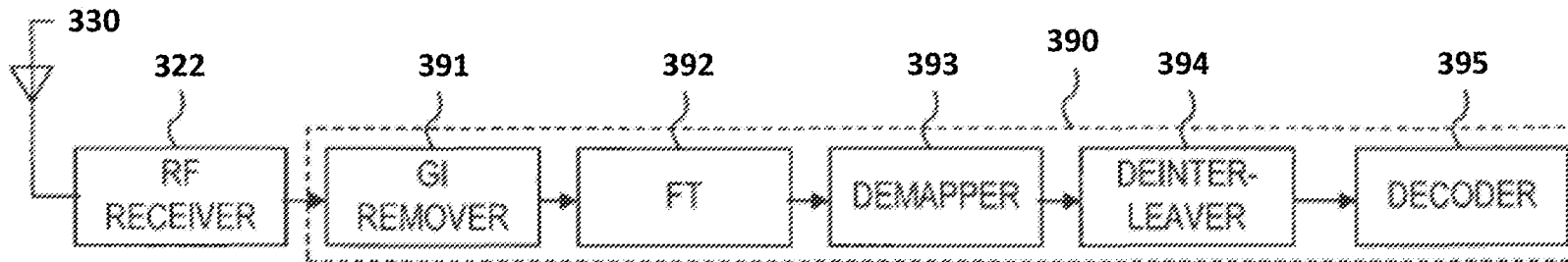


FIG. 4B

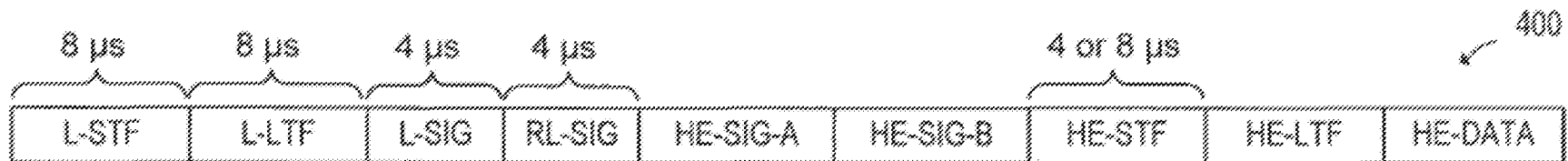


FIG. 4C

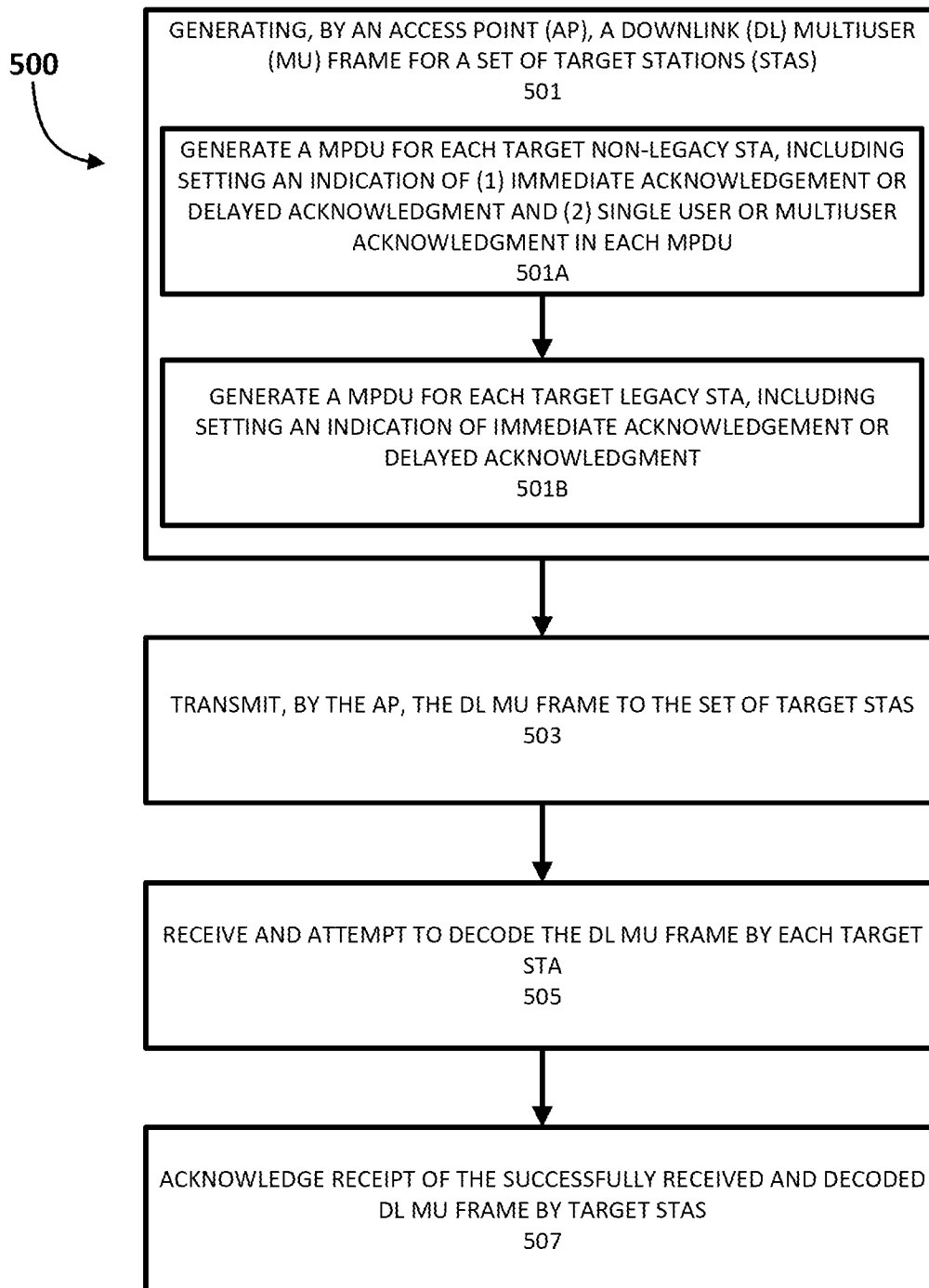


FIG. 5A

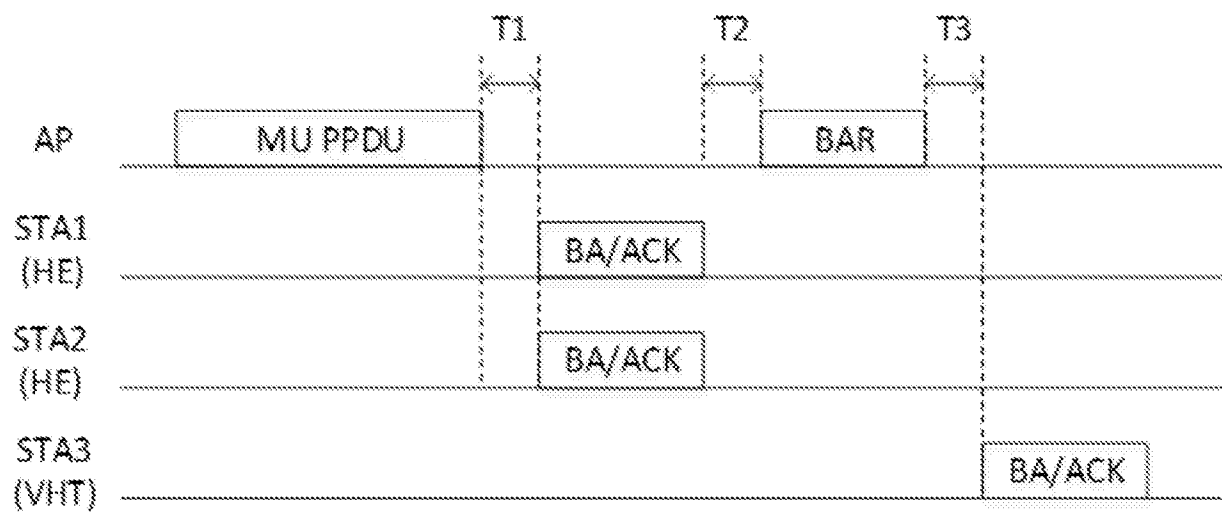


FIG. 5B

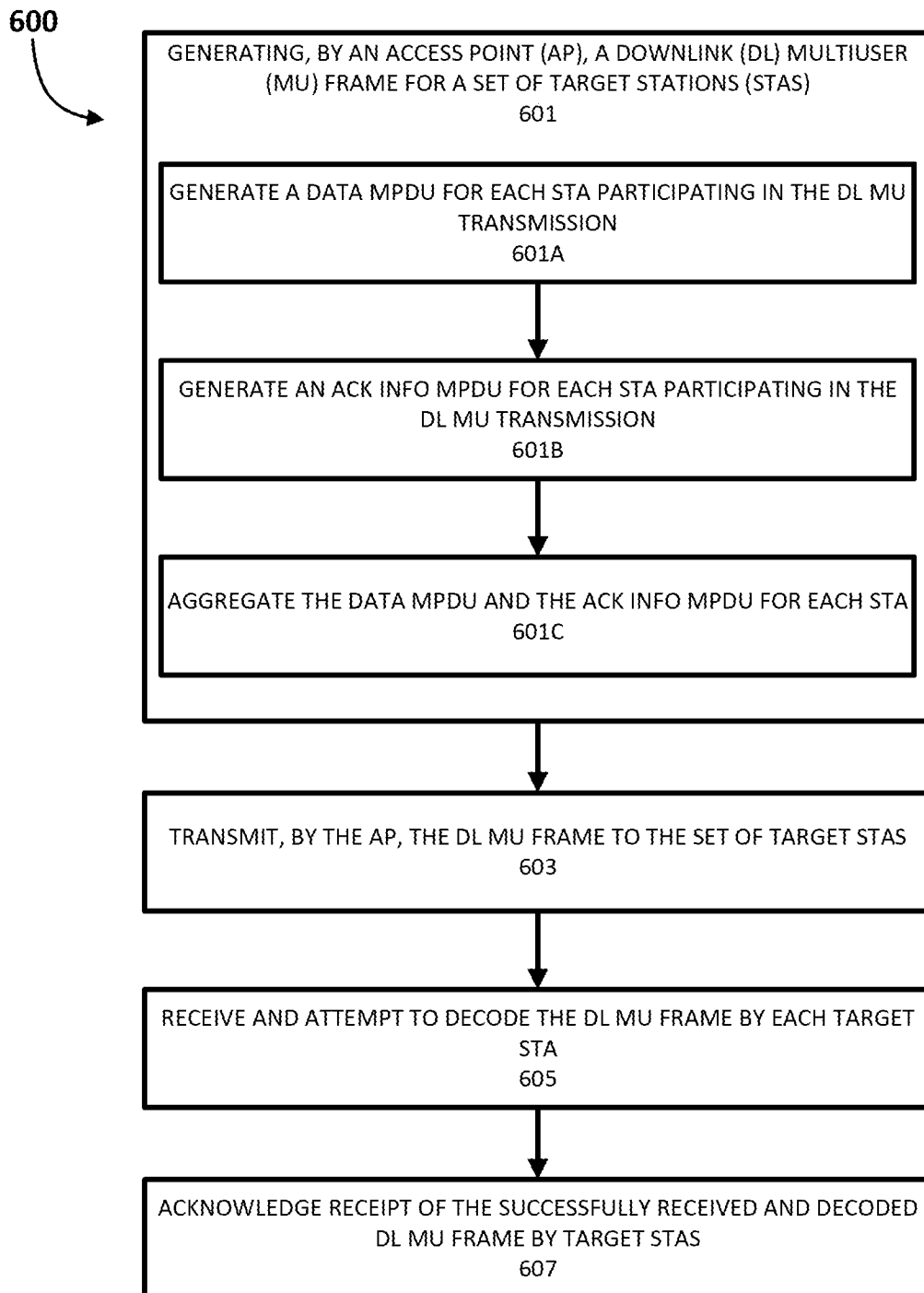


FIG. 6A

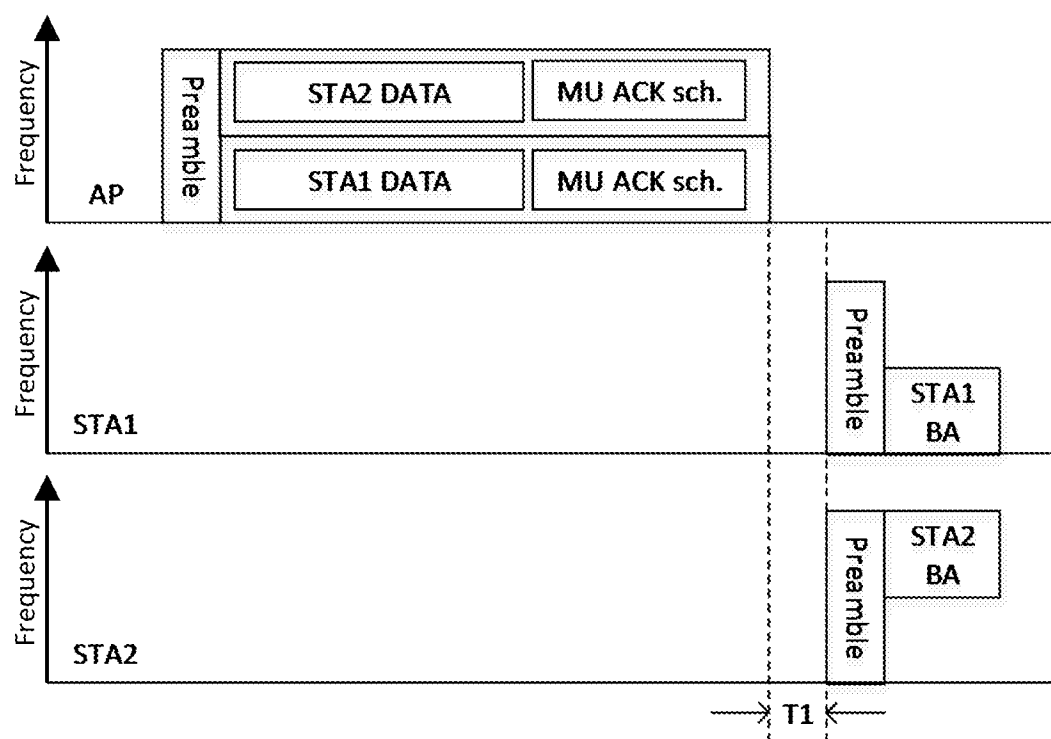


FIG. 6B

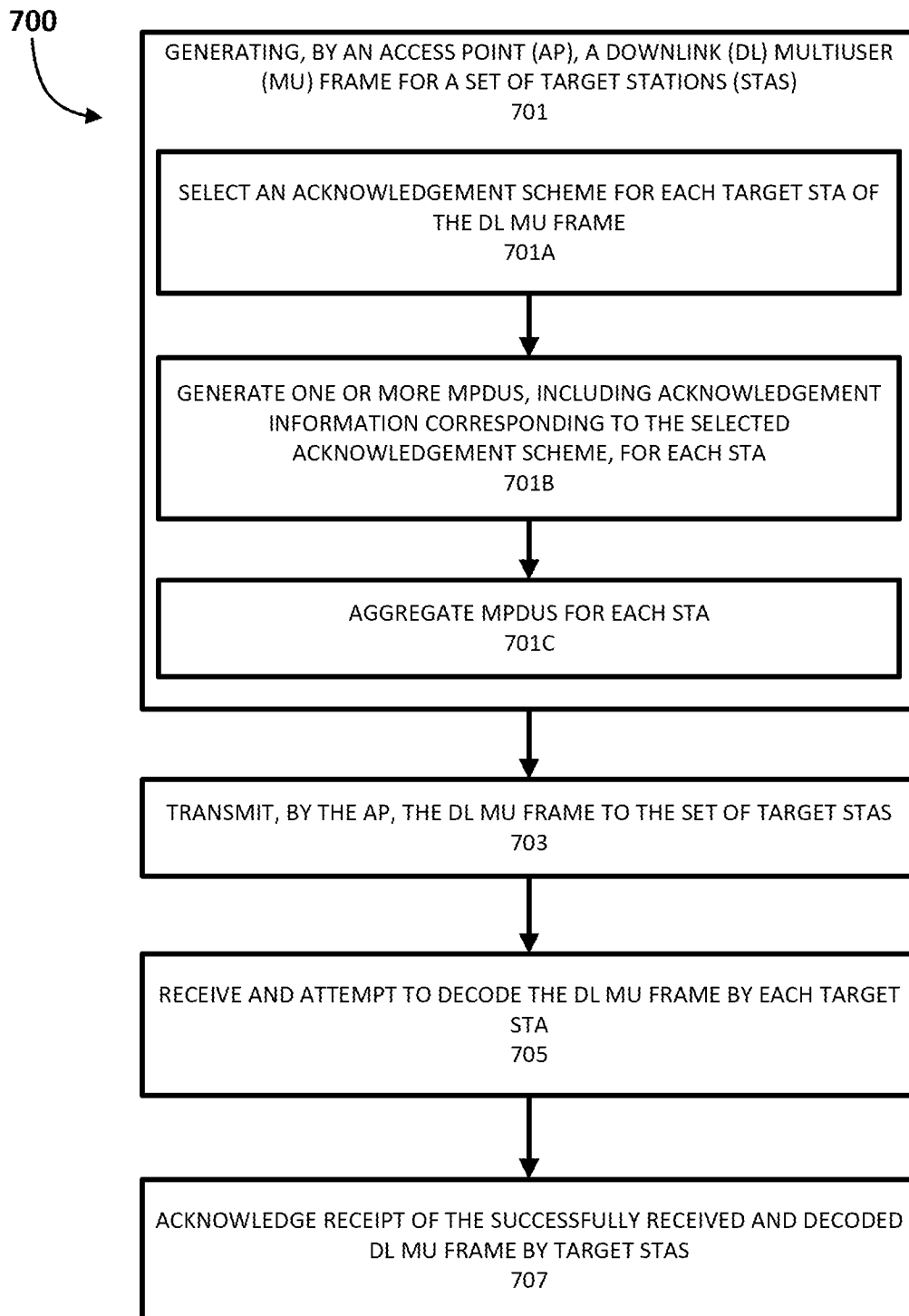


FIG. 7A

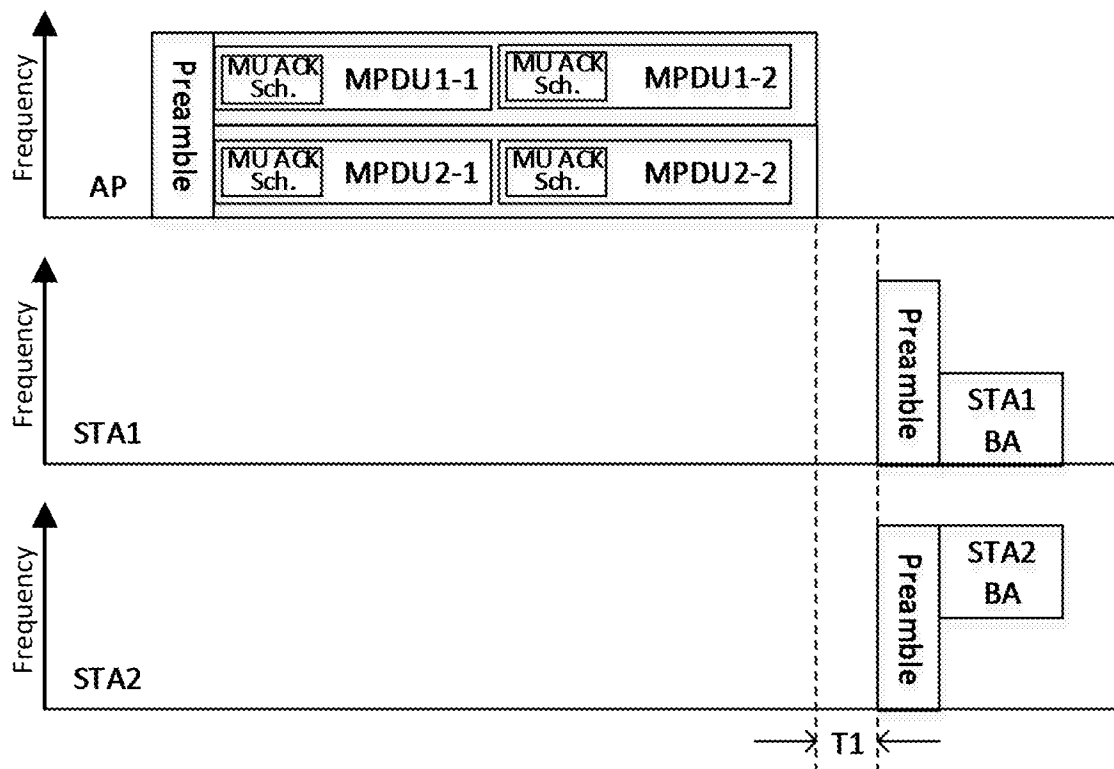


FIG. 7B

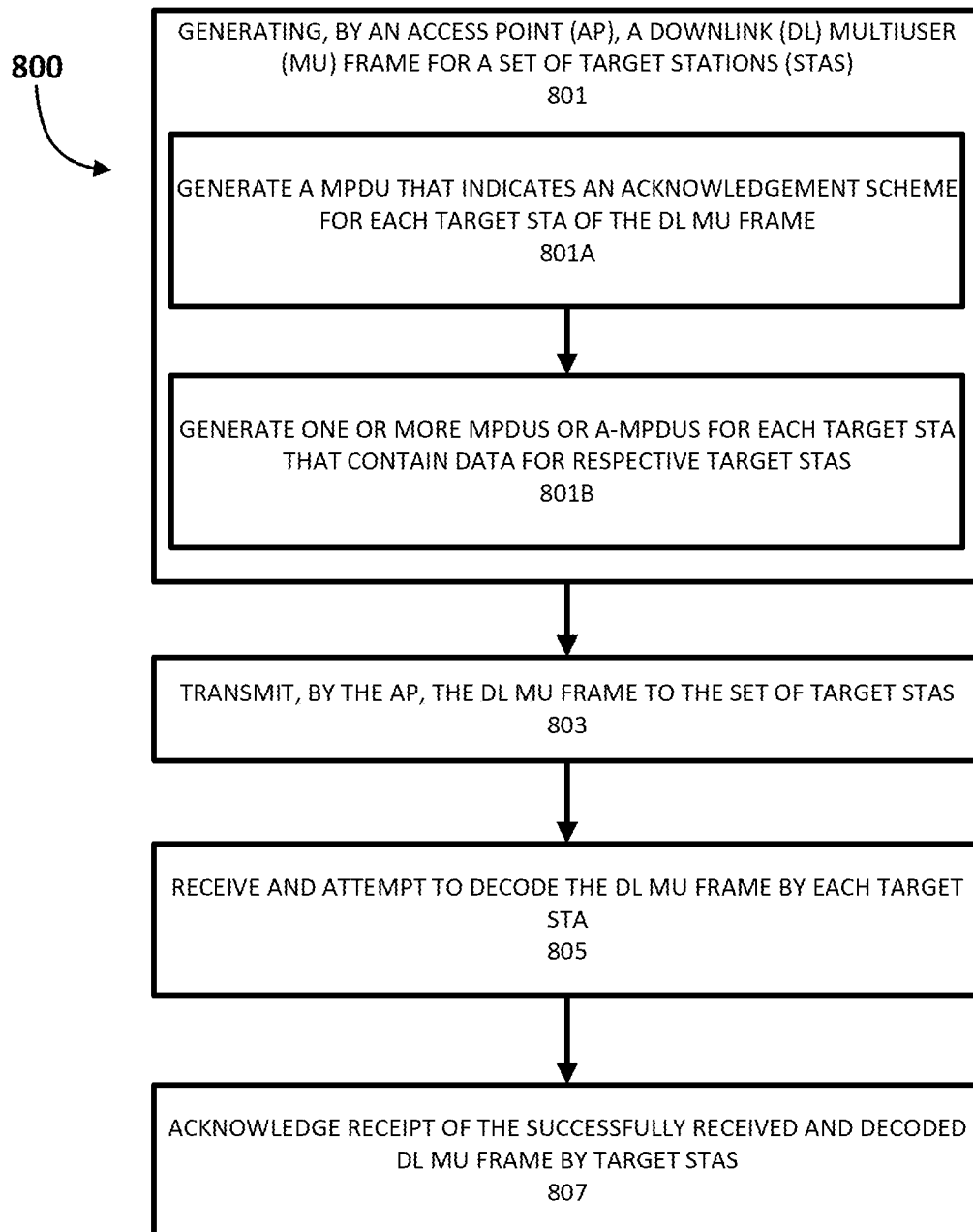


FIG. 8A

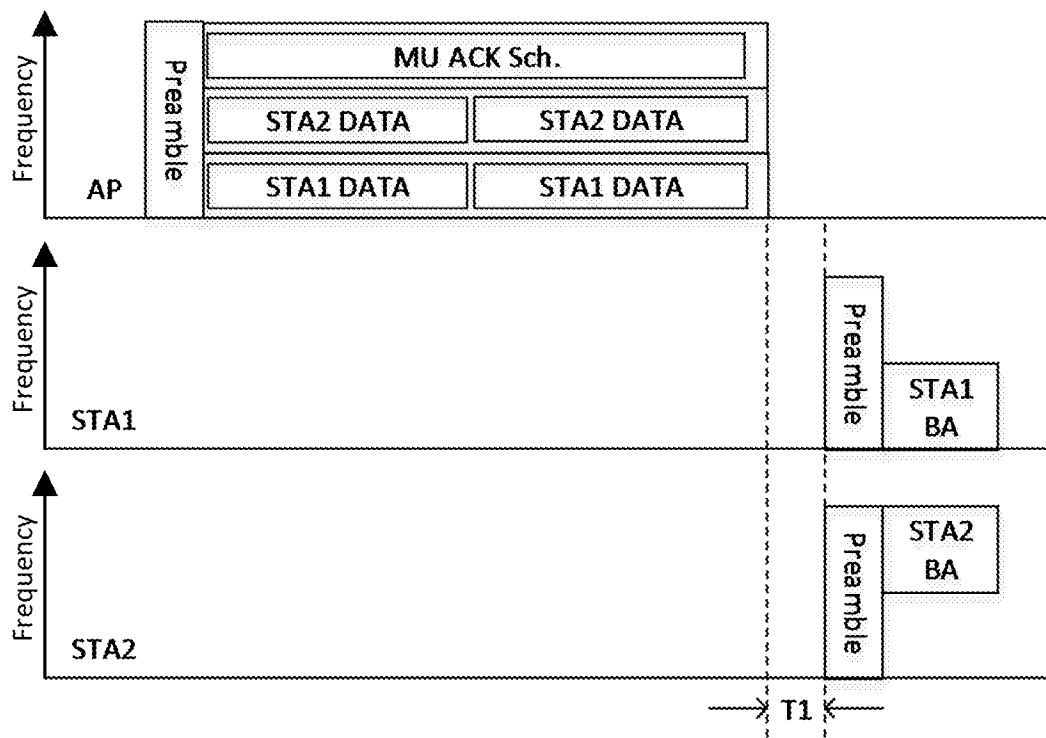


FIG. 8B

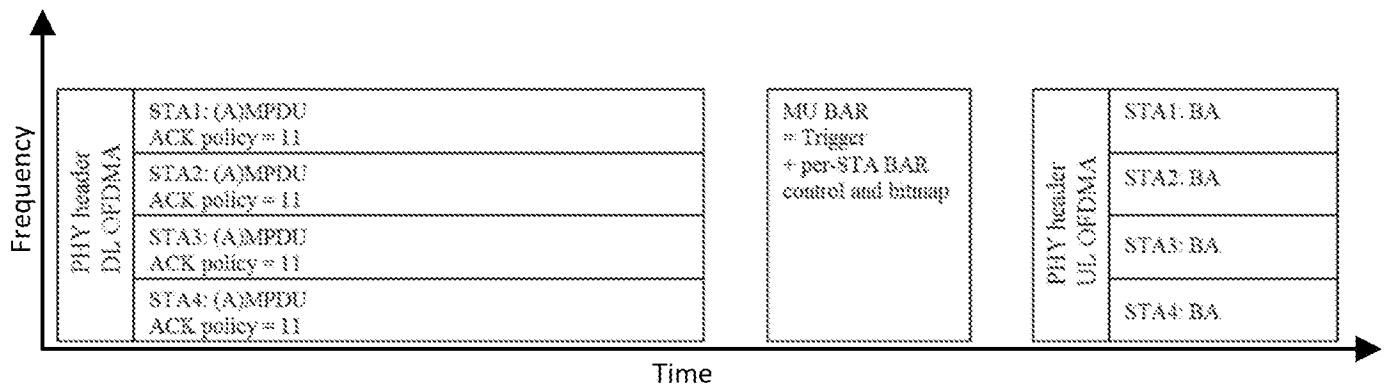


FIG. 9

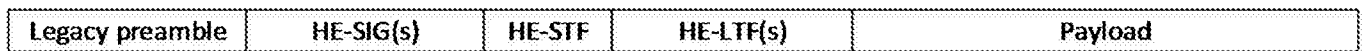


FIG. 10

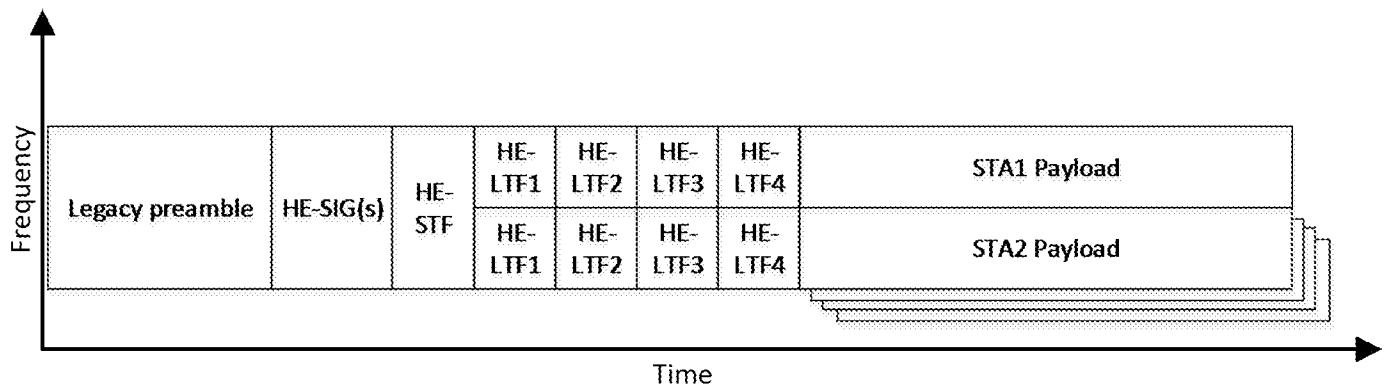


FIG. 11

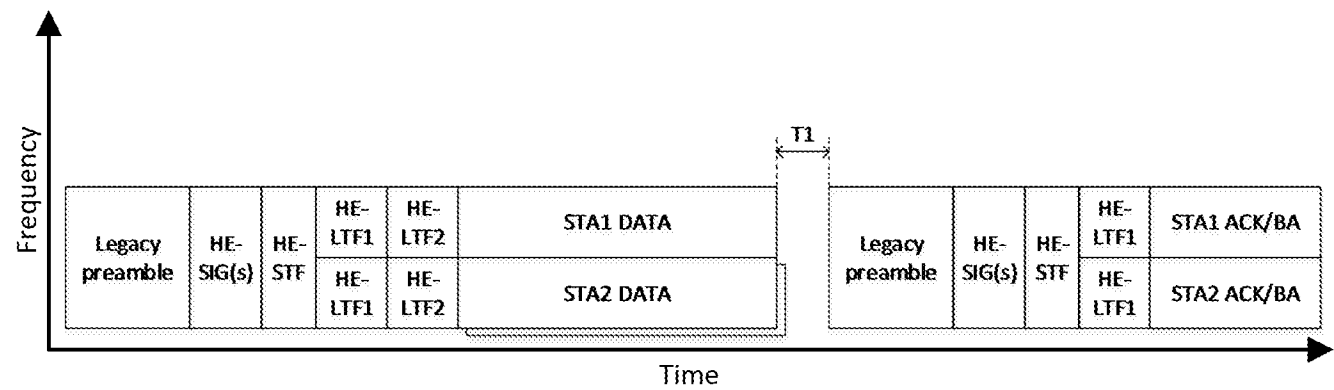


FIG. 12

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
15/078,920

APPLICATION AS FILED - PART I

(Column 1)		(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	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).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	730		TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	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))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	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))							OR		
	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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/078,920	03/23/2016	2414	730	A303AA-012300US	20	3

CONFIRMATION NO. 2806

FILING RECEIPT



0000000082113497

83220
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

Date Mailed: 04/13/2016

Receipt is acknowledged of this non-provisional 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 APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Young Hoon KWON, Irvine, CA;
Ahmad Reza HEDAYAT, Irvine, CA;

Applicant(s)

NEWRACOM, INC., Irvine, CA;

Power of Attorney: The patent practitioners associated with Customer Number 83220

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/137,138 03/23/2015
and claims benefit of 62/140,349 03/30/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 04/11/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/078,920**

Projected Publication Date: 09/29/2016

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US	2806

83220 7590 05/05/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

EXAMINER

NGO, RICKY QUOC

ART UNIT	PAPER NUMBER
----------	--------------

2464

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

05/05/2016

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):

docketing@ampacc.com
scho@ampacc.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Doc Code:
TRACK1.GRANT

**Decision Granting Request for
Prioritized Examination
(Track I or After RCE)**

Application No.: 15/078,920

1. THE REQUEST FILED March 23, 2016 IS **GRANTED**.

The above-identified application has met the requirements for prioritized examination

- A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

- A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to JoAnne Burke at 571-272-4584. In his/her absence, calls may be directed to Brian Brown, 571-272-5338.

/JoAnne Burke/
[Signature]

Paralegal Specialist, Office of Petitions
(Title)

Office of Petitions: Decision Count Sheet

Mailing Month

Application No.

15078920



For US serial numbers: enter number only, no slashes or commas. Ex: 10123456

For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official:

BURKE, JOANNE

Count (1) - Palm Credit

15/078,920

Decision:

GRANT

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type:

643 - Track One request



Notes:

Count (2)

Decision:

n/a

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type:

NONE

Notes:

Count (3)

Decision:

n/a

FINANCE WORK NEEDED

☐ Select Check Box for YES

Decision Type:

NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach
2nd count sheet & mark this box

Printed on:

Office of Petitions Internal Document - Ver. 5.0

Office of Petitions: Routing Sheet



Application No. 15/078,920

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

☒ **GRANTED**

☐ **DISMISSED**

☐ **DENIED**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US	2806

83220 7590 06/09/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

EXAMINER

PHAN, TRI H

ART UNIT	PAPER NUMBER
----------	--------------

2471

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

06/09/2016

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):

docketing@ampacc.com
scho@ampacc.com

Office Action Summary	Application No. 15/078,920	Applicant(s) KWON ET AL.	
	Examiner TRI H. PHAN	Art Unit 2471	AIA (First Inventor to File) 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 03/23/2016.
☐ 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) 1-20 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) 1-20 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 03/23/2016 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) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date _____ | 4) ☐ Other: _____ |

Art Unit: 2471

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

DETAILED ACTION

Response to Communication(s)

1. This office action is in response to the Application/Amendment/Arguments filed on March 23rd, 2016. Claims 1-20 are presented in the application for examination.

Information Disclosure Statement

2. The information disclosure statement filed 03/23/16 complies with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609. It has been considered and placed in the application file.

Specification

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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 pre-AIA 35 U.S.C. 103(a) are summarized as follows:

Art Unit: 2471

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.

5. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Wang et al.** (U.S. 2013/0301569; hereinafter refer as '**Wang**').

- In regard to claim 1, **Wang** discloses, in the respective portions of the specification about systems/devices and method, implemented by a network device in a wireless network, for coordinating an uplink multi-user response transmission to a downlink multi-user transmission (*for example see base station 114a-b in figs. 1A-C*), which comprise

generating, by the network device, a downlink multi-user frame addressed to a plurality of stations operating in the wireless network, the downlink multi-user frame including a plurality of resource units that are each assigned to a station in the plurality of stations (*for example see figs. 1A-C; page 1, paragraphs 7-9; wherein, it is obvious that transmitting the multi-user frame is just subsequent action of 'generating frame'*), wherein generating the downlink multi-user frame comprises:

including a set of MAC Protocol Data Units 'MPDUs' in each resource unit of the plurality of resource units (*for example see figs. 12-13*), wherein one or more MPDUs in each of the resource units in the downlink multi-user frame includes acknowledgement information for indicating properties of a multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame (*for example see figs. 7-13; page 1, paragraphs 7-9; page 6, paragraph 89, lines 3-9, paragraph 94, lines 3-9; pages 7-8, paragraphs 100-108*); and

transmitting the downlink multi-user frame to the plurality of stations (*see WTRU 102a-d in figs. 1A-C*) over a wireless channel (*for example see page 1, paragraphs 7-9*).

Art Unit: 2471

- Regarding claim 2, in addition to features in base claim 1 (see rationales pertaining the rejection of base claim 1 discussed above), **Wang** further discloses for including the acknowledgement information, for indicating properties of the multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame, in a header of the one or more MPDUs (*for example see figs. 7-13; page 1, paragraphs 7-9; page 6, paragraph 89, lines 3-9, paragraph 94, lines 3-9; pages 7-8, paragraphs 100-108*).

- In regard to claim 3, in addition to features in base claims (see rationales pertaining the rejection of base claims discussed above), **Wang** further discloses for wherein the header is a MAC header of the one or more MPDUs (*for example see fig. 7; page 6, paragraph 94, lines 3-9*).

- Regarding claims 4-5, in addition to features in base claim 1 (see rationales pertaining the rejection of base claim 1 discussed above), **Wang** further discloses for wherein one of the one or more MPDUs in each of the resource units in the downlink multi-user frame is a unicast trigger frame that contains the acknowledgement information for the respective station in the plurality of stations (*for example see figs. 7-13; page 1, paragraphs 7-9; page 6, paragraph 89, lines 3-9, paragraph 94, lines 3-9; pages 7-8, paragraphs 100-108*) and wherein the trigger frame instigates each respective station in the plurality of stations to transmit the multi-user acknowledgement transmission after an interframe spacing period following receipt of the downlink multi-user frame (*for example see fig. 9; page 7, paragraphs 100-107*).

- In regard to claim 6, in addition to features in base claim 1 (see rationales pertaining the rejection of base claim 1 discussed above), **Wang** further discloses for generating a multi-user block acknowledgement request frame (*for example see BAR in fig. 9; page 7, paragraphs 101-104*) to solicit acknowledgements from two or more stations of the plurality of stations; and transmitting the multi-user block acknowledgment request frame following transmission of the downlink multi-user frame (*for example see figs. 1A-C, 9; page 1, paragraphs 7-8; page 7, paragraphs 101-104*).

- Regarding claim 7, in addition to features in base claim 1 (see rationales pertaining the rejection of base claim 1 discussed above), **Wang** further discloses for wherein the acknowledgement information includes one or more of: (1) whether the acknowledgement transmission is multi-user or single user, (2) whether the acknowledgment transmission is immediate or non-immediate, and (3) resource scheduling information for the multi-user acknowledgement transmission (*for example see fig. 9; page 1, paragraph 7; page 5, paragraph 74*).

- In regard to claim 8, **Wang** discloses, in the respective portions of the specification about systems/devices and method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment (*for example see WTRU 102a-d in figs. 1A-C*), which comprise

receiving a downlink multi-user frame addressed to a plurality of stations (*WTRUs 102a-d in figs. 1A-C*), including the first station, and received from an access point (*base stations 114a-b in figs. 1A-C*) in the wireless network (*for example see figs. 8-9; page 7, paragraphs 100-102*);

processing a first MAC Protocol Data Units 'MPDU' (*for example see figs. 12-13*) in the downlink multi-user frame to determine acknowledgement information for indicating properties of a first multi-user acknowledgement frame to acknowledge the downlink multi-user frame by two or more stations (*for example see figs. 7-13; page 6, paragraph 89, lines 3-9, paragraph 94, lines 3-9; pages 7-8, paragraphs 100-108*);

generating the first multi-user acknowledgment frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information (*for example see fig. 9; page 7, paragraphs 100-102; wherein, it is obvious that transmitting the multi-user acknowledge frame is just subsequent action of 'generating ... frame'*).

- Regarding claims 9-10, in addition to features in base claims (see rationales pertaining the rejection of base claims discussed above), **Wang** further discloses for wherein the first MPDU is located in a first resource unit of the downlink multi-user frame allocated to the first station, wherein the downlink

Art Unit: 2471

multi-user frame includes a second resource unit that contains a second MPDU with acknowledgement information for a second station to transmit a second multi-user acknowledgement frame (*for example see figs. 9, 12-13; page 7, paragraphs 100-108*) and wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement frame together form a multi-user acknowledgement frame for acknowledging the downlink multi-user frame (*for example see figs. 9, 12-13; page 7, paragraphs 100-108*).

- In regard to claims 11-12, in addition to features in base claims (see rationales pertaining the rejection of base claims discussed above), **Wang** further discloses for extracting the acknowledgement information, for indicating properties of the first multi-user acknowledgement frame, in a MAC header of the first MPDU (*for example see fig. 9; page 7, paragraphs 100-102; wherein 'extracting' acknowledgement information is obvious for reading ACK policy field in BAR control to return an ACK immediately or not, i.e. delay*).

- Regarding claims 13-14, in addition to features in base claim 8 (see rationales pertaining the rejection of base claim 8 discussed above), **Wang** further discloses for extracting the acknowledgement information, for indicating properties of the first multi-user acknowledgement frame transmission, from a payload of the first MPDU (*for example see fig. 9; page 7, paragraphs 100-102; wherein 'extracting' acknowledgement information is obvious for reading ACK policy field in BAR control to return an ACK immediately or not, i.e. delay*), wherein the first MPDU is a unicast trigger frame and processing a second MPDU in a same resource unit as the first MPDU, wherein the second MPDU includes data intended for the first station (*for example see figs. 7-13; page 1, paragraphs 7-9; page 6, paragraph 89, lines 3-9, paragraph 94, lines 3-9; pages 7-8, paragraphs 100-108*).

- In regard to claim 15, in addition to features in base claims (see rationales pertaining the rejection of base claims discussed above), **Wang** further discloses for wherein the trigger frame instigates

Art Unit: 2471

the first station to transmit the first multi-user acknowledgement after an interframe spacing period following receipt of the downlink multi-user frame (*for example see fig. 9; page 7, paragraphs 100-107*).

- Regarding claim 16, in addition to features in base claim 8 (see rationales pertaining the rejection of base claim 8 discussed above), **Wang** further discloses for receiving a multi-user block acknowledgement request frame that solicits acknowledgements from two or more stations, wherein the first multi-user acknowledgement frame is transmitted after receipt of and in response to the multi-user block acknowledgement request frame (*for example see figs. 1A-C, 9; page 1, paragraphs 7-8; page 7, paragraphs 101-104*).

- In regard to claim 18, **Wang** discloses, in the respective portions of the specification about systems/devices and method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment (*for example see WTRU 102a-d in figs. 1A-C*), which comprise

receiving a downlink multi-user frame addressed to a plurality of stations (*see WTRU 102a-d in figs. 1A-C*), including the first station, wherein the downlink multi-user frame is received from an access point (*see base station 114a-b in figs. 1A-C*) in the wireless network (*for example see figs. 8-9; page 7, paragraphs 100-102*);

receiving a multi-user block acknowledgement request frame that solicits acknowledgements from two or more stations (*for example see BAR in fig. 9; page 7, paragraphs 101-104*), wherein the multi-user block acknowledgement request frame includes acknowledgement information for indicating properties of a first multi-user acknowledgement frame that acknowledges receipt of the downlink multi-user frame by the first station (*for example see figs. 7-13; page 6, paragraph 89, lines 3-9, paragraph 94, lines 3-9; pages 7-8, paragraphs 100-108*);

generating the first multi-user acknowledgment frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information (*for example see fig. 9; page 7, paragraphs 100-102; wherein, it is obvious that transmitting the multi-user acknowledge frame is just subsequent action of 'generating ... frame'*).

Art Unit: 2471

- Regarding claim 17 and 19, in addition to features in base claim 8 (see rationales pertaining the rejection of base claim 8 discussed above), **Wang** further discloses for wherein the acknowledgement information includes one or more of (1) whether the first multi-user acknowledgement frame is part of multi-user or single user transmission, (2) whether the first multi-user acknowledgement frame is transmitted immediately following receipt of the downlink multi-user frame or upon receipt of a multi-user block acknowledgement request frame, and (3) resource scheduling information for an uplink multi-user acknowledgement transmission (*for example see fig. 9; page 1, paragraph 7; page 5, paragraph 74*).

- In regard to claim 20, in addition to features in base claim 18 (see rationales pertaining the rejection of base claim 18 discussed above), **Wang** further discloses for wherein the acknowledgment scheduling information includes properties of a second multi-user acknowledgement frame generated and transmitted by a second station, wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement together form a multi-user transmission (*for example see fig. 9; page 1, paragraph 7; page 5, paragraph 74*).

6. **Examiner's Note:** Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages or figures may apply as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

In the case of **amending the claimed invention**, Applicant is respectfully requested to indicate the portion(s) of the specification which dictate(s) the structure relied on for proper interpretation and also to verify and ascertain the metes and bounds of the claimed invention.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wentink; Maarten Menzo (U.S. 2011/0261742), **Wentink et al.** (U.S. 2014/0233478), **Chu et al.** (U.S. 2016/0028452) and **Josiam et al.** (U.S. 2016/0080115) are all cited to show systems/devices and

Art Unit: 2471

methods for improving multi-user acknowledgement in wireless telecommunication architectures which are considered pertinent to the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tri H. Phan, whose telephone number is (571) 272-3074. The examiner can normally be reached on M-F (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi H. Pham can be reached on (571) 272-3179.

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.

/TRI H. PHAN/
Primary Examiner, Art Unit 2471

June 6, 2016

Notice of References Cited	Application/Control No. 15/078,920		Applicant(s)/Patent Under Reexamination KWON ET AL.	
	Examiner TRI H. PHAN		Art Unit 2471	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2011/0261742 A1	10-2011	Wentink; Maarten Menzo	H04L1/1854	370/312
*	B	US-2013/0301569 A1	11-2013	Wang; Xiaofei	H04L5/0055	370/329
*	C	US-2014/0233478 A1	08-2014	WENTINK; Maarten Menzo	H04L5/0055	370/329
*	D	US-2016/0028452 A1	01-2016	CHU; Liwen	H04J11/00	375/267
*	E	US-2016/0080115 A1	03-2016	Josiam; Kaushik	H04L5/0094	370/329
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	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. 15078920	Applicant(s)/Patent Under Reexamination KWON ET AL.
	Examiner TRI H PHAN	Art Unit 2471

CPC- SEARCHED		
Symbol	Date	Examiner
H04L1/1621,1685,1854,1864,1887,1896;H04L5/0055;H04W4/06;H04W28/044;H04W84/12	5/30/2016	TP

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
370	310-350	5/30/2016	TP

SEARCH NOTES		
Search Notes	Date	Examiner
EAST (USPT,JPO,EPO,FPRS,DWPI) - see text search printout.	5/30/2016	TP

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/TRI H PHAN/ Primary Examiner.Art Unit 2471
--	--

Substitute for form 1449B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	Unassigned 15/078920
				Filing Date	Filed Herewith 03/23/2016
				First Named Inventor	Young Hoon KWON
				Art Unit	Unassigned 2471
				Examiner Name	Unassigned Tri H. Phan
Sheet	1	of	1	Attorney Docket Number	A303AA-012300US

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials *	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
/T.P./	1	"Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications", IEEE Standards 802.11™ -2012 (Revision of IEEE Standard 802.11-2007), March 29, 2012, pp. 1-2695, IEEE (The Institute of Electrical and Electronic Engineers, Inc.), New York, NY, USA.	☐
/T.P./	2	"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", IEEE Standards 802.11ac™ -2013, 2013, pp. 1-395, IEEE (The Institute of Electrical and Electronic Engineers, Inc.), New York, NY, USA.	☐
/T.P./	3	"Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, Amendment 2: Sub 1 GHz License Exempt Operation", IEEE P802.11ah™/D5.0, March 2015, pp. 1-604, IEEE (The Institute of Electrical and Electronic Engineers, Inc.), New York, NY, USA.	☐

Examiner Signature	/Tri Phan/ (05/29/2016)	Date Considered	05/29/2016
-----------------------	-------------------------	--------------------	------------

*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.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	0	(NEWRACOM.asn. or (KWON.in. and YOUNG-HOON.in.) or (HEDAYAT.in. and AHMAD-REZA.in.)) and ((MAC! near2 header) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 13:14
S2	2	(NEWRACOM.asn. or (KWON.in. and YOUNG-HOON.in.) or (HEDAYAT.in. and AHMAD-REZA.in.)) and ((MAC! near2 header) and PDU!)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 13:14
S3	501	((MAC! near2 header) and PDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (ACK! acknowledge\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 13:21
S4	32	((MAC! near2 header) and PDU! and (((multi\$3 adj1 user\$1) or (group adj1 user\$1)) same (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 13:21
S5	318	((MAC! near2 header) and PPDU! and MPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (ACK! acknowledge\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 14:39
S6	119	((MAC! near2 header) and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! same (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 14:40
S7	94	((MAC! near2 header) and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 14:40
S8	265	S5 and @ad<="20150323"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 15:09
S9	47	((MAC! near2 header) and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)))	US-PGPUB; USPAT;	OR	ON	2016/05/29 15:10

		user\$1)) and (MPDU! with (ACK! acknowledge\$3) with indicat\$3))	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S10	180	S8 and 370/310-350.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 15:11
S11	35	S5 AND ((H04W4/06 OR H04L1/1854).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 16:18
S12	181	S5 AND ((H04W84/12 OR H04W4/06 OR H04L5/0055 OR H04L1/1621 OR H04L1/1854 OR H04L1/1887 OR H04L1/1864 OR H04L1/1896 OR H04W28/044 OR H04L1/1685).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:06
S13	212	S8 and 370/\$7.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:29
S14	32	S13 not S10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:30
S15	11	S8 and 455/\$7.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:33
S16	23	S8 and 375/\$7.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:37
S17	1	S8 and 709/\$7.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:37
S18	95	S5 not (S13 or S15 or S16 or S17)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:40
S19	0	(NEWRACOM.asn. or (KWON.in. and YOUNG-HOON.in.) or (HEDAYAT.in.	US-PGPUB; USPAT;	OR	ON	2016/05/29 17:42

		and AHMAD-REZA.in.)) and (MPDU! and (ACK! acknowledge\$3))	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S20	8	(NEWRACOM.asn. or (KWON.in. and YOUNG-HOON.in.) or (HEDAYAT.in. and AHMAD-REZA.in.)) and (MAC! and (ACK! acknowledge\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:42
S21	4	(NEWRACOM.asn. or (KWON.in. and YOUNG-HOON.in.) or (HEDAYAT.in. and AHMAD-REZA.in.)) and (((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (ACK! acknowledge\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 17:43
S22	8	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((MPDU! with (ACK! acknowledge\$3)) same (indicat\$3 with immediat\$4)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 22:21
S23	4	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! with (ACK! acknowledge\$3)) and (indicat\$3 with proptert\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 22:26
S24	24	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! with (ACK! acknowledge\$3) with immediat\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 22:30
S25	52	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! with (ACK! acknowledge\$3) with indicat\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/29 22:31
S26	79	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((MPDU! with (ACK! acknowledge\$3)) same indicat\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/30 09:21
S27	4	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! with (ACK! acknowledge\$3)) and (indicat\$3 with proptert\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/30 09:38
S28	0	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((MPDU! with (ACK! acknowledge\$3)) same proptert\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/30 09:39
S29	30	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and	US-PGPUB; USPAT;	OR	ON	2016/05/30 09:40

		(MPDU! with (ACK! acknowledge\$3)) and propt\$3)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S30	123	(MAC! and PPDU! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (MPDU! with (ACK! acknowledge\$3)) and indicat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/30 09:41

5/ 30/ 2016 9:57:27 AM
C:\ Users\ tphan4\ Documents\ EAST\ Workspaces\ 15-078920.wsp



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 2806

SERIAL NUMBER 15/078,920	FILING or 371(c) DATE 03/23/2016 RULE	CLASS 370	GROUP ART UNIT 2471	ATTORNEY DOCKET NO. A303AA-012300US		
APPLICANTS NEWRACOM, INC., Irvine, CA; INVENTORS Young Hoon KWON, Irvine, CA; Ahmad Reza HEDAYAT, Irvine, CA; ** CONTINUING DATA ***** This appln claims benefit of 62/137,138 03/23/2015 and claims benefit of 62/140,349 03/30/2015 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** ** SMALL ENTITY ** 04/11/2016						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged <u>/TRI H PHAN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 13	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS AMPACC Law Group, PLLC Steve Cho 6100 219th Street SW, Suite 580 Mountlake Terrace, WA 98043 UNITED STATES						
TITLE APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS						
FILING FEE RECEIVED 730	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees			
			☐ 1.16 Fees (Filing)			
			☐ 1.17 Fees (Processing Ext. of time)			
			☐ 1.18 Fees (Issue)			
			☐ Other _____			
				☐ Credit		

<i>Index of Claims</i> 	Application/Control No. 15078920	Applicant(s)/Patent Under Reexamination KWON ET AL.
	Examiner TRI H PHAN	Art Unit 2471

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

☐ Claims renumbered in the same order as presented by applicant		☐ CPA		☐ T.D.		☐ R.1.47			
CLAIM		DATE							
Final	Original	05/30/2016							
	1	✓							
	2	✓							
	3	✓							
	4	✓							
	5	✓							
	6	✓							
	7	✓							
	8	✓							
	9	✓							
	10	✓							
	11	✓							
	12	✓							
	13	✓							
	14	✓							
	15	✓							
	16	✓							
	17	✓							
	18	✓							
	19	✓							
	20	✓							

Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	15/078,920
				Filing Date	March 23, 2016
				First Named Inventor	Young Hoon KWON
				Art Unit	2471
				Examiner Name	PHAN, TRI H
Sheet	1	of	2	Attorney Docket Number	A303AA-012300US

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number Kind Code ² (if known)			
	1	US-2012/0213308 A1	08-23-2012	MERLIN et al.	
	2	US-2010/0310003 A1	12-09-2010	LAUER et al.	
	3	US-2013/0301569 A1	11-14-2013	WANG et al.	

Examiner Signature		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. ¹ Applicant's unique citation designation number (optional). ² Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

Substitute for form 1449B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	15/078,920
				Filing Date	March 23, 2016
				First Named Inventor	Young Hoon KWON
				Art Unit	2471
				Examiner Name	PHAN, TRI H
Sheet	2	of	2	Attorney Docket Number	A303AA-012300US

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials *	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²	
	4	International Search Report and Written Opinion for International Patent Application No. PCT/US2016/023829 filed March 23, 2016 (Attorney Docket No. 303-012300PC).	☐	
	5	SIMONE MERLIN et al., "Multi-STA Acknowledgment", IEEE 802.11-15/0366r1, March 9, 2015, pp.1-17, IEEE.	☐	
	6	KISEON RYU et al., "UL MU Procedure", IEEE 802.11-15/0365r0, March 9, 2015, pp. 1-16, IEEE.	☐	

Examiner Signature		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.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: CHO, STEVE Y. 6100 219TH STREET SW, SUITE 580 MOUNTLAKE TERRACE WA 98043 USA	PCT NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION (PCT Rule 44.1)
Applicant's or agent's file reference 303-012300PC	Date of mailing (day/month/year) 29 June 2016 (29.06.2016)
International application No. PCT/US2016/023829	International filing date (day/month/year) 23 March 2016 (23.03.2016)
Applicant NEWRACOM, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9-011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **19 months** from the priority date, the applicant may request that a supplementary international search be carried out by an International Searching Authority, that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea  Facsimile No. 82-42-481-8578	Authorized officer COMMISSIONER  Telephone No. 82-42-481-5875
--	---

* Attention

Copies of the documents cited in the international search report can be searched in the following Korean Intellectual Property Office English website for six months(expire date : **2016.12.29**) from the date of mailing of the international search report.

<http://www.kipo.go.kr/en/> => PCT Services => PCT Services

ID : PCT international application number

PW : **6A2G7222**

Inquiries related to PCT International Search Report or Written Opinion prepared by KIPO as an International Searching Authority can be answered not only by KIPO but also through IPKC (Intellectual Property Korea Center), located in Vienna, VA, which functions as a PCT Help Desk for PCT applicants.

Homepage: <http://www.ipkcenter.com>

Email: ipkc@ipkcenter.com

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 303-012300PC	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2016/023829	International filing date (<i>day/month/year</i>) 23 March 2016 (23.03.2016)	(Earliest) Priority Date (<i>day/month/year</i>) 23 March 2015 (23.03.2015)
Applicant NEWRACOM, INC.		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of :

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 6A
☐ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☒ as selected by this Authority, because this figure better characterizes the invention.
 b. ☐ none of the figures is to be published with the abstract.

A. CLASSIFICATION OF SUBJECT MATTER**H04L 5/00(2006.01)i, H04L 29/10(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
H04L 5/00; H04L 27/00; H04W 4/00; H04L 29/10Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: downlink multi-user frame, resource units, MPDU, acknowledgement information, header, MAC, unicast trigger frame, multi-user acknowledgement transmission, multi-user block acknowledgement request, payload, scheduling information**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2012-0213308 A1 (SIMONE MERLIN et al.) 23 August 2012 See paragraphs [0079]-[0085]; claims 1, 12, 15, 59, 69; and figures 6, 7.	1-8, 11-13, 15-20
A		9, 10, 14
Y	US 2010-0310003 A1 (JOSEPH PAUL LAUER et al.) 9 December 2010 See paragraphs [0113]-[0119]; claims 1, 4, 13, 14; and figure 14A.	1-8, 11-13, 15-20
Y	SIMONE MERLIN et al., 'Multi-STA Acknowledgement', IEEE 802.11-15/0366r1, 10 March 2015 See pages 8-13.	4, 5, 13, 15
A	KISEON RYU et al., 'UL MU Procedure', IEEE 802.11-15/0365r0, 9 March 2015 See pages 10-14.	1-20
A	US 2013-0301569 A1 (INTERDIGITAL PATENT HOLDINGS, INC.) 14 November 2013 See paragraphs [0094]-[0115]; and figures 7-13.	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29 June 2016 (29.06.2016)

Date of mailing of the international search report

29 June 2016 (29.06.2016)

Name and mailing address of the ISA/KR

International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon, 35208, Republic of Korea

Facsimile No. +82-42-481-8578

Authorized officer

KANG, Hee Gok

Telephone No. +82-42-481-8264



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2016/023829

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012-0213308 A1	23/08/2012	CA 2807378 A1	01/03/2012
		CN 103069737 A	24/04/2013
		EP 2609707 A1	03/07/2013
		JP 2013-536655 A	19/09/2013
		JP 2015-111829 A	18/06/2015
		KR 10-1521188 B1	05/06/2015
		KR 10-2013-0050980 A	16/05/2013
		RU 2013112912 A	27/09/2014
		RU 2546319 C2	10/04/2015
		WO 2012-027614 A1	01/03/2012
US 2010-0310003 A1	09/12/2010	CN 102195699 A	21/09/2011
		CN 102195699 B	17/09/2014
		EP 2357773 A2	17/08/2011
		EP 2357773 A3	09/11/2011
		TW 201203975 A	16/01/2012
		TW I499258 B	01/09/2015
		US 2010-0309779 A1	09/12/2010
		US 2010-0309834 A1	09/12/2010
		US 2010-0309848 A1	09/12/2010
		US 2010-0309871 A1	09/12/2010
		US 2010-0309872 A1	09/12/2010
		US 2010-0310002 A1	09/12/2010
		US 2010-0311432 A1	09/12/2010
		US 2010-0316150 A1	16/12/2010
		US 2010-0322219 A1	23/12/2010
		US 2011-0002219 A1	06/01/2011
		US 2011-0013616 A1	20/01/2011
		US 2011-0032875 A1	10/02/2011
		US 2011-0064040 A1	17/03/2011
		US 2011-0075607 A1	31/03/2011
		US 2011-0194475 A1	11/08/2011
		US 8441975 B2	14/05/2013
		US 8498359 B2	30/07/2013
		US 8526351 B2	03/09/2013
		US 8582485 B2	12/11/2013
		US 8599804 B2	03/12/2013
		US 8717957 B2	06/05/2014
		US 8804495 B2	12/08/2014
		US 8861447 B2	14/10/2014
		US 8879523 B2	04/11/2014
		US 8885535 B2	11/11/2014
		US 9048895 B2	02/06/2015
		US 9197298 B2	24/11/2015
US 2013-0301569 A1	14/11/2013	CN 104321995 A	28/01/2015
		EP 2847909 A1	18/03/2015
		JP 2015-525017 A	27/08/2015
		KR 10-2015-0007334 A	20/01/2015

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2016/023829

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		TW 201407991 A	16/02/2014
		WO 2013-170136 A1	14/11/2013

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
CHO, STEVE Y.

6100 219TH STREET SW, SUITE 580 MOUNTLAKE
TERRACE WA 98043 USA

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) **29 June 2016 (29.06.2016)**

Applicant's or agent's file reference
303-012300PC

FOR FURTHER ACTION

See paragraph 2 below

International application No.
PCT/US2016/023829

International filing date (day/month/year)
23 March 2016 (23.03.2016)

Priority date(day/month/year)
23 March 2015 (23.03.2015)

International Patent Classification (IPC) or both national classification and IPC

H04L 5/00(2006.01)i, H04L 29/10(2006.01)i

Applicant
NEWRACOM, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon,
35208, Republic of Korea
Facsimile No. +82-42-481-8578

Date of completion of this opinion

29 June 2016 (29.06.2016)

Authorized officer

KANG, Hee Gok

Telephone No. +82-42-481-8264



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2016/023829

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

- a. ☐ forming part of the international application as filed:
- ☐ in the form of an Annex C/ST.25 text file.
- ☐ on paper or in the form of an image file.
- b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
- c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
- ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
- ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2016/023829

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	9-10,14	YES
	Claims	1-8,11-13,15-20	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2012-0213308 A1 (SIMONE MERLIN et al.) 23 August 2012

D2: US 2010-0310003 A1 (JOSEPH PAUL LAUER et al.) 9 December 2010

D3: SIMONE MERLIN et al., 'Multi-STA Acknowledgement', IEEE 802.11-15/0366r1, 10 March 2015

D4: KISEON RYU et al., 'UL MU Procedure', IEEE 802.11-15/0365r0, 9 March 2015

D5: US 2013-0301569 A1 (INTERDIGITAL PATENT HOLDINGS, INC.) 14 November 2013

2.1 Novelty (PCT Article 33(2)) and Inventive Step (PCT Article 33(3))

2.1.1 Independent Claim 1

D1, which is considered to represent the most relevant state of the art to the subject matter of claim 1, discloses a method comprising: generating a plurality of Data Units (DUs) and transmitting a multi-user multiple-input multiple-output (MU-MIMO) transmission comprising the DUs to a plurality of apparatuses, wherein the plurality of DUs comprises a plurality of Media access control Protocol Data Units (MPDUs) (see claims 1, 15 in D1). Claim 1 differs from D1 in that one or more MPDUs in each of resource units in a downlink multi-user frame includes acknowledgement information for indicating properties of a multi-user acknowledgement transmission transmitted by each respective station in a plurality of stations to acknowledge the downlink multi-user frame. However, it is merely a variation of the disclosure of D2, considering transmitting, by an access point (AP), a multi-user packet to a plurality of wireless communication devices, wherein the multi-user packet includes a plurality of acknowledgement instructions corresponding respectively to each of the plurality of wireless communication devices and wherein time slotted acknowledgement information is contained in MAC Headers that are part of OFDMA/MU-MIMO transmission (see paragraph [0119]; claims 1, 14; and figure 14A in D2). Accordingly, claim 1 would have been obvious over D1 in view of D2. Therefore, claim 1 does not involve an inventive step under PCT Article 33(3).

Continued on Supplemental Box

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2016/023829

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The expression ‘, and received from an access point’ of claim 8 is considered to be a writing error for ‘, wherein the downlink multi-user frame is received from an access point’ (PCT Article 6).

Claim 20 is unclear in that ‘the acknowledgement scheduling information’ has not been previously defined. Therefore, claim 20 does not meet the requirements of PCT Article 6.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box No. V

2.1.2 Dependent Claims 2-7

The additional features of claims 2 and 3, directly or indirectly dependent on claim 1, are merely variations of the disclosure of D2, considering that the time slotted acknowledgement information is contained in the MAC Headers that are part of the OFDMA/MU-MIMO transmission (see paragraph [0119]; and figure 14A in D2). Accordingly, claims 2 and 3 would have been obvious over D1 in view of D2. Therefore, claims 2 and 3 do not involve an inventive step under PCT Article 33(3).

The additional feature of claim 4, dependent on claim 1, is not disclosed in D1 or D2. However, the additional feature is merely a variation of the disclosures of D3, considering that an AP transmits trigger frame and a proposed Multi-STA BA frame allows ACK indication per STA (see pages 8, 13 in D3). Accordingly, claim 4 would have been obvious over D1 in view of D2 and further in view of D3. Therefore, claim 4 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 5, dependent on claim 4, is merely a variation of the disclosure of D2, considering that intended receivers respond in an ordered sequence based on detection of respondents ACK transmissions (see paragraph [0115] in D2). Accordingly, claim 5 would have been obvious over D1 in view of D2 and further in view of D3. Therefore, claim 5 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 6, dependent on claim 1, can be easily derived by a person skilled in the art from the disclosure of D1, considering transmitting, following the MU-MIMO transmission, Block Acknowledgement Request (BAR) messages to one or more of the apparatuses other than a first apparatus (see claim 12 in D1). Accordingly, claim 6 would have been obvious over D1 in view of D2. Therefore, claim 6 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 7, dependent on claim 1, can be easily derived by a person skilled in the art from the disclosure of D2, considering the plurality of acknowledgement instructions including scheduling information directing the plurality of wireless communication devices for providing the plurality of acknowledgements (see claim 4 in D2). Accordingly, claim 7 would have been obvious over D1 in view of D2. Therefore, claim 7 does not involve an inventive step under PCT Article 33(3).

2.1.3 Independent Claim 8

D1, which is considered to represent the most relevant state of the art to the subject

Continued on The Next Page

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Previous Page

matter of claim 8, discloses a method comprising: transmitting, by a transmitter, a multi-user multiple-input multiple-output (MU-MIMO) transmission comprising Data Units (DUs) to a plurality of apparatuses and receiving, by an apparatus, a DU transmitted with one or more other DUs, wherein the DU comprises a Media access control Protocol Data Unit (MPDU) and the one or more other DUs comprise one or more other MPDUs (see claims 1, 59, 69 in D1). Claim 8 differs from D1 in that it comprises: processing a first MAC Protocol Data Units (MPDU) in a downlink multi-user frame to determine acknowledgement information for indicating properties of a first multi-user acknowledgement frame to acknowledge the downlink multi-user frame by two or more stations; generating the first multi-user acknowledgement frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to an access point based on the acknowledgement information. However, they are merely variations of the disclosure of D2, considering: transmitting, by an access point (AP), a multi-user packet to a plurality of wireless communication devices and simultaneously receiving at least two of a plurality of acknowledgements, wherein the multi-user packet includes a plurality of acknowledgement instructions corresponding respectively to each of the plurality of wireless communication devices and wherein time slotted acknowledgement information is contained in MAC Headers that are part of OFDMA/MU-MIMO transmission (see paragraph [0119]; claims 1, 13, 14; and figure 14A in D2); and responding, by intended receivers, in an ordered sequence based on detection of respondents ACK transmissions (see paragraph [0115] in D2). Accordingly, claim 8 would have been obvious over D1 in view of D2. Therefore, claim 8 does not involve an inventive step under PCT Article 33(3).

2.1.4 Dependent Claims 9-17

The additional feature of claim 9, dependent on claim 8, is characterized in that a first MPDU is located in a first resource unit of a downlink multi-user frame allocated to a first station, wherein the downlink multi-user frame includes a second resource unit that contains a second MPDU with acknowledgement information for a second station to transmit a second multi-user acknowledgement frame. And it is not disclosed in any of the prior art documents, nor is it obvious from the documents, when taken individually or in any combination. Accordingly, claim 9 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claim 10 is dependent on claim 9 and therefore meets the requirements of PCT Article 33(2) and 33(3).

Continued on The Next Page

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Previous Page

The additional features of claims 11 and 12, directly or indirectly dependent on claim 8, are merely variations of the disclosure of D2, considering that the time slotted acknowledgement information is contained in the MAC Headers that are part of the OFDMA/MU-MIMO transmission (see paragraph [0119]; and figure 14A in D2). Accordingly, claims 11 and 12 would have been obvious over D1 in view of D2. Therefore, claims 11 and 12 do not involve an inventive step under PCT Article 33(3).

The additional feature of claim 13, dependent on claim 8, is not disclosed in D1 or D2. However, the additional feature is merely a variation of the disclosures of D3, considering that an AP transmits trigger frame and a proposed Multi-STA BA frame allows ACK indication per STA (see pages 8, 13 in D3). Accordingly, claim 13 would have been obvious over D1 in view of D2 and further in view of D3. Therefore, claim 13 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 14, dependent on claim 13, is characterized by processing a second MPDU in a same resource unit as the first MPDU, wherein the second MPDU includes data intended for the first station. And it is not disclosed in any of the prior art documents, nor is it obvious from the documents, when taken individually or in any combination. Accordingly, claim 14 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

The additional feature of claim 15, dependent on claim 13, is merely a variation of the disclosure of D2, considering that intended receivers respond in an ordered sequence based on detection of respondents ACK transmissions (see paragraph [0115] in D2). Accordingly, claim 15 would have been obvious over D1 in view of D2 and further in view of D3. Therefore, claim 15 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 16, dependent on claim 8, can be easily derived by a person skilled in the art from the disclosure of D1, considering transmitting, following the MU-MIMO transmission, Block Acknowledgement Request (BAR) messages to one or more of the apparatuses other than a first apparatus (see claim 12 in D1). Accordingly, claim 16 would have been obvious over D1 in view of D2. Therefore, claim 16 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 17, dependent on claim 8, can be easily derived by a person skilled in the art from the disclosure of D2, considering the plurality of

Continued on The Next Page

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Previous Page

acknowledgement instructions including scheduling information directing the plurality of wireless communication devices for providing the plurality of acknowledgements (see claim 4 in D2). Accordingly, claim 17 would have been obvious over D1 in view of D2. Therefore, claim 17 does not involve an inventive step under PCT Article 33(3).

2.1.5 Independent Claim 18

D1, which is considered to represent the most relevant state of the art to the subject matter of claim 18, discloses a method comprising: transmitting, by a transmitter, a multi-user multiple-input multiple-output (MU-MIMO) transmission comprising Data Units (DUs) to a plurality of apparatuses and receiving, by an apparatus, a DU transmitted with one or more other DUs, wherein the DU comprises a Media access control Protocol Data Unit (MPDU) and the one or more other DUs comprise one or more other MPDUs (see claims 1, 59, 69 in D1); and transmitting, following the MU-MIMO transmission, Block Acknowledgement Request (BAR) messages to one or more of the apparatuses other than a first apparatus (see claim 12 in D1). Claim 18 differs from D1 in that it comprises: receiving a multi-user block acknowledgement request frame including acknowledgement information for indicating properties of a first multi-user acknowledgement frame that acknowledges receipt of a downlink multi-user frame by a first station; generating the first multi-user acknowledgement frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to an access point based on the acknowledgement information. However, they are merely variations of the disclosure of D2, considering: transmitting, by an access point (AP), a multi-user packet to a plurality of wireless communication devices, wherein the multi-user packet includes a plurality of acknowledgement instructions corresponding respectively to each of the plurality of wireless communication devices and responding, by intended receivers, to the transmitter an acknowledgement (e.g., either a single acknowledgement or a block acknowledgement) (see paragraph [0113]; and claims 1, 14 in D2); and responding, by the intended receivers, in an ordered sequence based on detection of respondents ACK transmissions (see paragraph [0115] in D2). Accordingly, claim 18 would have been obvious over D1 in view of D2. Therefore, claim 18 does not involve an inventive step under PCT Article 33(3).

2.1.6 Dependent Claims 19 and 20

The additional feature of claim 19, dependent on claim 18, can be easily derived by a person skilled in the art from the disclosure of D2, considering the plurality of acknowledgement instructions including scheduling information directing the plurality of wireless communication devices for providing the plurality of acknowledgements (see claim 4 in D2). Accordingly, claim 19 would have been obvious over D1 in view of D2.

Continued on The Next Page

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Previous Page

Therefore, claim 19 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 20, dependent on claim 18, can be easily derived by a person skilled in the art from the disclosure of D2, considering the apparatus simultaneously receiving at least two of the plurality of acknowledgements (see claim 13 in D2). Accordingly, claim 20 would have been obvious over D1 in view of D2. Therefore, claim 20 does not involve an inventive step under PCT Article 33(3).

2.2 Industrial Applicability (PCT Article 33(4))

Claims 1-20 are industrially applicable under PCT Article 33(4).

Electronic Acknowledgement Receipt

EFS ID:	26337698
Application Number:	15078920
International Application Number:	
Confirmation Number:	2806
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
First Named Inventor/Applicant Name:	Young Hoon KWON
Customer Number:	83220
Filer:	Kevin Wesley Raudebaugh/Jade Ogoy
Filer Authorized By:	Kevin Wesley Raudebaugh
Attorney Docket Number:	A303AA-012300US
Receipt Date:	13-JUL-2016
Filing Date:	23-MAR-2016
Time Stamp:	19:24:04
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		2016_07_13_IDS_A303AA-012300US.pdf	163333	yes	4
			8baebdd36752b8609112aed2c8bccdf4ac031846		

Multipart Description/PDF files in .zip description					
Document Description			Start	End	
Transmittal Letter			1	2	
Information Disclosure Statement (IDS) Form (SB08)			3	4	
Warnings:					
Information:					
2	Non Patent Literature	2016_07_13_REF4_NPL1_A303 AA-012300US.pdf	3569844 2cc10f50eea1e89d62de9941ab1e68cb511b586c	no	15
Warnings:					
Information:					
3	Non Patent Literature	2016_07_13_REF5_NPL2_A303 AA-012300US.pdf	442989 bceb1627b90e0abbaf78de9e176d07adb17fc1c6	no	17
Warnings:					
Information:					
4	Non Patent Literature	2016_07_13_REF6_NPL3_A303 AA-012300US.pdf	158251 d519b3f65b367c2ee5b6d68886b1f1de674a2b96	no	16
Warnings:					
Information:					
Total Files Size (in bytes):			4334417		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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

In re application of:

Young Hoon KWON et al.

Application No.: 15/078,920

Filed: March 23, 2016

For: APPARATUS AND METHOD FOR
DOWNLINK AND UPLINK MULTI-
USER TRANSMISSIONS

Customer No.: 83220

Confirmation No.: 2806

Examiner: PHAN, TRI H

Art Unit: 2471

SUPPLEMENTAL INFORMATION
DISCLOSURE STATEMENT UNDER 37 CFR
§1.97 and §1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The references cited on attached form PTO/SB/08A and PTO/SB/08B are being called to the attention of the Examiner. Copies of the references are enclosed in compliance with the requirements of 37 CFR §1.98(a)(2).

It is respectfully requested that the cited references be expressly considered during the prosecution of this application, and the references be made of record therein and appear among the “references cited” on any patent to issue therefrom.

As provided for by 37 CFR §1.97(g) and (h), no inference should be made that the information and references cited are prior art merely because they are in this statement and no representation is being made that a search has been conducted or that this statement encompasses all the possible relevant information.

This IDS is being filed before the mailing date of the final Office Action or Notice of Allowance.

CERTIFICATION

I hereby certify that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.

Applicant believes that no fee is required for submission of this statement. However, if a fee is required, the Commissioner is authorized to deduct such fee from the undersigned's Deposit Account No. 50-4713. Please deduct any additional fees from, or credit any overpayment to, the above-noted Deposit Account.

Respectfully submitted,

/Kevin W. Raudebaugh/
Kevin W. Raudebaugh
Reg. No. 65,587

AMPACC Law Group, PLLC
6100 219th St. SW, Suite 580
Mountlake Terrace, WA 98043
Tel: 425-348-3500
Fax: 425-348-3299

Doc Code: ECOMM.AUTH/ECOMM.WTDW

Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

**AUTHORIZATION FOR INTERNET
COMMUNICATIONS IN A PATENT
APPLICATION OR REQUEST TO
WITHDRAW AUTHORIZATION FOR
INTERNET COMMUNICATIONS**

Application No.	15/078920
Filing Date	March 23, 2016
First Named Inventor	Young Hoon KWON
Art Unit	2471
Examiner Name	PHAN, TRI H
Practitioner Docket No.	A303AA-012300US

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. To authorize permission for Internet Communications.

☒ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number 65,215.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Dennis M. O'Connor/
Signature

July 14, 2016
Date

Dennis M. O'Connor, Reg. #65215
Typed or printed name

602-885-8150
Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

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.

Electronic Acknowledgement Receipt

EFS ID:	26362384
Application Number:	15078920
International Application Number:	
Confirmation Number:	2806
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
First Named Inventor/Applicant Name:	Young Hoon KWON
Customer Number:	83220
Filer:	Dennis Michael O'Connor
Filer Authorized By:	
Attorney Docket Number:	A303AA-012300US
Receipt Date:	15-JUL-2016
Filing Date:	23-MAR-2016
Time Stamp:	13:50:27
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	Internet Communications Authorized	2016_07_14_AUTH_INT_COM M_A303AA-012300US.pdf	75228 b9381254f541ca7a01c1f5d062fe095d14f6ef20	no	2

Warnings:

ZYXEL-1002

Page 135 (of 196)

Information:	
Total Files Size (in bytes):	75228
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.	

Appl. No. 15/078,920
Response to Office Action of June 09, 2016
Amdt. dated July 22, 2016

PATENT
Attorney Docket No.: A303AA-012300US
Client Ref. No.: P15-041US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Young Hoon KWON et al.

Application No.: 15/078,920

Filed: March 23, 2016

For: APPARATUS AND METHOD FOR
DOWNLINK AND UPLINK
MULTI-USER TRANSMISSIONS

Customer No.: 83220

Confirmation No.: 2806

Examiner: PHAN, TRI H

Technology Center/Art Unit: 2471

AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed June 09, 2016, and the Interview held with the Examiner on July 20, 2016, please enter the following amendments and remarks:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A method, implemented by a network device in a wireless network, for coordinating an uplink multi-user response transmission to a downlink multi-user transmission, the method comprising:

generating, by the network device, a downlink multi-user frame addressed to a plurality of stations operating in the wireless network, the downlink multi-user frame including a plurality of resource units ~~that are each assigned to a station in the plurality of stations~~ (RUs), wherein generating the downlink multi-user frame comprises:

assigning each RU of the plurality of RUs to a respective station in the plurality of stations, and

including a respective set of MAC Protocol Data Units (MPDUs) in each ~~resource unit RU~~ RU of the plurality of ~~resource units~~ RUs,

wherein ~~one or more MPDUs~~ an MPDU in ~~each one or more~~ each of the ~~resource units~~ RUs in the plurality of RUs ~~downlink multi-user frame~~ includes acknowledgement information ~~transmitted by each~~ indicating properties of a multi-user acknowledgement transmission ~~transmitted by each~~ [[for]] ~~respective that the~~ station in the plurality of stations to which the RU is assigned is requested to transmit to acknowledge the downlink multi-user frame; [[and]]

transmitting the downlink multi-user frame to the plurality of stations over a wireless channel; and

receiving the uplink multi-user response transmission, the uplink multi-user response transmission including multi-user acknowledgement transmissions respectively and simultaneously transmitted by two or more stations in the plurality of stations,

wherein the plurality of RUs respectively correspond to a plurality of simultaneous uplink transmissions, and each of the plurality of simultaneous uplink transmissions uses a sub-channel, spatial stream, or sub-channel and spatial stream combination that is not used by any other of the plurality of simultaneous uplink transmissions.

2. (Original) The method of claim 1, wherein generating the downlink multi-user frame further comprises:

including the acknowledgement information, for indicating properties of the multi-user acknowledgement transmission transmitted by each respective station in the plurality of stations to acknowledge the downlink multi-user frame, in a header of the one or more MPDUs.

3. (Original) The method of claim 2, wherein the header is a MAC header of the one or more MPDUs.

4. (Currently amended) The method of claim 1, wherein one of the one or more MPDUs in each of the ~~resource units in the downlink multi-user frame~~ RUs of the plurality of RUs is a unicast trigger frame that contains the acknowledgement information for the respective station in the plurality of stations.

5. (Original) The method of claim 4, wherein the trigger frame instigates each respective station in the plurality of stations to transmit the multi-user acknowledgement transmission after an interframe spacing period following receipt of the downlink multi-user frame.

6. (Original) The method of claim 1, further comprising:
generating, by the network device, a multi-user block acknowledgement request frame to solicit acknowledgements from two or more stations of the plurality of stations; and
transmitting the multi-user block acknowledgment request frame following transmission of the downlink multi-user frame.

7. (Currently amended) The method of claim 1, wherein the acknowledgement information includes one or more of: (1) an indication of whether the acknowledgement transmission is multi-user or single user, and (2) an indication of whether the acknowledgment transmission is immediate or non-immediate, and ~~(3) further includes~~ resource scheduling information ~~for when~~ the multi-user acknowledgement transmission is indicated.

8. (Currently amended) A method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment, the method comprising:

receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, and received from an access point in the wireless network;

processing a first MAC Protocol Data Units (MPDU) in the downlink multi-user frame to determine acknowledgement information ~~[[for]]~~ indicating properties of a first multi-user acknowledgement frame ~~to acknowledge the downlink multi-user frame by two or more stations;~~

generating the first multi-user acknowledgment frame based on the acknowledgement information; and

transmitting the first multi-user acknowledgement frame to the access point ~~based on the acknowledgement information to acknowledge the downlink multi-user frame,~~

wherein the first multi-user acknowledgement frame is transmitted simultaneously to a second multi-user acknowledgement frame transmitted by a second station.

9. (Currently amended) The method of claim 8, wherein the first MPDU is located in a first resource unit of the downlink multi-user frame allocated to the first station, wherein the downlink multi-user frame includes a second resource unit that contains a second MPDU ~~with that includes~~ acknowledgement information for ~~a second station to transmit a~~ second multi-user acknowledgement frame.

10. (Original) The method of claim 9, wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement frame together form a multi-user acknowledgement frame for acknowledging the downlink multi-user frame.

11. (Currently amended) The method of claim 8, wherein processing the first MPDU comprises:

extracting the acknowledgement information, ~~for~~ indicating the properties of the first multi-user acknowledgement frame, ~~in~~ from a header of the first MPDU.

12. (Original) The method of claim 11, wherein the header is a MAC header of the first MPDU.

13. (Currently amended) The method of claim 8, wherein processing the MPDU comprises:

extracting the acknowledgement information, ~~for~~ indicating the properties of the first multi-user acknowledgement frame transmission[[,]] from a payload of the first MPDU, wherein the first MPDU is a unicast trigger frame.

14. (Original) The method of claim 13, further comprising:
processing a second MPDU in a same resource unit as the first MPDU, wherein the second MPDU includes data intended for the first station.

15. (Original) The method of claim 13, wherein the trigger frame instigates the first station to transmit the first multi-user acknowledgement after an interframe spacing period following receipt of the downlink multi-user frame.

16. (Currently amended) The method of claim 8, further comprising:
receiving a multi-user block acknowledgement request frame that solicits acknowledgements from ~~two or more stations~~ the first and second station, wherein the first multi-user acknowledgement frame is transmitted after receipt of and in response to the multi-user block acknowledgement request frame.

17. (Currently amended) The method of claim 8, wherein the acknowledgement information includes one or more of: (1) an indication of whether the first multi-user acknowledgement frame is part of a multi-user or a single user transmission, and (2) an indication of whether the first multi-user acknowledgement frame is transmitted immediately following receipt of the downlink multi-user frame or upon receipt of a multi-user block acknowledgement request frame, and ~~and [(3)]~~ further includes resource scheduling information ~~for an uplink when the first multi-user acknowledgement transmission frame is indicated as being part of the multi-user transmission.~~

18. (Currently amended) A method, implemented by a first station in a wireless network, for transmitting an uplink acknowledgment, the method comprising:

receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, wherein the downlink multi-user frame is received from an access point in the wireless network;

receiving a multi-user block acknowledgement request frame that solicits acknowledgements from ~~two or more stations~~ the first station and a second station, wherein the multi-user block acknowledgement request frame includes acknowledgement information ~~[[for]]~~ indicating properties of a first multi-user acknowledgement frame ~~that acknowledges receipt of the downlink multi-user frame by the first station;~~

generating the first multi-user acknowledgment frame based on the acknowledgement information; and

acknowledging the receipt of the downlink multi-user frame by transmitting the first multi-user acknowledgement frame to the access point based on the acknowledgement information, wherein the first multi-user acknowledgement frame is transmitted simultaneously with a second multi-user acknowledgement frame generated and transmitted by the second station.

19. (Currently amended) The method of claim 18, wherein the acknowledgement information includes one or more of: (1) an indication of whether the first multi-user acknowledgement frame is part of a multi-user or single user transmission and (2) resource scheduling information for the first multi-user acknowledgement transmission.

20. (Currently amended) The method of claim 18, wherein the acknowledgment scheduling information includes properties of ~~[[a]]~~ the second multi-user acknowledgement frame generated and transmitted by ~~[[a]]~~ the second station, wherein the first multi-user acknowledgement frame and the second multi-user acknowledgement together form a multi-user transmission.

INTERVIEW SUMMARY

In the Interview with the Examiner held on July 20, 2016, the amendments to the claims presented herein were discussed. Applicants appreciate the Examiner's acknowledgement during the Interview that these amendments are sufficient to overcome the current rejections of the claims, and that additional search of the art would be required to determine the allowability of the claims.

Applicants also appreciate the Examiner's willingness to contact Applicant's undersigned representative with suggestions that may expedite the prosecution of the present application.

REMARKS/ARGUMENTS

The claims have been amended as indicated above. No new matter has been added.

Claims 1-20 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over US Pub. No. 2013/0301569 to Wang et al. (Wang). Applicants respectfully traverse the rejections.

As discussed with the Examiner at the July 20, 2016 interview, the claims are directed to Up-Link (UL) Multi-User (MU) transmissions, and in particular to UL MU acknowledgement transmissions transmitted in response to a Down-Link (DL) frame. The UL MU transmissions may be simultaneous transmitted from respective stations to an Access Point (AP).

Wang does not disclose UL MU transmissions, much less UL MU acknowledgement transmissions. Wang only discloses DL MU transmissions, such as the DL MU Block Ack (BA) frame 950 shown being transmitted by a single device (an AP) in FIG. 9 of Wang.

Because Wang does not disclose UL MU transmissions, then per the discussion held during the Interview of July 20, continued maintenance of the current rejection of the claims as unpatentable over Wang would be improper and the rejections should be withdrawn.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

The Commissioner is authorized to charge any deficiency in any fees required under 37 C.F.R. 1.16 and/or 1.17, including extension of time fees, and credit any overpayment to Deposit Account No. 50-4713.

If the Examiner believes a telephone conference would expedite prosecution of this Application, please telephone the undersigned at 602-885-8150.

Respectfully submitted,

/Dennis M. O'Connor/

Dennis M. O'Connor
Reg. No. 65,215

AMPACC Law Group, PLLC
6100 219th St. SW, Suite 580
Mountlake Terrace, WA 98043
Tel: 425-348-3500
Fax: 425-348-3299
DOC

Electronic Acknowledgement Receipt

EFS ID:	26436070
Application Number:	15078920
International Application Number:	
Confirmation Number:	2806
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
First Named Inventor/Applicant Name:	Young Hoon KWON
Customer Number:	83220
Filer:	Dennis Michael O'Connor
Filer Authorized By:	
Attorney Docket Number:	A303AA-012300US
Receipt Date:	22-JUL-2016
Filing Date:	23-MAR-2016
Time Stamp:	19:19:47
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	Amendment/Req. Reconsideration-After Non-Final Reject	2016_07_22_AMD_A303AA-012300US.pdf	110852 c4661d4eb74078eb5b18fd699c4682dd7fc69624	no	8

Warnings:

ZYXEL-1002

Page 145 (of 196)

Information:	
Total Files Size (in bytes):	110852
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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 APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/078,920	Filing Date 03/23/2016	☐ To be Mailed
---	---	----------------------------------	---------------------------------------

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
☐ 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	07/22/2016	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X \$40 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X \$210 =	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	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	☐ 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.

** 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 number found in the appropriate box in column 1.

LIE
GLORIA ANTHONY

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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US	2806
83220	7590	07/28/2016	EXAMINER	
AMPACC Law Group, PLLC			PHAN, TRI H	
Steve Cho			ART UNIT	
6100 219th Street SW, Suite 580			PAPER NUMBER	
Mountlake Terrace, WA 98043			2471	
			NOTIFICATION DATE	DELIVERY MODE
			07/28/2016	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):

docketing@ampacc.com
scho@ampacc.com

<i>Applicant-Initiated Interview Summary</i>	Application No. 15/078,920	Applicant(s) KWON ET AL.	
	Examiner TRI H. PHAN	Art Unit 2471	

All participants (applicant, applicant's representative, PTO personnel):

(1) TRI H. PHAN. (3)_____.

(2) DENNIS O'CONNOR (Reg. No. 65,215). (4)_____.

Date of Interview: 20 July 2016.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1,8 and 18.

Identification of prior art discussed: Wang et al. (U.S. 2013/0301569).

Substance of Interview

(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Discussed the differences between prior art and proposed amendment claim invention. No agreement was reached at this time; further search and consideration will be required in determining the patent ability of the claims, when the official amendment is submitted.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the 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.

☐ Attachment

/TRI H. PHAN/
Primary Examiner, Art Unit 2471

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

83220 7590 08/15/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

EXAMINER

PHAN, TRI H

ART UNIT

PAPER NUMBER

2471

DATE MAILED: 08/15/2016

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

15/078,920

03/23/2016

Young Hoon KWON

A303AA-012300US

2806

TITLE OF INVENTION: APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0	\$0	\$480	11/15/2016

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 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity 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 and an extra copy of the form should be submitted. 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: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (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 including the Patent, advance orders and notification of maintenance fees 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.

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

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.

83220 7590 08/15/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

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 facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US	2806

TITLE OF INVENTION: APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0	\$0	\$480	11/15/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
PHAN, TRI H	2471	370-329000

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/SB/122) attached. ☐ "Fee Address" indication (or "Fee Address" Indication form 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, 1 _____ (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. 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 has been filed for recordation as set forth in 37 CFR 3.11. 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. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

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

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
☐ Applicant asserting small entity status. See 37 CFR 1.27
☐ Applicant changing to regular undiscounted fee status.

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.

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.

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. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US	2806

83220 7590 08/15/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

EXAMINER

PHAN, TRI H

ART UNIT PAPER NUMBER

2471

DATE MAILED: 08/15/2016

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 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, 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. 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.

Notice of Allowability	Application No. 15/078,920	Applicant(s) KWON ET AL.	
	Examiner TRI H. PHAN	Art Unit 2471	AIA (First Inventor to File) 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 the Amendment filed on 07/22/2016.
☐ 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 1-20. 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) | 5. ☐ Examiner's Amendment/Comment |
| 2. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. ☒ Examiner's Statement of Reasons for Allowance |
| 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. ☐ Other _____. |
| 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/TRI H. PHAN/
Primary Examiner, Art Unit 2471

Art Unit: 2471

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

DETAILED ACTION

Response to Communication(s)

1. This office action is in response to the Amendment/Arguments filed on July 22nd, 2016. Claims 1-20 are now pending in the application.

Information Disclosure Statement

2. The information disclosure statement filed 07/13/16 complies with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609. It has been considered and placed in the application file.

Response to Amendment/Arguments

3. The 35 U.S.C. 103(a) rejection to claims 1-20 of the previous office action sent on 06/09/16 have been withdrawn in light of the outstanding applicant's amendment/arguments (see REMARKS, page 7).

Allowable Subject Matter

4. Claims 1-20 are allowed. The following is a statement of reasons for the indication of allowable subject matter:

The Applicants' amendments/arguments in the outstanding response filed 07/22/16 have been fully appreciated and considered. The prior art of record, considered individually or in combination, fails to fairly show or suggest the claimed method (claim 1), implemented by a network device in a wireless network, for coordinating an uplink multi-user response transmission to a downlink multi-user transmission, comprising the novel and unobvious limitation of "*generating, by the network device, a*

Art Unit: 2471

downlink multi-user frame addressed to a plurality of stations operating in the wireless network, the downlink multi-user frame including a plurality of resource units 'RUs', wherein generating the downlink multi-user frame comprises assigning each RU of the plurality of RUs to a respective station in the plurality of stations, and including a respective set of MAC Protocol Data Units 'MPDUs' in each RU of the plurality of RUs, wherein an MPDU in one or more of the RUs in the plurality of RUs includes acknowledgement information indicating properties of a multi-user acknowledgement transmission that the station in the plurality of stations to which the RU is assigned is requested to transmit to acknowledge the downlink multi-user frame; transmitting the downlink multi-user frame to the plurality of stations over a wireless channel; and receiving the uplink multi-user response transmission, the uplink multi-user response transmission including multi-user acknowledgement transmissions respectively and simultaneously transmitted by two or more stations in the plurality of stations, wherein the plurality of RUs respectively correspond to a plurality of simultaneous uplink transmissions, and each of the plurality of simultaneous uplink transmissions uses a sub-channel, spatial stream, or sub-channel and spatial stream combination that is not used by any other of the plurality of simultaneous uplink transmissions."

structurally and functionally interconnected with other limitations in a manner as recited in dependent claims 2-7.

The prior art of record also fails to fairly show or suggest the claimed method (claim 8) for transmitting an uplink acknowledgment, comprising the novel and unobvious limitations as "*receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, and received from an access point in the wireless network; processing a first MAC Protocol Data Units 'MPDU' in the downlink multi-user frame to determine acknowledgement information indicating properties of a first multi-user acknowledgement frame; generating the first multi-user acknowledgment frame based on the acknowledgement information; and transmitting the first multi-user acknowledgement frame to the access point to acknowledge the downlink multi-user frame, wherein the first multi-user acknowledgement frame is transmitted simultaneously to a second multi-user acknowledgement frame transmitted by a second station."* structurally and functionally interconnected with other limitations in a manner as recited in dependent claims 9-17.

Art Unit: 2471

The prior art of record also fails to fairly show or suggest the claimed method (claim 18) for transmitting an uplink acknowledgment, comprising the novel and unobvious limitations as *"receiving a downlink multi-user frame addressed to a plurality of stations, including the first station, wherein the downlink multi-user frame is received from an access point in the wireless network; receiving a multi-user block acknowledgement request frame that solicits acknowledgements from the first station and a second station, wherein the multi-user block acknowledgement request frame includes acknowledgement information indicating properties of a first multi-user acknowledgement frame; generating the first multi-user acknowledgment frame based on the acknowledgement information; and acknowledging the receipt of the downlink multi-user frame by transmitting the first multi-user acknowledgement frame to the access point, wherein the first multi-user acknowledgement frame is transmitted simultaneously with a second multi-user acknowledgement frame generated and transmitted by the second station."* structurally and functionally interconnected with other limitations in a manner as recited in dependent claims 19-20.

5. References U.S. 8,582,485; U.S. 8,982,758; U.S. 9,338,789; U.S. 2016/0028452; U.S. 2016/0037484; U.S. 2016/0088602 and U.S. 2016/0227569 are cited because they are put pertinent to improve multi-user wireless communication in telecommunication networks. However, none of references teach as recited in claimed invention.

Any comments considered necessary by applicant must be submitted no later than the 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

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tri H. Phan, whose telephone number is (571) 272-3074. The examiner can normally be reached on M-F (8:00-4:30).

Art Unit: 2471

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi H. Pham can be reached on (571) 272-3179.

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.

/TRI H. PHAN/
Primary Examiner, Art Unit 2471

August 10, 2016

Notice of References Cited	Application/Control No. 15/078,920		Applicant(s)/Patent Under Reexamination KWON ET AL.	
	Examiner TRI H. PHAN		Art Unit 2471	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-8,582,485 B2	11-2013	Fischer; Matthew James	H04L5/0023	370/312
*	B	US-8,982,758 B2	03-2015	Gong; Michelle X.	H04B7/0452	370/312
*	C	US-9,338,789 B2	05-2016	Wang; Xiaofei	H04W72/0413	1/1
*	D	US-2016/0028452 A1	01-2016	CHU; Liwen	H04J11/00	375/267
*	E	US-2016/0037484 A1	02-2016	KWON; Young Hoon	H04W72/005	370/312
*	F	US-2016/0088602 A1	03-2016	SEOK; Yongho	H04L5/0055	370/338
*	G	US-2016/0227569 A1	08-2016	Wang; Xiaofei	H04W72/1278	370/338
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	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. 15078920	Applicant(s)/Patent Under Reexamination KWON ET AL.
	Examiner TRI H PHAN	Art Unit 2471

CPC- SEARCHED		
Symbol	Date	Examiner
H04L1/1621,1685,1854,1864,1887,1896;H04L5/0055;H04W4/06;H04W28/044;H04W84/12	5/30/2016	TP
H04L1/00,12,16,1614,1621,1685,1854,1861,1864,1887,1896;H04L5/0055;H04L27/2601,2628;H04W4/06;H04W28/044;H04W72/042,0406,0446,1268;H04W84/12;H04B7/0452;H04J11/00	8/5/2016	TP

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
370	310-350	5/30/2016	TP

SEARCH NOTES		
Search Notes	Date	Examiner
EAST (USPT,JPO,EPO,FPRS,DWPI) - see text search printout.	5/30/2016	TP
Inventorship search.	8/5/2016	TP
EAST (updated search history printout).	8/5/2016	TP

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Interference search history printout.	8/5/2016	TP

	/TRI H PHAN/ Primary Examiner.Art Unit 2471
--	--



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 2806

SERIAL NUMBER 15/078,920	FILING or 371(c) DATE 03/23/2016 RULE	CLASS 370	GROUP ART UNIT 2471	ATTORNEY DOCKET NO. A303AA-012300US		
APPLICANTS NEWRACOM, INC., Irvine, CA; INVENTORS Young Hoon KWON, Irvine, CA; Ahmad Reza HEDAYAT, Irvine, CA; ** CONTINUING DATA ***** This appln claims benefit of 62/137,138 03/23/2015 and claims benefit of 62/140,349 03/30/2015 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** ** SMALL ENTITY ** 04/11/2016						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged <u>/TRI H PHAN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY CA	SHEETS DRAWINGS 13	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS AMPACC Law Group, PLLC Steve Cho 6100 219th Street SW, Suite 580 Mountlake Terrace, WA 98043 UNITED STATES						
TITLE APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS						
FILING FEE RECEIVED 730	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees			
			☐ 1.16 Fees (Filing)			
			☐ 1.17 Fees (Processing Ext. of time)			
			☐ 1.18 Fees (Issue)			
			☐ Other _____			
				☐ Credit		

PTO/SB/08A (04-07)

Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known			
		Application Number	15/078,920		
		Filing Date	March 23, 2016		
		First Named Inventor	Young Hoon KWON		
		Art Unit	2471		
		Examiner Name	PHAN, TRI H		
Sheet	1	of	2	Attorney Docket Number	A303AA-012300US

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number Kind Code ² (if known)			
	1	US-2012/0213308 A1	08-23-2012	MERLIN et al.	
	2	US-2010/0310003 A1	12-09-2010	LAUER et al.	
	3	US-2013/0301569 A1	11-14-2013	WANG et al.	

Examiner Signature	/Tri Phan/ (08/05/2016)	Date Considered	08/05/2016
-----------------------	-------------------------	--------------------	------------

*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. ¹ Applicant's unique citation designation number (optional). ² Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to place a check mark here, if English language Translation is attached.

Substitute for form 1449B/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	15/078,920
				Filing Date	March 23, 2016
				First Named Inventor	Young Hoon KWON
				Art Unit	2471
				Examiner Name	PHAN, TRI H
Sheet	2	of	2	Attorney Docket Number	A303AA-012300US

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials *	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²	
	4	International Search Report and Written Opinion for International Patent Application No. PCT/US2016/023829 filed March 23, 2016 (Attorney Docket No. 303-012300PC).	☐	
	5	SIMONE MERLIN et al., "Multi-STA Acknowledgment", IEEE 802.11-15/0366r1, March 9, 2015, pp.1-17, IEEE.	☐	
	6	KISEON RYU et al., "UL MU Procedure", IEEE 802.11-15/0365r0, March 9, 2015, pp. 1-16, IEEE.	☐	

Examiner Signature	/Tri Phan/ (08/05/2016)	Date Considered	08/05/2016
-----------------------	-------------------------	--------------------	------------

*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.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached.

<i>Index of Claims</i> 	Application/Control No. 15078920	Applicant(s)/Patent Under Reexamination KWON ET AL.
	Examiner TRI H PHAN	Art Unit 2471

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

☒ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		DATE							
Final	Original	05/30/2016	08/05/2016						
	1	✓	=						
	2	✓	=						
	3	✓	=						
	4	✓	=						
	5	✓	=						
	6	✓	=						
	7	✓	=						
	8	✓	=						
	9	✓	=						
	10	✓	=						
	11	✓	=						
	12	✓	=						
	13	✓	=						
	14	✓	=						
	15	✓	=						
	16	✓	=						
	17	✓	=						
	18	✓	=						
	19	✓	=						
	20	✓	=						

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S53	4	(MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (uplink ("up" adj1 link)) and (ACK! acknowledge\$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/08/05 18:03
S54	6	((MPDU! (protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (uplink ("up" adj1 link)) and (ACK! acknowledge\$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/08/05 18:07
S55	12	(MAC! and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (uplink ("up" adj1 link)) and (ACK! acknowledge\$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/08/05 18:07
S56	62	((((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (uplink ("up" adj1 link)) and (ACK! acknowledge\$3)).clm.	US-PGPUB; USPAT	OR	ON	2016/08/05 19:05

8/ 5/ 2016 7:22:57 PM
C:\ Users\ tphan4\ Documents\ EAST\ Workspaces\ 15-078920.wsp

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S34	6	(NEWRACOM.asn. or (KWON.in. and YOUNG-HOON.in.) or (HEDAYAT.in. and AHMAD-REZA.in.)) and (MAC! and (MPDU! PDU! (Protocol adj data adj unit)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 11:27
S35	88	(MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and (((multi\$3 adj1 user\$1) or (group adj1 user\$1)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 14:33
S39	214	(MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((uplink ("up" adj1 link)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 15:26
S41	55242	(H04L1/00,12,16,1614,1621,1685,1854,1861,1864,1887,1896 OR H04L5/0055 OR H04L27/2601,2628).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 16:04
S42	217	S41 and (MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (uplink ("up" adj1 link)) and (ACK! acknowledge\$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 16:05
S43	170	S42 and @ad<="20150323"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 16:06
S44	96581	(H04W4/06 OR H04W28/044 OR H04W72/0406,0446 OR H04W84/12 OR H04B7/0452 OR H04J11/00).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 16:26
S45	299	S44 and (MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and (uplink ("up" adj1 link)) and (ACK! acknowledge\$3))	US-PGPUB; USPAT; USOCR;	OR	ON	2016/08/05 16:26

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S46	225	S45 and @ad<="20150323"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 16:26
S47	155	370/310-350.ccls. and (MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((uplink ("up" adj1 link)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 17:17
S48	15	375/\$7.ccls. and (MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((uplink ("up" adj1 link)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 18:01
S49	14	455/\$7.ccls. and (MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((uplink ("up" adj1 link)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 18:02
S50	1	709/\$7.ccls. and (MAC! and (MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((uplink ("up" adj1 link)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 18:03
S51	52150	(H04L5/0055 OR H04W72/042 OR H04w72/0446 OR H04W72/1268).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 19:05
S52	77	S51 and ((MPDU! (MAC! adj protocol adj data adj unit\$1)) and ((multi\$3 adj1 user\$1) or (group adj1 user\$1)) and ((uplink ("up" adj1 link)) with (ACK! acknowledge\$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/05 19:06

8/ 5/ 2016 7:22:45 PM
C:\ Users\ tphan4\ Documents\ EAST\ Workspaces\ 15-078920.wsp

Issue Classification 	Application/Control No. 15078920	Applicant(s)/Patent Under Reexamination KWON ET AL.	
	Examiner TRI H PHAN	Art Unit 2471	

CPC						
Symbol					Type	Version
H04L		5	/	0055	F	2013-01-01
H04W		72	/	1268	I	2013-01-01
H04W		72	/	042	I	2013-01-01
H04W		72	/	0446	I	2013-01-01
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			
			/			

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
		20	
(Assistant Examiner)	(Date)		
/TRI H PHAN/ Primary Examiner.Art Unit 2471	08/05/2016	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	12

Issue Classification 	Application/Control No. 15078920	Applicant(s)/Patent Under Reexamination KWON ET AL.
	Examiner TRI H PHAN	Art Unit 2471

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		17												
	2		18												
	3		19												
	4		20												
	5														
	6														
	7														
	8														
	9														
	10														
	11														
	12														
	13														
	14														
	15														
	16														

NONE	Total Claims Allowed: 20	
(Assistant Examiner)	(Date)	
/TRI H PHAN/ Primary Examiner.Art Unit 2471	08/05/2016	O.G. Print Claim(s) 1
(Primary Examiner)	(Date)	O.G. Print Figure 12



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US

CONFIRMATION NO. 2806

PUBLICATION NOTICE



OC000000086146554

83220
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

Title: APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

Publication No. US-2016-0285608-A1

Publication Date: 09/29/2016

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 Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, 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 <http://pair.uspto.gov/>. 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.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax **(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 including the Patent, advance orders and notification of maintenance fees 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.

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

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.

83220 7590 08/15/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

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 facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	03/23/2016	Young Hoon KWON	A303AA-012300US	2806

TITLE OF INVENTION: APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0	\$0	\$480	11/15/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
PHAN, TRI H	2471	370-329000

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/SB/122) attached. ☐ "Fee Address" indication (or "Fee Address" Indication form 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, 1 _____ (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. 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 has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

NEWRACOM, INC.

IRVINE, CALIFORNIA

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

4a. The following fee(s) are submitted:

- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☒ Payment by credit card. Form PTO-2038 is attached.
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 50-4713 (enclose an extra copy of this form).

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

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

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.

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.

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 /Dennis M. O'Connor/

Date November 15, 2016

Typed or printed name Dennis M. O'Connor

Registration No. 65,215

Electronic Patent Application Fee Transmittal

Application Number:	15078920			
Filing Date:	23-Mar-2016			
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS			
First Named Inventor/Applicant Name:	Young Hoon KWON			
Filer:	Dennis Michael O'Connor			
Attorney Docket Number:	A303AA-012300US			
Filed as Small 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:				
UTILITY APPL ISSUE FEE	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				480

Electronic Acknowledgement Receipt

EFS ID:	27515331
Application Number:	15078920
International Application Number:	
Confirmation Number:	2806
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
First Named Inventor/Applicant Name:	Young Hoon KWON
Customer Number:	83220
Filer:	Dennis Michael O'Connor/Nadin Hamoui-Najjar
Filer Authorized By:	Dennis Michael O'Connor
Attorney Docket Number:	A303AA-012300US
Receipt Date:	15-NOV-2016
Filing Date:	23-MAR-2016
Time Stamp:	18:57:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$480
RAM confirmation Number	111616INTEFSW18581400
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

--

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	2016_11_15_FEE_TRNSMTL_A303AA-012300US.pdf	1093212	no	1
			693b1552f8cb6c5f739223f672ef2a03c9afa1e4		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30533	no	2
			4f4e4b7cd6d401212bcbad2061dab7a1cc53984b		

Warnings:

Information:

Total Files Size (in bytes):			1123745
------------------------------	--	--	---------

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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/078,920	12/27/2016	9531520	A303AA-012300US	2806

83220 7590 12/07/2016
AMPACC Law Group, PLLC
Steve Cho
6100 219th Street SW, Suite 580
Mountlake Terrace, WA 98043

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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 Application Information Retrieval (PAIR) WEB site (<http://pair.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 Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Young Hoon KWON, Irvine, CA;
NEWRACOM, INC., Irvine, CA;
Ahmad Reza HEDAYAT, Irvine, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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.

**CHANGE OF
CORRESPONDENCE ADDRESS**
*Patent*Address to:
Mail Stop Post Issue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Patent Number	9531520
Issue Date	2016-12-27
Application Number	15078920
Filing Date	2016-03-23
First Named Inventor	Young Hoon Kwon
Attorney Docket Number	303AA0123US

Please change the Correspondence Address for the above-identified patent to:



The address associated with Customer Number:

179786

OR**Firm or
Individual Name****Address****City****State****ZIP****Country****Telephone****Email**

This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

This form will not affect any "fee address" provided for the above-identified patent. To change a "fee address" use the "Fee Address Indication Form" (PTO/SB/47).

I am the:



Patentee.



If the Patentee was not the applicant for patent (37 CFR 1.42), then a Statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is enclosed or was filed on _____. See 37 CFR 3.71.



Attorney or agent of record. Registration Number _____.



Patent practitioner acting in a representative capacity whose correspondence address is the correspondence address of record. Notice has been given to the patentee or owner. Registration Number _____.

Signature /Thomas J. Lavan/

Typed or
Printed Name Thomas J. Lavan

Date 2021-06-22

Telephone 303-301-4431

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.



*Total of _____ forms are submitted.

This collection of information is required by 37 CFR 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: Mail Stop Post Issue, 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.

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.

Electronic Acknowledgement Receipt

EFS ID:	43172161
Application Number:	15078920
International Application Number:	
Confirmation Number:	2806
Title of Invention:	APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONS
First Named Inventor/Applicant Name:	Young Hoon KWON
Customer Number:	83220
Filer:	Thomas John Lavan
Filer Authorized By:	
Attorney Docket Number:	303AA0123US
Receipt Date:	06-JUL-2021
Filing Date:	23-MAR-2016
Time Stamp:	11:55:05
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	Assignee showing of ownership per 37 CFR 3.73	373C_9531520_062321.pdf	117862	no	3
			7990b12061b14680e231127e68d78bcb1e4c0e93		

Warnings:

ZYXEL-1002

Page 181 (of 196)

Information:					
2	Change of Address	Change_of_Correspondence_9531520_062321.pdf	245872	no	2
			aaa0d83fe049da73ff128d54c6d2c80ee3c0c0fc		
Warnings:					
Information:					
Total Files Size (in bytes):			363734		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

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: Atlas Global Technologies LLCApplication No./Patent No.: 15/078,920Filed/Issue Date: 03/23/2016Titled: APPARATUS AND METHOD FOR DOWNLINK AND UPLINK MULTI-USER TRANSMISSIONSAtlas Global Technologies LLC, 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:

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 055517, Frame 0548, 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.

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.

/Thomas J. Lavan/

2021-06-22

Signature

Date

Thomas J. Lavan

58487

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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE	REQUEST ID
15/078,920	03/23/2016	Young Hoon KWON	303AA0123US	143609

Acknowledgement of Loss of Entitlement to Entity Status Discount

The entity status change request below filed through Private PAIR on 07/15/2021 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

✕ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Thomas J. Lavan/
Name:	Thomas J. Lavan
Registration Number:	58487

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 2:22-cv-00103	DATE FILED 4/4/2022	U.S. DISTRICT COURT Eastern District of Texas, Marshall Division
PLAINTIFF ATLAS GLOBAL TECHNOLOGIES LLC		DEFENDANT D-LINK CORPORATION
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 9,531,520	12/27/2016	ATLAS GLOBAL TECHNOLOGIES LLC
2 9,763,259	9/12/2017	ATLAS GLOBAL TECHNOLOGIES LLC
3 9,825,738	11/21/2017	ATLAS GLOBAL TECHNOLOGIES LLC
4 9,848,442	12/19/2017	ATLAS GLOBAL TECHNOLOGIES LLC
5 *		*SEE ATTACHED FOR ADDITIONAL PATENTS

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY	
	☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
-------	-------------------	------

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Attachment to AO 120 filed 4/4/2022 in Case No. 2:22-cv-00103

Patent Number	Date of Patent	Holder of Patent
US 9,912,513	3/6/2018	Atlas Global Technologies LLC
US 9,917,679	3/13/2018	Atlas Global Technologies LLC
US 10,020,919	7/10/2018	Atlas Global Technologies LLC
US 10,153,886	12/11/2018	Atlas Global Technologies LLC
US 10,756,851	8/25/2020	Atlas Global Technologies LLC

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas, Waco Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 6:22-cv-00355	DATE FILED 4/4/2022	U.S. DISTRICT COURT Western District of Texas, Waco Division
PLAINTIFF ATLAS GLOBAL TECHNOLOGIES LLC		DEFENDANT ZYXEL NETWORKS CORPORATION and ZYXEL COMMUNICATIONS CORPORATION
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 9,763,259	9/12/2017	ATLAS GLOBAL TECHNOLOGIES LLC
2 US 9,825,738	11/21/2017	ATLAS GLOBAL TECHNOLOGIES LLC
3 US 9,531,520	12/27/2016	ATLAS GLOBAL TECHNOLOGIES LLC
4 US 9,848,442	12/19/2017	ATLAS GLOBAL TECHNOLOGIES LLC
5 *		* SEE ATTACHED FOR ADDITIONAL PATENTS

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Attachment to AO 120 filed 4/4/2022 in Case No. 6:22-cv-00355

Patent Number	Date of Patent	Holder of Patent
US 9,912,513	3/6/2018	Atlas Global Technologies LLC
US 9,917,679	3/13/2018	Atlas Global Technologies LLC
US 10,020,919	7/10/2018	Atlas Global Technologies LLC
US 10,153,886	12/11/2018	Atlas Global Technologies LLC
US 10,756,851	8/25/2020	Atlas Global Technologies LLC

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas, Waco Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 6:22-cv-00520	DATE FILED 5/24/2022	U.S. DISTRICT COURT Western District of Texas, Waco Division
PLAINTIFF Atlas Global Technologies LLC		DEFENDANT D-Link Corporation
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 9,531,520	12/27/2016	ATLAS GLOBAL TECHNOLOGIES LLC
2 9,763,259	9/12/2017	ATLAS GLOBAL TECHNOLOGIES LLC
3 9,825,738	11/21/2017	ATLAS GLOBAL TECHNOLOGIES LLC
4 9,848,442	12/19/2017	ATLAS GLOBAL TECHNOLOGIES LLC
5 *		*SEE ATTACHED FOR ADDITIONAL PATENTS

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY	
	☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
-------	-------------------	------

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Attachment to AO 120 filed 5/24/2022 in Case No. 6:22-cv-00520

Patent Number	Date of Patent	Holder of Patent
US 9,912,513	3/6/2018	Atlas Global Technologies LLC
US 9,917,679	3/13/2018	Atlas Global Technologies LLC
US 10,020,919	7/10/2018	Atlas Global Technologies LLC
US 10,153,886	12/11/2018	Atlas Global Technologies LLC
US 10,756,851	8/25/2020	Atlas Global Technologies LLC

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been
filed in the U.S. District Court Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 2:22-cv-00259	DATE FILED 7/13/2022	U.S. DISTRICT COURT Eastern District of Texas, Marshall Division
PLAINTIFF ATLAS GLOBAL TECHNOLOGIES LLC		DEFENDANT ACER Incorporated
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 9,531,520	12/27/2016	ATLAS GLOBAL TECHNOLOGIES LLC
2 US 9,763,259	9/12/2017	ATLAS GLOBAL TECHNOLOGIES LLC
3 US 9,825,738	11/21/2017	ATLAS GLOBAL TECHNOLOGIES LLC
4 US 9,848,442	12/19/2017	ATLAS GLOBAL TECHNOLOGIES LLC
5 *		* SEE ATTACHED FOR ADDITIONAL PATENTS

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Attachment to AO 120 filed 7/13/2022 in Case No. 2:22-cv-00259

Patent Number	Date of Patent	Holder of Patent
US 9,912,513	3/6/2018	Atlas Global Technologies LLC
US 9,917,679	3/13/2018	Atlas Global Technologies LLC
US 10,020,919	7/10/2018	Atlas Global Technologies LLC
US 10,153,886	12/11/2018	Atlas Global Technologies LLC
US 10,756,851	8/25/2020	Atlas Global Technologies LLC

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been
filed in the U.S. District Court Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 2:22-cv-00349	DATE FILED 9/7/2022	U.S. DISTRICT COURT Eastern District of Texas, Marshall Division
PLAINTIFF ATLAS GLOBAL TECHNOLOGIES LLC		DEFENDANT Arcadyan Technology Corporation
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 9,531,520	12/27/2016	ATLAS GLOBAL TECHNOLOGIES LLC
2 US 9,628,310	4/18/2017	ATLAS GLOBAL TECHNOLOGIES LLC
3 US 9,763,259	9/12/2017	ATLAS GLOBAL TECHNOLOGIES LLC
4 US 9,825,738	11/21/2017	ATLAS GLOBAL TECHNOLOGIES LLC
5 *		* SEE ATTACHED FOR ADDITIONAL PATENTS

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Attachment to AO 120 filed 9/7/2022 in Case No. 2:22-cv-00349

Patent Number	Date of Patent	Holder of Patent
US 9,848,442	12/19/2017	Atlas Global Technologies LLC
US 9,912,513	3/6/2018	Atlas Global Technologies LLC
US 10,020,919	7/10/2018	Atlas Global Technologies LLC
US 10,153,886	12/11/2018	Atlas Global Technologies LLC
US 10,327,172	6/18/2019	Atlas Global Technologies LLC
US 10,756,851	8/25/2020	Atlas Global Technologies LLC