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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	02/02/2021	10911186	QUS-0003	4240

34610 7590 01/13/2021

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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):

Woojin AHN, Seoul, KOREA, REPUBLIC OF;
WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC., Seoul, KOREA, REPUBLIC OF;
Yongho KIM, Incheon, KOREA, REPUBLIC OF;
SK TELECOM CO., LTD., Seoul, KOREA, REPUBLIC OF;
Jinsam KWAK, Gyeonggi-do, KOREA, REPUBLIC OF;
Juhyung SON, Gyeonggi-do, KOREA, REPUBLIC OF;

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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

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

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence 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)

34610 7590 09/23/2020
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

TITLE OF INVENTION: WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	12/23/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SHARMA, GAUTAM	2467	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 03-09 or more recent) attached. **Use of a Customer Number is required.**

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

1 KED & Associates, LLP
2
3

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

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

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
1. WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.	1. Gyeonggi-do, Republic of Korea
2. SK TELECOM CO., LTD.	2. Seoul, Republic of Korea

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 16-0607

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 /David C. Oren/ Date December 23, 2020

Typed or printed name David C. Oren Registration No. 38,694

Electronic Patent Application Fee Transmittal

Application Number:	16377829
Filing Date:	08-Apr-2019
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Filer:	Daniel Y.J. Kim/Jaime Barker
Attorney Docket Number:	QUS-0003

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt	
EFS ID:	41479742
Application Number:	16377829
International Application Number:	
Confirmation Number:	4240
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Jaime Barker
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	QUS-0003
Receipt Date:	23-DEC-2020
Filing Date:	08-APR-2019
Time Stamp:	14:37:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	E2020BME38129082
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)	IFTrans.pdf	1729317 654d7abc8214aa61f6527512b86b1929960 8e91f	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30591 45c43adedf6dbd7500d460397c30c595d5d 2e6b9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1759908		

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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

7590 10/27/2020

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER	
SHARMA, GAUTAM	
ART UNIT	PAPER NUMBER
2467	

DATE MAILED: 10/27/2020

PRIORITY ACKNOWLEDGMENT

☑ 1. Receipt is acknowledged of priority papers submitted under 35 U.S.C. 119. The papers have been placed of record in the file.

☐ 2. Applicant's claim for priority, based on papers filed in parent Application Number _____ submitted under 35 U.S.C. 119, is acknowledged.

☐ 3. The priority papers, submitted _____, after payment of the issue fee are

- ☐ acknowledged
  While the priority claim or certified copy filed will be placed in the file record, neither will be reviewed and the patent when published will not include the priority claim.
  See 37 CFR 1.55(a)(2).
- ☐ not acknowledged since the processing fee in 37 CFR 1.17(i) has not been received.

☐ 4. For utility and plant applications filed on or after November 29, 2000, the priority claim is not entered because the claim was not presented within the time limit required by 37 CFR 1.55(a)(1). A petition to accept a delayed claim for priority under 35 U.S.C. 119(a) - (d) or (f), or 365(a) may be filed. See 37 CFR 1.55(c) and MPEP 201.14(a).

N. Horne, for

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

PTOL-147 (Rev. 03/08)

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/377,829	04/08/2019	2467	1720	QUS-0003	16	2

CONFIRMATION NO. 4240

REPLACEMENT FILING RECEIPT

34610
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

OC000000120358972

Date Mailed: 10/13/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Woojin AHN, Seoul, KOREA, REPUBLIC OF;
Yongho KIM, Incheon, KOREA, REPUBLIC OF;
Jinsam KWAK, Gyeonggi-do, KOREA, REPUBLIC OF;
Juhyung SON, Gyeonggi-do, KOREA, REPUBLIC OF;

Applicant(s)

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

Power of Attorney: The patent practitioners associated with Customer Number 34610

Domestic Priority data as claimed by applicant

This application is a CON of 15/555,075 01/02/2018 PAT 10305638
which is a 371 of PCT/KR2016/002199 03/04/2016

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
REPUBLIC OF KOREA 10-2015-0030369 03/04/2015 Access Code Provided
REPUBLIC OF KOREA 10-2015-0036754 03/17/2015 Access Code Provided
REPUBLIC OF KOREA 10-2015-0066670 05/13/2015 Access Code Provided

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.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 10/09/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/377,829**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

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).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The International Bureau certifies that a copy of the patent application indicated below has been available to the WIPO Digital Access Service since the date of availability indicated, and that the patent application has been available to the indicated Office(s) as of the date specified following the relevant Office code:

Document details: Country/Office: KR
Filing date: 13 May 2015 (13.05.2015)
Application number: 10-2015-0066670

Date of availability of document: 28 May 2020 (28.05.2020)

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Date of issue of this certificate: 12 Oct 2020 (12.10.2020)

34, chemin des Colombettes
1211 Geneva 20, Switzerland
www.wipo.int

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KOREAN INTELLECTUAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office.

출 원 번 호 : 10-2015-0066670
Application Number

출 원 년 월 일 : 2015년 05월 13일
Filing Date May. 13, 2015

출 원 인 : 주식회사 윌러스표준기술연구소

Applicant(s) WILUS Institute of Standards and Technology Inc.

2020년 10월 12일

특 허 청
COMMISSIONER

재출 일자 : 2015-05-13

【서지사항】

【서류명】 특허출원서

【참조번호】 150049HEW

【출원구분】 특허출원

【출원인】

【명칭】 주식회사 윌러스표준기술연구소

【특허고객번호】 1-2013-022334-3

【대리인】

【성명】 임국일

【대리인번호】 9-2014-000874-4

【포괄위임등록번호】 2014-036557-3

【발명의 국문명칭】 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법

【발명의 영문명칭】 GROUP ACK TRANSMISSION AND PADDING METHODS FOR WIDEBAND WIRELESS LAN MULTIPLE USER UPLINK DATA TRANSMISSION

【발명자】

【성명】 안우진

【성명의 영문표기】 Woojin AHN

【주민등록번호】 831010-1XXXXXX

【우편번호】 122-957

【주소】 서울특별시 은평구 서오릉로13길 18-1

【국적】 KR

【발명자】

【성명】 김용호

【성명의 영문표기】 Yongho KIM

【주민등록번호】 721010-1XXXXXX

【우편번호】 405-761

【주소】 인천시 남동구 구월로 192 구월힐스테이트 1404동 804호

【국적】 KR

【발명자】

【성명】 곽진삼

【성명의 영문표기】 Jinsam KWAK

【주민등록번호】 740908-1XXXXXX

【우편번호】 437-810

【주소】 경기도 의왕시 내손중앙로 11 의왕내손이편한세상 1113동1704호

【국적】 KR

【발명자】

【성명】 손주형

【성명의 영문표기】 Juhyung SON

【주민등록번호】 770724-1XXXXXX

【우편번호】 437-810

【주소】 경기도 의왕시 내손중앙로 11 의왕내손이편한세상 1114동 302호

【국적】 KR

재출 일자 : 2015-05-13

【출원언어】 국어

【이 발명을 지원한 국가연구개발사업】

【과제고유번호】 R0166-15-1030

【부처명】 미래창조과학부

【과제관리(전문)기관명】 정보통신기술연구진흥센터

【연구사업명】 정보통신방송표준개발지원

【연구과제명】 IEEE802.11 High Efficiency WLAN (HEW) 표준개발

【기여율】 1/1

【과제수행기관명】 (주)윌러스표준기술연구소

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【취지】 위와 같이 특허청장에게 제출합니다.

대리인 임국일 (서명 또는 인)

【수수료】

【출원료】 0 면 46,000 원

【가산출원료】 26 면 0 원

【우선권주장료】 0 건 0 원

【심사청구료】 0 항 0 원

【합계】 46,000 원

【감면사유】 소기업(70%감면)[1]

【감면후 수수료】 13,800 원

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【발명의 설명】

【발명의 명칭】

무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법{GROUP ACK TRANSMISSION AND PADDING METHODS FOR WIDEBAND WIRELESS LAN MULTIPLE USER UPLINK DATA TRANSMISSION}

【기술분야】

【0001】 본 발명은 무선랜을 위한 장치, 시스템 및 무선랜 통신 방법에 관한 것으로, 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법에 관한 기술이다.

【발명의 배경이 되는 기술】

【0002】 최근 모바일 기기의 보급이 확대됨에 따라 이들에게 빠른 무선 인터넷 서비스를 제공할 수 있는 무선랜(Wireless LAN) 기술이 많은 각광을 받고 있다. 무선랜 기술은 근거리에서 무선 통신 기술을 바탕으로 스마트 폰, 스마트 패드, 랩탑 컴퓨터, 휴대형 멀티미디어 플레이어, 임베디드 기기 등과 같은 모바일 기기들이 무선으로 인터넷에 접속할 수 있도록 하는 기술이다.

【0003】 초기의 무선랜 기술은 IEEE(Institute of Electrical and Electronics Engineers) 802.11을 통해 2.4GHz 주파수를 사용하여 주파수 도약(hopping), 대역확산, 적외선 통신 등으로 1~2Mbps의 속도를 지원한 이래, 최근에는 OFDM(Orthogonal Frequency Division Multiplex)을 적용하여 최대 54Mbps의 속

도를 지원할 수 있다. 이외에도 IEEE 802.11에서는 QoS(Quality for Service)의 향상, 액세스 포인트(Access Point, AP) 프로토콜 호환, 보안 강화(security enhancement), 무선 자원 측정(radio resource measurement), 차량 환경을 위한 무선 접속(wireless access vehicular environment), 빠른 로밍(fast roaming), 메쉬 네트워크(mesh network), 외부 네트워크와의 상호작용(interworking with external network), 무선 네트워크 관리(wireless network management) 등 다양한 기술의 표준을 실용화 또는 개발 중에 있다.

【0004】 IEEE 802.11 중에서 IEEE 802.11b는 2.4GHz 밴드의 주파수를 사용하면서 최고 11Mbps의 통신 속도를 지원한다. IEEE 802.11b 이후에 상용화된 IEEE 802.11a는 2.4GHz 밴드가 아닌 5GHz 밴드의 주파수를 사용함으로써 상당히 혼잡한 2.4GHz 밴드의 주파수에 비해 간섭에 대한 영향을 줄였으며, OFDM 기술을 사용하여 통신 속도를 최대 54Mbps까지 향상시켰다. 그러나 IEEE 802.11a는 IEEE 802.11b에 비해 통신 거리가 짧은 단점이 있다. 그리고 IEEE 802.11g는 IEEE 802.11b와 마찬가지로 2.4GHz 밴드의 주파수를 사용하여 최대 54Mbps의 통신속도를 구현하며, 하위 호환성(backward compatibility)을 만족하고 있어 상당한 주목을 받았는데, 통신 거리에 있어서도 IEEE 802.11a보다 우위에 있다.

【0005】 그리고, 무선랜에서 취약점으로 지적되어온 통신 속도에 대한 한계를 극복하기 위하여 제정된 기술 규격으로써 IEEE 802.11n이 있다. IEEE 802.11n은 네트워크의 속도와 신뢰성을 증가시키고, 무선 네트워크의 운영 거리를 확장하는데 목적을 두고 있다. 보다 구체적으로, IEEE 802.11n에서는 데이터 처리 속도가 최대

540Mbps 이상인 고처리율(High Throughput, HT)을 지원하며, 또한 전송 에러를 최소화하고 데이터 속도를 최적화하기 위해 송신부와 수신부 양단 모두에 다중 안테나를 사용하는 MIMO(Multiple Inputs and Multiple Outputs) 기술에 기반을 두고 있다. 또한, 이 규격은 데이터 신뢰성을 높이기 위해 중복되는 사본을 여러 개 전송하는 코딩 방식을 사용할 뿐만 아니라, 속도를 증가시키기 위해 직교 주파수 분할 다중(Orthogonal Frequency Division Multiplex, OFDM)을 사용할 수도 있다.

【0006】무선랜의 보급이 활성화되고, 이를 이용한 어플리케이션이 다양화됨에 따라, 최근에는 IEEE 802.11n이 지원하는 데이터 처리 속도보다 더 높은 처리율(Very High Throughput, VHT)을 지원하기 위한 새로운 무선랜 시스템에 대한 필요성이 대두되고 있다. 이 중 IEEE 802.11ac는 5GHz 주파수에서 넓은 대역폭(80MHz~160MHz)을 지원한다. IEEE 802.11ac 표준은 5GHz 대역에서만 정의되어 있으나, 기존 2.4GHz 대역 제품들과의 하위 호환성을 위해 초기 11ac 칩셋들은 2.4GHz 대역에서의 동작도 지원할 것이다. 이때 802.11ac는 2.4GHz에서 최대 40MHz까지 대역폭을 지원한다. 이론적으로, 이 규격에 따르면 다중 단말의 무선랜 속도는 최소 1Gbps, 최대 단일 링크 속도는 최소 500Mbps까지 가능하게 된다. 이는 더 넓은 무선 주파수 대역폭(최대 160MHz), 더 많은 MIMO 공간적 스트림(최대 8개), 다중 사용자 MIMO, 그리고 높은 밀도의 변조(최대 256 QAM) 등 802.11n에서 받아들인 무선 인터페이스 개념을 확장하여 이루어진다. 또한, 기존 2.5GHz/5GHz 대신 60GHz 밴드를 사용해 데이터를 전송하는 방식으로 IEEE 802.11ad가 있다. IEEE 802.11ad는 빔포밍 기술을 이용하여 최대 7Gbps의 속도를 제공하는 전송규격으로써, 대용량의 데

이터나 무압축 HD 비디오 등 높은 비트레이트 동영상 스트리밍에 적합하다. 하지만 60GHz 주파수 밴드는 장애물 통과가 어려워 근거리 공간에서의 디바이스들 간에만 이용이 가능한 단점이 있다.

【0007】무선랜은 넓은 주파수 대역을 사용할 수 있다. 넓은 주파수 대역을 사용하기 위해 데이터를 전송하기 전에 일정 시간동안 가능한 대역이 있는지 살펴보고 데이터를 인접한 영역의 주파수 대역이 가용한지 여부에 따라 연접하여 주파수 대역을 사용한다. 예를 들어 20MHz 대역이 주 주파수 대역 (주 채널)이고 그 다음 20MHz가 사용가능하고 그 다음 20MHz가 사용 불가능 그 다음 20MHz가 사용 가능이라면 총 40MHz를 전송 대역으로 하여 데이터를 전송한다. 연접한 주파수 대역만을 데이터 전송 대역으로 사용하기 때문에 실제 가용한 주파수 대역이 있음에도 불구하고 사용하지 못하는 문제가 있다. 또한 종래의 무선 접속 기술은 동일한 Basic Service Set (BSS) 내에서 매 전송 시도마다 하나의 송신 단말 및 수신 단말의 일대일 접속만을 지원하기 때문에 단말들의 접속 환경이나 전송 데이터의 특성을 반영하지 못하여 비효율적이라는 문제를 지니고 있다.

【발명의 내용】

【해결하고자 하는 과제】

【0008】본 발명은 전술한 종래 기술의 문제점을 해결하기 위한 것으로서, 무선랜을 위한 다중채널 상향 패킷 전달 방법, 장치 및 시스템을 제공한다.

【0009】 상술한 본 발명의 실시예에 따르면 경쟁 기반 채널 접근 시스템에서 다중 사용자 상향 전송 시의 ACK 처리 방법을 제안한다.

【과제의 해결 수단】

【0010】 본 발명의 실시예에 따르면, 무선랜을 위한 장치, 시스템 및 무선랜 통신 방법이 제공될 수 있다.

【발명의 효과】

【0011】 상술한 본 발명의 실시예에 따르면 다수 채널의 서로 다른 길이의 multiplexed block ACK의 길이에 따른 무선랜 네트워크의 오작동을 방지할 수 있으며 동시에 AP의 기타 control frame의 전송을 위한 시간을 확보할 수 있다.

【0012】 본 발명은 무선랜을 이용하는 스테이션 내지 액세스 포인트, 셀룰러 통신을 이용하는 스테이션 내지 기지국 등 다양한 통신 디바이스에 사용 가능하다.

【도면의 간단한 설명】

【0013】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다.

도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다.

도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도이다.

도 4는 본 발명의 일 실시예에 따른 AP의 구성을 나타낸 블록도이다.

도 5는 본 발명의 일 실시 예에 관련된 STA이 AP와 링크를 설정하는 단계를

개략적으로 도시한 것이다.

도 6은 본 발명의 일 실시 예에 관련된 STA의 패시브 스캐닝 방법을 도시한 것이다.

도 7은 본 발명의 일 실시 예에 관련된 STA의 액티브 스캐닝 방법을 도시한 것이다.

도 8은 본 발명의 실시예에 따른 multiplexed block ACK의 구조를 도시하고 있다.

도 9는 본 발명의 실시예에 따른 다수의 20MHz 전송 상황에서의 M-BA 전송방법을 도시하고 있다.

【발명을 실시하기 위한 구체적인 내용】

【0014】 아래에서는 첨부한 도면을 참조하여 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 본 발명의 실시예를 상세히 설명한다. 그러나 본 발명은 여러 가지 상이한 형태로 구현될 수 있으며 여기에서 설명하는 실시예에 한정되지 않는다. 그리고 도면에서 본 발명을 명확하게 설명하기 위해서 설명과 관계없는 부분은 생략하였으며, 명세서 전체를 통하여 유사한 부분에 대해서는 유사한 도면 부호를 붙였다.

【0015】 명세서 전체에서, 어떤 부분이 다른 부분과 "연결"되어 있다고 할 때, 이는 "직접적으로 연결"되어 있는 경우뿐 아니라, 그 중간에 다른 소자를 사이에 두고 "전기적으로 연결"되어 있는 경우도 포함한다. 또한 어떤 부분이 어떤 구

성요소를 "포함"한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다.

【0017】 무선랜 시스템의 구조

【0018】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다.

【0019】 무선랜 시스템은 하나 또는 그 이상의 기본 서비스 세트(Basic Service Set, BSS)를 포함하는데, BSS는 성공적으로 동기화를 이루어서 서로 통신할 수 있는 기기들의 집합을 나타낸다. 일반적으로 BSS는 인프라스트럭쳐 BSS(infrastructure BSS)와 독립 BSS(Independent BSS, IBSS)로 구분될 수 있으며, 도 1은 이 중 인프라스트럭쳐 BSS를 나타내고 있다.

【0020】 도 1에 도시된 바와 같이 인프라스트럭쳐 BSS(BSS1, BSS2)는 하나 또는 그 이상의 스테이션(STA-1, STA-2, STA-3, STA-4, STA-5), 분배 서비스(Distribution Service)를 제공하는 스테이션인 액세스 포인트(PCP/AP-1, PCP/AP-2), 및 다수의 액세스 포인트(PCP/AP-1, PCP/AP-2)를 연결시키는 분배 시스템(Distribution System, DS)을 포함한다.

【0021】 스테이션(Station, STA)은 IEEE 802.11 표준의 규정을 따르는 매체 접속 제어(Medium Access Control, MAC)와 무선 매체에 대한 물리층(Physical Layer) 인터페이스를 포함하는 임의의 디바이스로서, 광의로는 액세스 포인트(AP)

와 비 액세스 포인트 STA(Non-AP Station)를 모두 포함한다. 무선 통신을 위한 스테이션은 프로세서(Processor)와 트랜시버(transceiver)를 포함하고, 실시예에 따라 사용자 인터페이스부와 디스플레이 유닛 등을 더 포함할 수 있다. 프로세서는 무선 네트워크를 통해 전송할 프레임을 생성하거나 또는 상기 무선 네트워크를 통해 수신된 프레임을 처리하며, 그 밖에 스테이션을 제어하기 위한 다양한 처리를 수행한다. 그리고, 트랜시버는 프로세서와 기능적으로 연결되어 있으며, 스테이션을 위하여 무선 네트워크를 통해 프레임을 송수신한다.

【0022】 액세스 포인트(Access Point, AP)는 자신에게 결합된 스테이션을 위하여 무선 매체를 경유하여 분배시스템(DS)에 대한 접속을 제공하는 개체이다. 인프라스트럭쳐 BSS에서 AP와 접속되지 않은 STA들 사이의 통신은 AP를 경유하여 이루어지는 것이 원칙이지만, 다이렉트 링크가 설정된 경우에는 AP와 접속되지 않은 STA들 사이에서도 직접 통신이 가능하다. 한편, 본 발명에서 AP는 PCP(Personal BSS Coordination Point)를 포함하는 개념으로 사용되며, 광의적으로는 집중 제어기, 기지국(Base Station, BS), 노드-B, BTS(Base Transceiver System), 또는 사이트 제어기 등의 개념을 모두 포함할 수 있다.

【0023】 복수의 인프라스트럭쳐 BSS는 분배 시스템(DS)을 통해 상호 연결될 수 있다. 이때, DS를 통하여 연결된 복수의 BSS를 확장 서비스 세트(Extended Service Set, ESS)라 한다. ESS에 포함되는 STA들은 서로 통신할 수 있으며, 동일한 ESS 내에서 AP와 접속되지 않은 STA들은 끊김 없이 통신하면서 하나의 BSS에서 다른 BSS로 이동할 수 있다.

【0024】 도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다. 도 2의 실시예에서 도 1의 실시예와 동일하거나 상응하는 부분은 중복적인 설명을 생략하도록 한다.

【0025】 도 2에 도시된 BSS-3는 독립 BSS이며 AP를 포함하지 않기 때문에, 모든 스테이션(STA-6, STA-7)이 AP와 접속되지 않은 상태이다. 독립 BSS는 DS로의 접속이 허용되지 않으며, 자기 완비적 네트워크(self-contained network)를 이룬다. 독립 BSS에서 각각의 스테이션들(STA-6, STA-7)은 다이렉트로 서로 연결될 수 있다.

【0027】 STA(스테이션)의 구성

【0028】 도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도이다.

【0029】 도시된 바와 같이, 본 발명의 실시예에 따른 STA(100)은 프로세서(110), 하나 이상의 네트워크 인터페이스 카드(NIC, Network Interface Card, 120), 유저 인터페이스부(140), 디스플레이 유닛(150) 및 메모리(160)를 포함할 수 있다.

【0030】 먼저, 네트워크 인터페이스 카드(120)는 무선랜 접속을 수행하기 위한 모듈로서, STA(100)에 내장되거나 외장으로 구비될 수 있다. 본 발명의 실시예에 따르면, 네트워크 인터페이스 카드 (120)는 서로 다른 주파수 밴드를 이용하는

복수의 네트워크 인터페이스 카드 모듈(120_1~120_n)을 포함할 수 있다. 이를 테면, 네트워크 인터페이스 카드 모듈(120_1~120_n)은 2.4GHz, 5GHz 및 60GHz 등의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 본 발명의 실시예에 따르면, STA(100)은 6GHz 이상의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈(120_1~120_n)은 해당 네트워크 인터페이스 카드 모듈(120_1~120_n)이 지원하는 주파수 밴드의 무선랜 규격에 따라 AP 또는 외부 STA과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드(120)는 STA(100)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈(120_1~120_n)만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈(120_1~120_n)을 함께 동작시킬 수 있다.

【0031】 한편, 도 3의 블록도에서 STA(100)의 복수의 네트워크 인터페이스 카드 모듈(120_1~120_n)은 서로 분리되어 도시되어 있으며, 각각의 네트워크 인터페이스 카드 모듈(120_1~120_n)의 MAC/PHY 계층이 서로 독립적으로 운영된다. 다만, 본 발명은 이에 한정하지 않으며, 복수의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈이 하나의 칩으로 통합된 상태로 STA(100)에 구비될 수도 있다.

【0032】 다음으로, 유저 인터페이스부(140)는 STA(100)에 구비된 다양한 형태의 입/출력 수단을 포함한다. 즉, 유저 인터페이스부(140)는 다양한 입력 수단을

이용하여 유저의 입력을 수신할 수 있으며, 프로세서(110)는 수신된 유저 입력에 기초하여 STA(100)을 제어할 수 있다. 또한, 유저 인터페이스부(140)는 다양한 출력 수단을 이용하여 프로세서(110)의 명령에 기초한 출력을 수행할 수 있다.

【0033】 다음으로, 디스플레이 유닛(150)은 디스플레이 화면에 이미지를 출력한다. 상기 디스플레이 유닛(150)은 프로세서(110)에 의해 실행되는 컨텐츠 또는 프로세서(110)의 제어 명령에 기초한 유저 인터페이스 등의 다양한 디스플레이 오브젝트를 출력할 수 있다. 또한, 메모리(160)는 STA(100)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 STA(100)이 AP 또는 외부 STA와 접속을 수행하는데 필요한 접속 프로그램이 포함될 수 있다.

【0034】 본 발명의 프로세서(110)는 다양한 명령 또는 프로그램을 실행하고, STA(100) 내부의 데이터를 프로세싱 할 수 있다. 또한, 프로세서(110)는 상술한 STA(100)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(110)는 STA(100)의 섹터 스윕 신호 전송/수신 및 이에 대응하는 피드백 신호 전송/수신 등의 커뮤니케이션 동작을 제어한다.

【0035】 또한, 프로세서(110)는 메모리(160)에 저장된 AP와의 접속을 실행하는 프로그램을 실행하여, AP가 전송한 통신 설정 메시지를 수신하고, 통신 설정 메시지에 포함된 STA(100)의 우선 조건에 대한 정보를 독출하고, STA(100)n의 우선 조건에 대한 정보에 따라 AP에 대한 접속을 요청한다. 이에 대한 구체적인 설명은 추후 기술하기로 한다.

【0036】 도 3에 도시된 STA(100)는 본 발명의 일 실시예에 따른 블록도로서,

분리하여 표시한 블록들은 디바이스의 엘리먼트들을 논리적으로 구별하여 도시한 것이다. 따라서 상술한 디바이스의 엘리먼트들은 디바이스의 설계에 따라 하나의 칩으로 또는 복수의 칩으로 장착될 수 있다. 또한, 본 발명의 실시예에서 STA(100)의 일부 구성들, 이를 테면 이동통신 모듈(130), 유저 인터페이스부(140) 및 디스플레이 유닛(150) 등은 STA(100)에 선택적으로 구비될 수 있다.

【0038】 AP(액세스 포인트)의 구성

【0039】 도 4는 본 발명의 일 실시예에 따른 AP의 구성을 나타낸 블록도이다.

【0040】 도시된 바와 같이, 본 발명의 실시예에 따른 AP(200)는 프로세서(210), NIC(Network Interface Card, 220) 및 메모리(160)를 포함할 수 있다. 도 4에서 AP(200)의 구성 중 도 3의 STA(100)의 구성과 동일하거나 상응하는 부분에 대해서는 중복적인 설명을 생략하도록 한다.

【0041】 도 4를 참조하면, 본 발명에 따른 AP(200)는 적어도 하나의 주파수 밴드에서 BSS를 운영하기 위한 네트워크 인터페이스 카드(220)를 구비한다. 도 3의 실시예에서 전술한 바와 같이, AP(200)의 네트워크 인터페이스 카드 (220) 또한 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈(220_1~220_m)을 포함할 수 있다. 즉, 본 발명의 실시예에 따른 AP(200)는 서로 다른 주파수 밴드, 이를 테면 2.4GHz, 5GHz, 60GHz 중 두 개 이상의 네트워크 인터페

이스 카드 모듈을 함께 구비할 수 있다. 바람직하게는, AP(200)는 6GHz 이상의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈(220_1~220_m)은 해당 네트워크 인터페이스 카드 모듈(220_1~220_m)이 지원하는 주파수 밴드의 무선랜 규격에 따라 STA과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드 (220)는 AP(200)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈(220_1~220_m)만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈(220_1~220_m)을 함께 동작시킬 수 있다.

【0042】 다음으로, 메모리(260)는 AP(200)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 STA의 접속을 관리하는 접속 프로그램이 포함될 수 있다. 또한, 프로세서(210)는 AP(200)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다.

【0043】 또한, 프로세서(210)는 메모리(260)에 저장된 스테이션과의 접속을 실행하는 프로그램을 실행하여, 하나 이상의 STA(100)에 대하여 통신 설정 메시지를 전송하고, STA(100)의 접속 요청에 따라 접속 설정을 수행하되, 통신 설정 메시지는 각 스테이션의 접속 우선 조건에 대한 정보를 포함한다. 이에 대한 구체적인 설명은 추후 기술하기로 한다.

【0045】 링크 설정 단계

【0046】 도 5는 본 발명의 일 실시 예에 관련된 STA이 AP와 링크를 설정하는 단계를 개략적으로 도시한 것이다.

【0047】 도 5를 참조하면, 본 발명에 따른 STA(100)가 AP(200)에 접속하는 단계는 크게 스캐닝(Scanning), 인증(Authentication) 및 결합(Association)의 3단계로 구분된다. 스캐닝단계는 STA(100)가 AP(200)가 운영하는 BSS의 접속 정보를 획득하는 단계이다. 스캐닝을 수행하기 위한 방법으로는 AP가 주기적으로 전송하는 비콘(Beacon) 메시지만을 활용하여 정보를 획득하는 패시브 스캐닝(Passive Scanning) 기법(S101)과 STA가 AP에 프로브 요청(Probe Request)을 전송하고(S103), AP로부터 프로브 응답(Probe Response)을 수신하여(S105) 접속 정보를 획득하는 액티브 스캐닝(Active Scanning)기법이 있다.

【0048】 스캐닝 단계에서 성공적으로 무선 접속 정보를 수신한 STA(100)는 인증 요청(Authentication Request)을 송신(S107a)하고, 인증 응답(Authentication Response)을 수신(S107b)하여 인증 절차를 수행한다.

【0049】 성공적인 IEEE 802.11 계층에서의 인증 절차를 수행 후, 결합 단계(S109a, S109b)를 수행하고, 추가적으로 802.1X 기반의 인증(S111) 및 DHCP를 통한 IP 주소 획득(S113) 단계를 수행할 수 있다. AS(300)는 Authentication Server로서 STA(100)과 802.1X 기반의 인증을 처리하는 서버로서 AP(200)에 물리적으로 결합되어 존재하거나 별도의 서버로서 존재할 수 있다.

【0050】 도 6은 본 발명의 일 실시 예에 관련된 STA의 패시브 스캐닝 방법을 도시한 것이다.

【0051】 도 6을 참조하면, 본 발명에 따른 제1 STA(110)는 주변에 위치한 제 1 AP(210)와 제 2 AP(220)에서 주기적으로 송신하는 비콘 메시지를 수신하여 각각 AP들의 무선 접속 정보를 획득한다.

【0052】 도 7은 본 발명의 일 실시 예에 관련된 STA의 액티브 스캐닝 방법을 도시한 것이다.

【0053】 도 7을 참조하면, 본 발명에 따른 제 1 STA(110)는 주변에 위치한 AP의 정보를 획득하기 위해 프로브 요청 메시지를 송신하고, 이에 대응하는 프로브 응답 메시지를 각각 제 1 AP(210)와 제 2 AP(220)로부터 수신하여 각각 AP들의 무선 접속 정보를 획득한다.

【0055】 다중 사용자 상향 전송

【0056】 다중 사용자 상향 전송의 경우 하향 전송과는 다르게 다수의 단말이 동시에 데이터를 전송해야 하기 때문에 BSS 내의 모든 단말과 통신을 수행할 수 있는 AP가 전송 과정을 관리하는 방법이 유력하다. 802.11ax에서는 AP가 trigger frame을 전송하는 것으로 UL-OFDMA를 시작한다. UL 단말들은 trigger frame 이후에 잠시의 IFS 시간이 지난 뒤에 즉시 UL data를 전송해야 하므로, trigger frame은 UL 단말에게 전송 시작시점을 알려주는 역할을 하며, 또한 각 UL 단말에게 할당된

channel정보를 알려주는 역할을 한다. AP가 Trigger를 전송하면 AP가 정해준 시점에 AP로부터 할당받은 subcarrier를 통하여 다수의 단말이 동시에 데이터를 전송하며, 데이터 전송 후에는 AP가 상향 데이터 전송에 참여한 모든 단말에게 데이터 수신 여부를 알리는 ACK을 전송해야 한다. 이 때 AP는 다수의 단말에 대한 ACK을 multiplexed block ACK의 형태로 전송할 수 있다.

【0057】 도 8은 본 발명의 실시예에 따른 multiplexed block ACK의 구조를 도시하고 있다.

【0058】 Multiplexed block ACK(M-BA)은 기존의 Block ACK(BA)의 구조를 이용하여 구현할 수 있다. BA format의 BA control 내부 값들의 활성화 여부에 따라 BA information 부분이 가변적인 크기로 추가될 수 있다. 이 때 BA information 필드 내부의 Per TID info 부분에 reserved bit가 12개 존재하며 이 정보를 ACK 전송을 위한 단말의 AID 값으로 설정할 수 있다. 따라서 11bit로 구성되어 있는 B0~B10을 AID로 설정하고 B11 값은 해당 ACK이 일반 ACK의 형태인지 BA의 형태인지를 알려주는 indication bit로 활용할 수 있다. 따라서 B11이 도 9의 예시와 같이 ACK으로 설정된 경우는 뒤따라 전송되는 Block ACK start sequence control 및 Block ACK bitmap이 필요없기 때문에 해당 필드는 자동적으로 삭제될 수 있다. BA information 은 크기는 가변적이므로 해당 다중 사용자 상향 전송에 참여한 모든 단말에 대해 AID를 삽입할 수 있다. 즉, AID와 관련 block ack sequence control과 blockack bitmap을 단말당 반복하여 삽입하여 전송하는 것이다. B11이 ACK을 지시하는 경우는 block ack sequence control과 blockack bitmap은 생략되고 AID만 반

복된다. AP는 각 UL 단말이 A-MPDU를 전송하여 그에 대한 block ACK을 전송해야하는 상황에서도 모든 A-MPDU가 정상적으로 전송이 된 경우에 한하여 B11을 활성화시킬 수 있다. 이 때의 B11은 모든 A-MPDU에 대한 ACK을 한번에 처리함을 의미하므로 이후의block ack sequence control과 blockack bitmap은 생략된다.

【0059】 도 9는 본 발명의 실시예에 따른 다수의 20MHz 전송 상황에서의 M-BA 전송방법을 도시하고 있다.

【0060】 다수의 20MHz channel이 전송에 사용되는 경우에는 M-BA의 길이가 지나치게 길어지는 것을 방지하기 위하여 각 20MHz에 할당된 UL 단말에 한하여 M-BA를 전송하는 방법이 유력하다.

【0061】 M-BA는 20MHz 단위의 channel에 할당된 단말 수와 다수 단말의 상향 데이터의 수신 상태에 따라 길이가 가변적일 수 있다. AP는 trigger frame을 전송하여 UL-OFDMA를 전송하는 시점에 ACK의 실질적인 길이를 예측할 수 없으므로, 가장 많은 수의 단말이 설정된 channel에서 모든 단말이 block ACK 옵션을 이용하는 가장 긴 ACK을 포함한 시간까지를 전체 TXOP으로 설정하여 trigger frame을 전송한다. 따라서모든 단말의 상향 전송이 마친 후에 수신 결과에 따라 실제 ACK 길이는 짧아질 수 있으며 channel 마다 다른 길이의 ACK이 전송될 수 있다. 도면과 같이 primary의 ACK이 가장 짧게 설정된 경우에는 AP의 다른 채널에 대한 ACK 전송이 마치기 전에 BSS 내의 다른 단말들이 DIFS의 시간이 지난뒤에 접속을 시도할 수 있다. 그러나 AP는 다른 채널에서 ACK 송신을 완료하는 시점까지는 상태전환을 하는 것이 불가능하므로 다른 무선 단말의 전송시도가 무시되거나 AP의 접속 시도 경

쟁에 불이익을 초래할 수 있다. 따라서 본 발명에서는 데이터 수신 이후에 결정된 가장 긴 ACK의 길이를 기준으로 모든 채널의 ACK 전송길이를 맞추어 전송하는 기법을 제안한다. ACK 전송 길이를 맞추기 위한 방법으로는 실제 ACK 내용 뒤에 zero padding을 하거나 ACK contents를 반복하는 것이 가능하며 기존의 802.11ac의 padding 방법을 이용하는 방법 역시 가능하다. 가장 긴 ACK의 전송시간에 모든 채널의 ACK 길이를 맞춘다 하더라도 trigger frame에서 최초로 설정한 TXOP길이보다 이전 시간에 모든 ACK의 전송이 마칠수 있는데 이 경우에는 AP가 TXOP을 반납하는 것도 가능하지만, 기타 control frame 전송 등과 같이 다른 용도로의 이용을 위해 TXOP을 유지시키는 방법 역시 가능하다.

【부호의 설명】

【특허청구범위】

【청구항 1】

무선랜을 위한 장치, 시스템 및 무선랜 통신 방법.

재출 일자 : 2015-05-13

【요약서】

【요약】

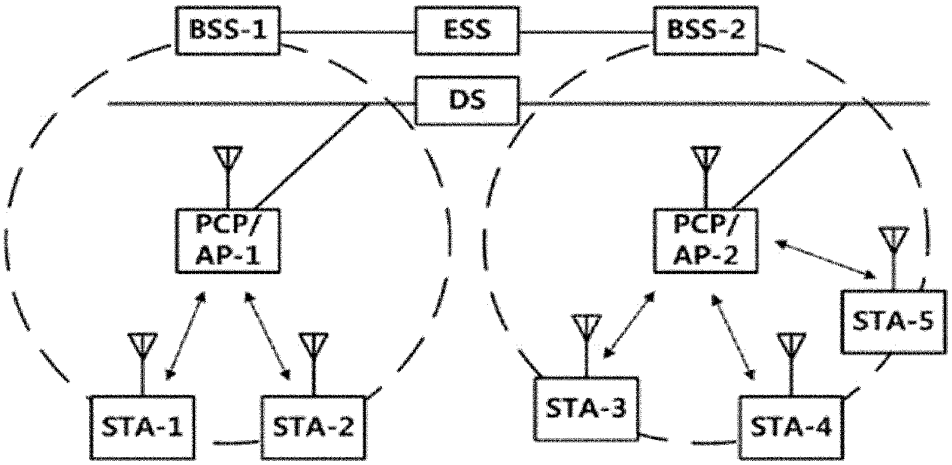
본 발명은 무선랜을 위한 장치, 시스템 및 무선랜 통신 방법에 관한 것으로, 본 발명의 실시예에 따르면, 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법이 제공될 수 있다.

【대표도】

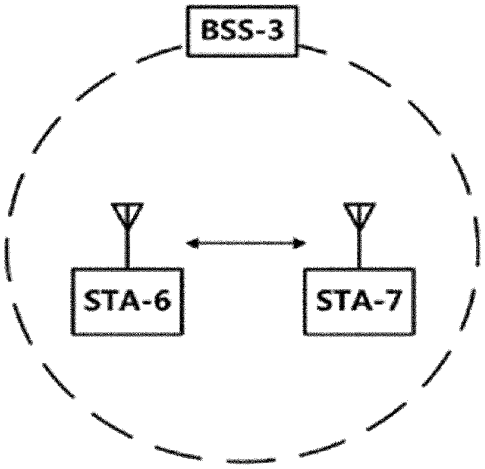
도 9

【도면】

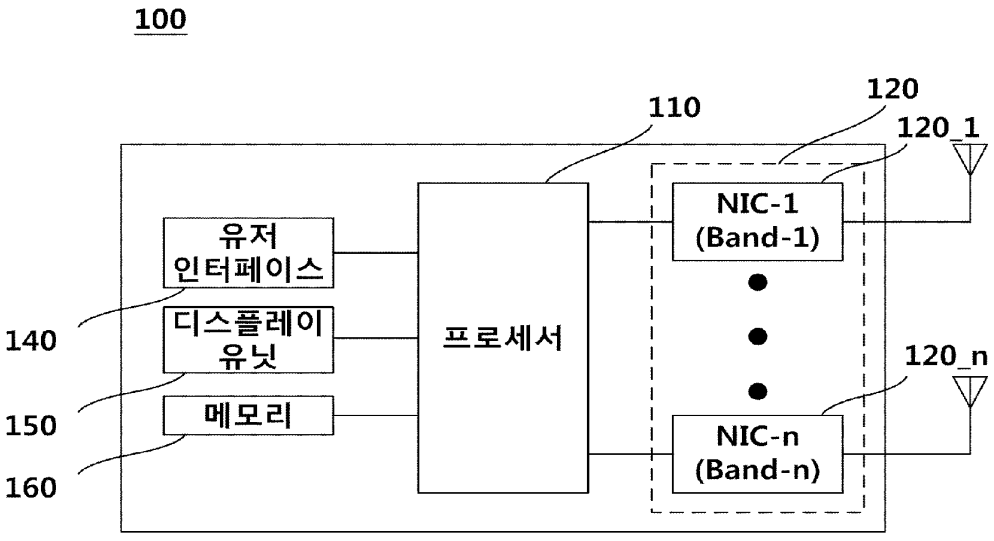
【도 1】



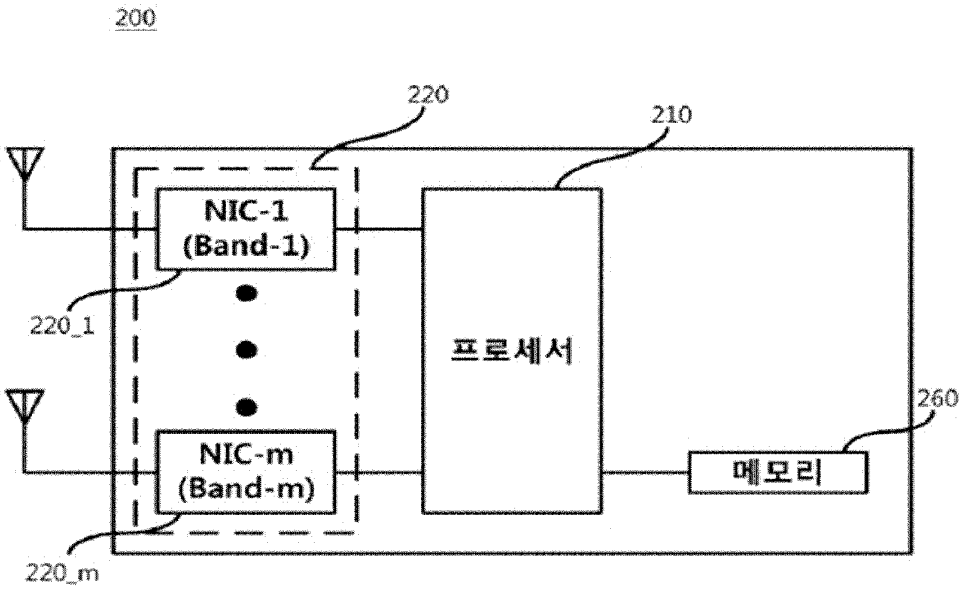
【도 2】


BSS-3
STA-6
STA-7

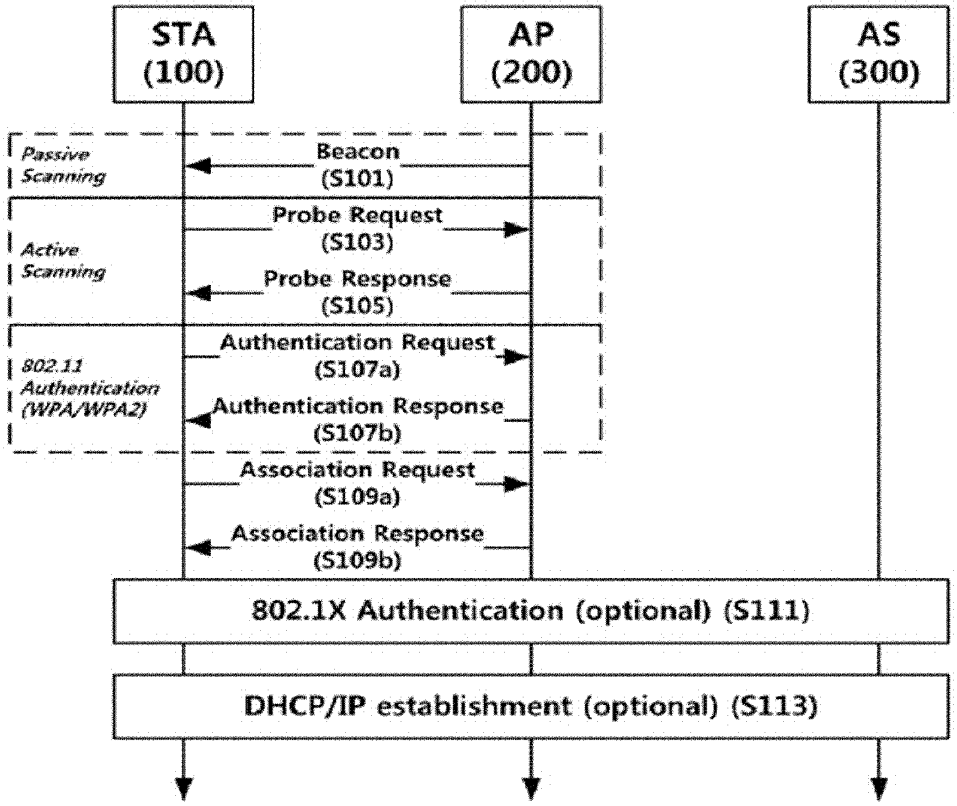
【도 3】


100
110
120
120_1
120_n
유저 인터페이스
디스플레이 유닛
메모리
프로세서
NIC-1 (Band-1)
NIC-n (Band-n)
140
150
160

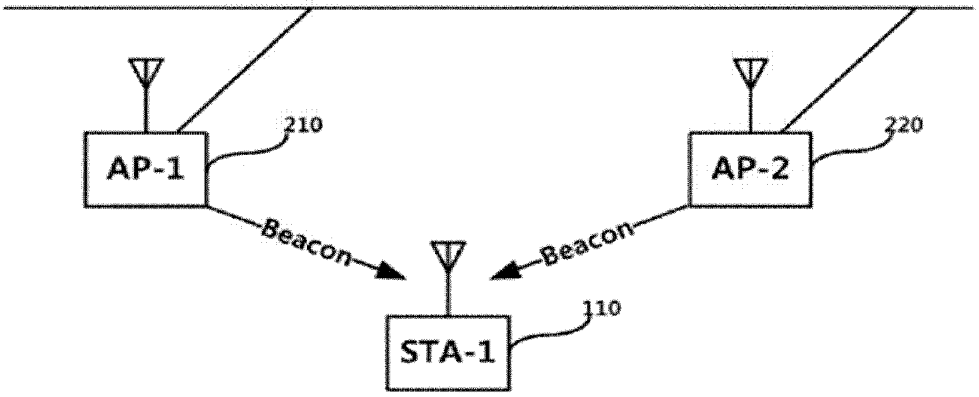
【도 4】



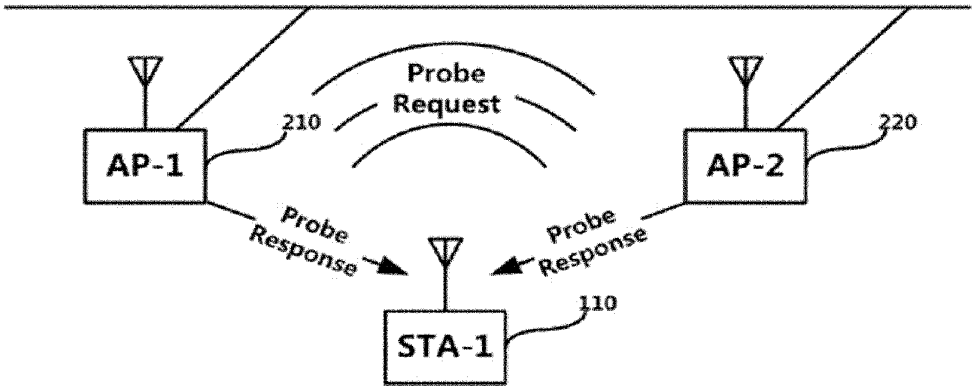
【도 5】


STA
(100)
AP
(200)
AS
(300)
Passive Scanning
Beacon
(S101)
Active Scanning
Probe Request
(S103)
Probe Response
(S105)
802.11 Authentication (WPA/WPA2)
Authentication Request
(S107a)
Authentication Response
(S107b)
Association Request
(S109a)
Association Response
(S109b)
802.1X Authentication (optional) (S111)
DHCP/IP establishment (optional) (S113)

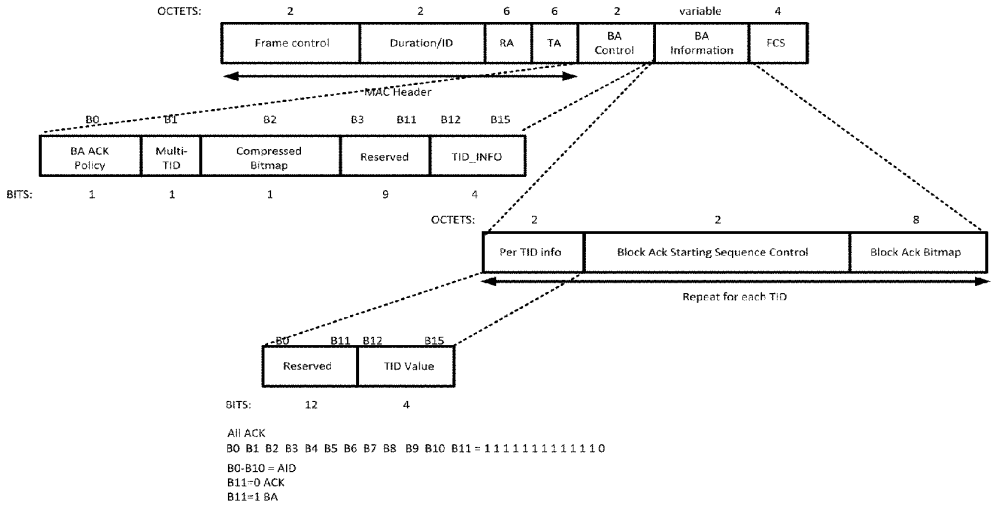
【도 6】


AP-1
210
AP-2
220
Beacon
Beacon
STA-1
110

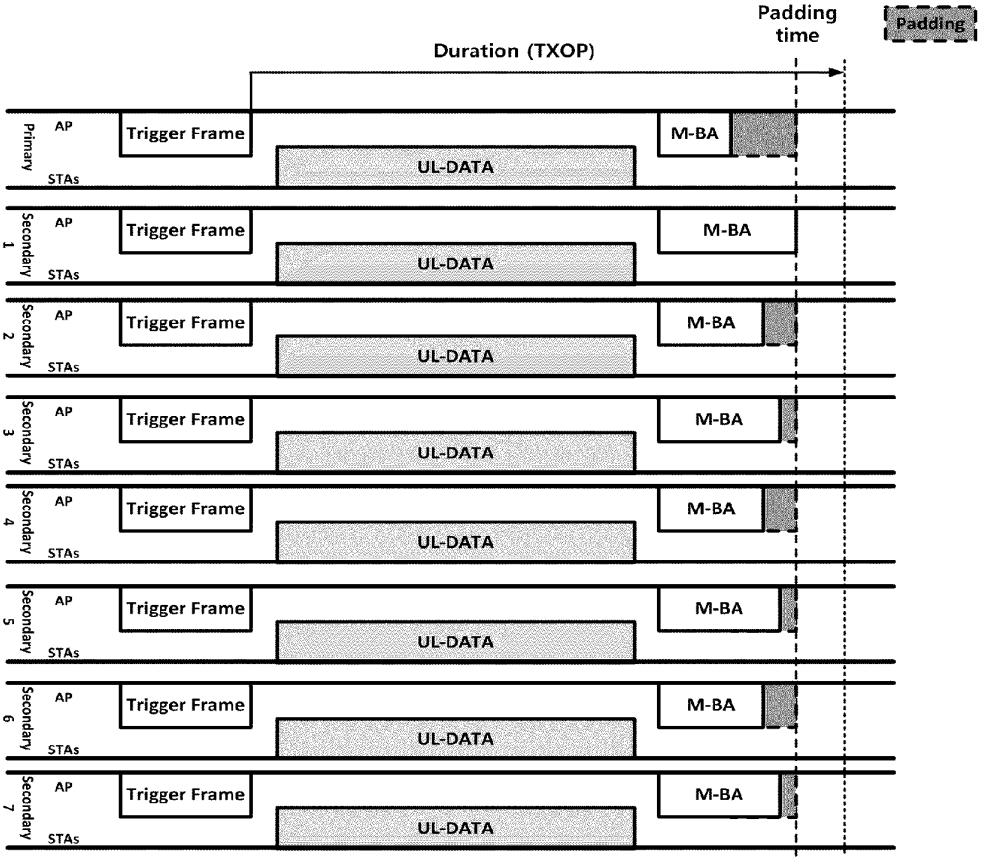
【도 7】


Probe
Request
AP-1
210
AP-2
220
Probe
Response
Probe
Response
STA-1
110

【도 8】


OCTETS:
2
2
6
6
2
variable
4
Frame control
Duration/ID
RA
TA
BA Control
BA Information
FCS
MAC Header
B0
B1
B2
B3
B11
B12
B15
BA ACK Policy
Multi-TID
Compressed Bitmap
Reserved
TID_INFO
BITS:
1
1
1
9
4
OCTETS:
2
2
8
Per TID info
Block Ack Starting Sequence Control
Block Ack Bitmap
Repeat for each TID
B0
B11
B12
B15
Reserved
TID Value
BITS:
12
4
All ACK
B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 = 1 1 1 1 1 1 1 1 1 1 1 0
B0-B10 = AID
B11=0 ACK
B11=1 BA

【도 9】


Padding time
Padding
Duration (TXOP)
Primary
Secondary 1
Secondary 2
Secondary 3
Secondary 4
Secondary 5
Secondary 6
Secondary 7
AP
STAs
Trigger Frame
UL-DATA
M-BA

Digital Access Service
(DAS)

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출 원 인 : 주식회사 윌러스표준기술연구소

Applicant(s) WILUS Institute of Standards and Technology Inc.

2020년 10월 12일

특 허 청
COMMISSIONER

재출 일자 : 2015-03-17

【서지사항】

【서류명】 특허출원서

【참조번호】 WILP150030KR

【출원구분】 특허출원

【출원인】

【명칭】 주식회사 윌러스표준기술연구소

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【대리인】

【성명】 임국일

【대리인번호】 9-2014-000874-4

【포괄위임등록번호】 2014-036557-3

【발명의 국문명칭】 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법

【발명의 영문명칭】 GROUP ACK TRANSMISSION AND PADDING METHODS FOR WIDEBAND WIRELESS LAN MULTIPLE USER UPLINK DATA TRANSMISSION

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【주민등록번호】 831010-1XXXXXX

【우편번호】 122-957

【주소】 서울특별시 은평구 서오릉로13길 18-1

【국적】 KR

【발명자】

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【주민등록번호】 721010-1XXXXXX

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【우편번호】 437-810

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【국적】 KR

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【성명의 영문표기】 Juhyung SON

【주민등록번호】 770724-1XXXXXX

【우편번호】 437-810

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【국적】 KR

제출 일자 : 2015-03-17

【출원언어】 국어

【이 발명을 지원한 국가연구개발사업】

【과제고유번호】 2014-PK10-18

【부처명】 미래창조과학부

【과제관리(전문)기관명】 한국정보통신기술협회

【연구사업명】 정보통신방송표준화사업

【연구과제명】 IEEE802.11 High Efficiency WLAN (HEW) 표준개발

【기여율】 1/1

【과제수행기관명】 (주)윌러스표준기술연구소

【연구기간】 2014.04.01 ~ 2017.02.28

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 임국일 (서명 또는 인)

【수수료】

【출원료】 0 면 46,000 원

【가산출원료】 33 면 0 원

【우선권주장료】 0 건 0 원

【심사청구료】 0 항 0 원

【합계】 46,000 원

【감면사유】 소기업(70%감면)[1]

【감면후 수수료】 13,800 원

제출 일자 : 2015-03-17

【발명의 설명】

【발명의 명칭】

무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법{GROUP ACK TRANSMISSION AND PADDING METHODS FOR WIDEBAND WIRELESS LAN MULTIPLE USER UPLINK DATA TRANSMISSION}

【기술분야】

【0001】 본 발명은 무선랜을 위한 장치, 시스템 및 방법에 관한 것으로, 보다 상세하게는, 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법에 관한 기술이다.

【발명의 배경이 되는 기술】

【0002】 최근 모바일 기기의 보급이 확대됨에 따라 이들에게 빠른 무선 인터넷 서비스를 제공할 수 있는 무선랜(Wireless LAN) 기술이 많은 각광을 받고 있다. 무선랜 기술은 근거리에서 무선 통신 기술을 바탕으로 스마트 폰, 스마트 패드, 랩탑 컴퓨터, 휴대형 멀티미디어 플레이어, 임베디드 기기 등과 같은 모바일 기기들이 무선으로 인터넷에 접속할 수 있도록 하는 기술이다.

【0003】 초기의 무선랜 기술은 IEEE(Institute of Electrical and Electronics Engineers) 802.11을 통해 2.4GHz 주파수를 사용하여 주파수 도약(hopping), 대역확산, 적외선 통신 등으로 1~2Mbps의 속도를 지원한 이래, 최근에는 OFDM(Orthogonal Frequency Division Multiplex)을 적용하여 최대 54Mbps의 속

도를 지원할 수 있다. 이외에도 IEEE 802.11에서는 QoS(Quality for Service)의 향상, 액세스 포인트(Access Point, AP) 프로토콜 호환, 보안 강화(security enhancement), 무선 자원 측정(radio resource measurement), 차량 환경을 위한 무선 접속(wireless access vehicular environment), 빠른 로밍(fast roaming), 메쉬 네트워크(mesh network), 외부 네트워크와의 상호작용(interworking with external network), 무선 네트워크 관리(wireless network management) 등 다양한 기술의 표준을 실용화 또는 개발 중에 있다.

【0004】 IEEE 802.11 중에서 IEEE 802.11b는 2.4GHz 밴드의 주파수를 사용하면서 최고 11Mbps의 통신 속도를 지원한다. IEEE 802.11b 이후에 상용화된 IEEE 802.11a는 2.4GHz 밴드가 아닌 5GHz 밴드의 주파수를 사용함으로써 상당히 혼잡한 2.4GHz 밴드의 주파수에 비해 간섭에 대한 영향을 줄였으며, OFDM 기술을 사용하여 통신 속도를 최대 54Mbps까지 향상시켰다. 그러나 IEEE 802.11a는 IEEE 802.11b에 비해 통신 거리가 짧은 단점이 있다. 그리고 IEEE 802.11g는 IEEE 802.11b와 마찬가지로 2.4GHz 밴드의 주파수를 사용하여 최대 54Mbps의 통신속도를 구현하며, 하위 호환성(backward compatibility)을 만족하고 있어 상당한 주목을 받았는데, 통신 거리에 있어서도 IEEE 802.11a보다 우위에 있다.

【0005】 그리고, 무선랜에서 취약점으로 지적되어온 통신 속도에 대한 한계를 극복하기 위하여 제정된 기술 규격으로써 IEEE 802.11n이 있다. IEEE 802.11n은 네트워크의 속도와 신뢰성을 증가시키고, 무선 네트워크의 운영 거리를 확장하는데 목적을 두고 있다. 보다 구체적으로, IEEE 802.11n에서는 데이터 처리 속도가 최대

540Mbps 이상인 고처리율(High Throughput, HT)을 지원하며, 또한 전송 에러를 최소화하고 데이터 속도를 최적화하기 위해 송신부와 수신부 양단 모두에 다중 안테나를 사용하는 MIMO(Multiple Inputs and Multiple Outputs) 기술에 기반을 두고 있다. 또한, 이 규격은 데이터 신뢰성을 높이기 위해 중복되는 사본을 여러 개 전송하는 코딩 방식을 사용할 뿐만 아니라, 속도를 증가시키기 위해 직교 주파수 분할 다중(Orthogonal Frequency Division Multiplex, OFDM)을 사용할 수도 있다.

【0006】무선랜의 보급이 활성화되고, 이를 이용한 어플리케이션이 다양화됨에 따라, 최근에는 IEEE 802.11n이 지원하는 데이터 처리 속도보다 더 높은 처리율(Very High Throughput, VHT)을 지원하기 위한 새로운 무선랜 시스템에 대한 필요성이 대두되고 있다. 이 중 IEEE 802.11ac는 5GHz 주파수에서 넓은 대역폭(80MHz~160MHz)을 지원한다. IEEE 802.11ac 표준은 5GHz 대역에서만 정의되어 있으나, 기존 2.4GHz 대역 제품들과의 하위 호환성을 위해 초기 11ac 칩셋들은 2.4GHz 대역에서의 동작도 지원할 것이다. 이때 802.11ac는 2.4GHz에서 최대 40MHz까지 대역폭을 지원한다. 이론적으로, 이 규격에 따르면 다중 단말의 무선랜 속도는 최소 1Gbps, 최대 단일 링크 속도는 최소 500Mbps까지 가능하게 된다. 이는 더 넓은 무선 주파수 대역폭(최대 160MHz), 더 많은 MIMO 공간적 스트림(최대 8개), 다중 사용자 MIMO, 그리고 높은 밀도의 변조(최대 256 QAM) 등 802.11n에서 받아들인 무선 인터페이스 개념을 확장하여 이루어진다. 또한, 기존 2.5GHz/5GHz 대신 60GHz 밴드를 사용해 데이터를 전송하는 방식으로 IEEE 802.11ad가 있다. IEEE 802.11ad는 빔포밍 기술을 이용하여 최대 7Gbps의 속도를 제공하는 전송규격으로써, 대용량의 데

이터나 무압축 HD 비디오 등 높은 비트레이트 동영상 스트리밍에 적합하다. 하지만 60GHz 주파수 밴드는 장애물 통과가 어려워 근거리 공간에서의 디바이스들 간에만 이용이 가능한 단점이 있다.

【0007】무선랜은 넓은 주파수 대역을 사용할 수 있다. 넓은 주파수 대역을 사용하기 위해 데이터를 전송하기 전에 일정 시간동안 가능한 대역이 있는지 살펴보고 데이터를 인접한 영역의 주파수 대역이 가용한지 여부에 따라 연접하여 주파수 대역을 사용한다. 예를 들어 20MHz 대역이 주 주파수 대역 (주 채널)이고 그 다음 20MHz가 사용가능하고 그 다음 20MHz가 사용 불가능 그 다음 20MHz가 사용 가능이라면 총 40MHz를 전송 대역으로 하여 데이터를 전송한다. 연접한 주파수 대역만을 데이터 전송 대역으로 사용하기 때문에 실제 가용한 주파수 대역이 있음에도 불구하고 사용하지 못하는 문제가 있다. 또한 종래의 무선 접속 기술은 동일한 Basic Service Set (BSS) 내에서 매 전송 시도마다 하나의 송신 단말 및 수신 단말의 일대일 접속만을 지원하기 때문에 단말들의 접속 환경이나 전송 데이터의 특성을 반영하지 못하여 비효율적이라는 문제를 지니고 있다.

【발명의 내용】

【해결하고자 하는 과제】

【0008】본 발명은 전술한 종래 기술의 문제점을 해결하기 위한 것으로서, 무선랜을 위한 다중채널 상향 패킷 전달 방법, 장치 및 시스템을 제공하고자 하는 목적을 가지고 있다.

【과제의 해결 수단】

【0009】 본 발명의 실시예에 따르면 무선랜을 위한 장치, 시스템 및 방법이 제공될 수 있다.

【발명의 효과】

【0010】 본 발명의 실시예에 따르면 경쟁 기반 채널 접근 시스템에서 다중 사용자 상향 전송 시에 불필요한 채널 점유를 줄일 수 있는 효과가 있다.

【0011】 또한, 본 발명의 실시예에 따르면 multiplexed group ACK을 이용하여 OBSS의 primary channel의 점유 확률을 증가시키는 효과가 있다.

【0012】 또한, 본 발명의 실시예에 따르면 과밀한 OBSS 환경에서 네트워크 전체의 spectral efficiency를 높일 수 있는 효과가 있다.

【0013】 또한, 무선랜을 이용하는 스테이션 내지 액세스 포인트, 셀룰러 통신을 이용하는 스테이션 내지 기지국 등 다양한 통신 디바이스에 사용 가능하다.

【도면의 간단한 설명】

【0014】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다.

도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다.

도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도이다.

도 4는 본 발명의 일 실시예에 따른 AP의 구성을 나타낸 블록도이다.

도 5는 본 발명의 일 실시예에 관련된 STA이 AP와 링크를 설정하는 단계를 개략적으로 도시한 것이다.

도 6은 본 발명의 일 실시예에 관련된 STA의 패시브 스캐닝 방법을 도시한 것이다.

도 7은 본 발명의 일 실시예에 관련된 STA의 액티브 스캐닝 방법을 도시한 것이다.

도 8은 기본적인 다중 사용자 상향 데이터 전송 과정의 예시를 나타내고 있다.

도 9는 본 발명의 실시예에 따른 multiplexed group ACK의 구조를 도시하고 있다.

도 10은 본 발명의 다른 실시예에 따른 multiplexed group ACK 전송방법을 도시하고 있다.

도 11은 본 발명의 다른 실시예에 따른 BA length alignment를 위한 AID field padding 방법을 도시하고 있다.

도 12는 본 발명의 다른 실시예에 따른 다중 사용자 하향 데이터 전송 과정에서의 AID field padding의 활용과 Block ACK padding의 활용을 도시하고 있다.

【발명을 실시하기 위한 구체적인 내용】

【0015】 아래에서는 첨부한 도면을 참조하여 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 본 발명의 실시예를 상세

히 설명한다. 그러나 본 발명은 여러 가지 상이한 형태로 구현될 수 있으며 여기에서 설명하는 실시예에 한정되지 않는다. 그리고 도면에서 본 발명을 명확하게 설명하기 위해서 설명과 관계없는 부분은 생략하였으며, 명세서 전체를 통하여 유사한 부분에 대해서는 유사한 도면 부호를 붙였다.

【0016】 명세서 전체에서, 어떤 부분이 다른 부분과 "연결"되어 있다고 할 때, 이는 "직접적으로 연결"되어 있는 경우뿐 아니라, 그 중간에 다른 소자를 사이에 두고 "전기적으로 연결"되어 있는 경우도 포함한다. 또한 어떤 부분이 어떤 구성요소를 "포함"한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다.

【0018】 무선랜 시스템의 구조

【0019】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다.

【0020】 무선랜 시스템은 하나 또는 그 이상의 기본 서비스 세트(Basic Service Set, BSS)를 포함하는데, BSS는 성공적으로 동기화를 이루어서 서로 통신할 수 있는 기기들의 집합을 나타낸다. 일반적으로 BSS는 인프라스트럭쳐 BSS(infrastructure BSS)와 독립 BSS(Independent BSS, IBSS)로 구분될 수 있으며, 도 1은 이 중 인프라스트럭쳐 BSS를 나타내고 있다.

【0021】도 1에 도시된 바와 같이 인프라스트럭쳐 BSS(BSS1, BSS2)는 하나 또는 그 이상의 스테이션(STA-1, STA-2, STA-3, STA-4, STA-5), 분배 서비스(Distribution Service)를 제공하는 스테이션인 액세스 포인트(PCP/AP-1, PCP/AP-2), 및 다수의 액세스 포인트(PCP/AP-1, PCP/AP-2)를 연결시키는 분배 시스템(Distribution System, DS)을 포함한다.

【0022】스테이션(Station, STA)은 IEEE 802.11 표준의 규정을 따르는 매체 접속 제어(Medium Access Control, MAC)와 무선 매체에 대한 물리층(Physical Layer) 인터페이스를 포함하는 임의의 디바이스로서, 광의로는 액세스 포인트(AP)와 비 액세스 포인트 STA(Non-AP Station)를 모두 포함한다. 무선 통신을 위한 스테이션은 프로세서(Processor)와 트랜시버(transceiver)를 포함하고, 실시예에 따라 사용자 인터페이스부와 디스플레이 유닛 등을 더 포함할 수 있다. 프로세서는 무선 네트워크를 통해 전송할 프레임을 생성하거나 또는 상기 무선 네트워크를 통해 수신된 프레임을 처리하며, 그 밖에 스테이션을 제어하기 위한 다양한 처리를 수행한다. 그리고, 트랜시버는 프로세서와 기능적으로 연결되어 있으며, 스테이션을 위하여 무선 네트워크를 통해 프레임을 송수신한다.

【0023】액세스 포인트(Access Point, AP)는 자신에게 결합된 스테이션을 위하여 무선 매체를 경유하여 분배시스템(DS)에 대한 접속을 제공하는 개체이다. 인프라스트럭쳐 BSS에서 AP와 접속되지 않은 STA들 사이의 통신은 AP를 경유하여 이루어지는 것이 원칙이지만, 다이렉트 링크가 설정된 경우에는 AP와 접속되지 않은 STA들 사이에서도 직접 통신이 가능하다. 한편, 본 발명에서 AP는 PCP(Personal

BSS Coordination Point)를 포함하는 개념으로 사용되며, 광의적으로는 집중 제어기, 기지국(Base Station, BS), 노드-B, BTS(Base Transceiver System), 또는 사이트 제어기 등의 개념을 모두 포함할 수 있다.

【0024】 복수의 인프라스트럭쳐 BSS는 분배 시스템(DS)을 통해 상호 연결될 수 있다. 이때, DS를 통하여 연결된 복수의 BSS를 확장 서비스 세트(Extended Service Set, ESS)라 한다. ESS에 포함되는 STA들은 서로 통신할 수 있으며, 동일한 ESS 내에서 AP와 접속되지 않은 STA들은 끊김 없이 통신하면서 하나의 BSS에서 다른 BSS로 이동할 수 있다.

【0025】 도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다. 도 2의 실시예에서 도 1의 실시예와 동일하거나 상응하는 부분은 중복적인 설명을 생략하도록 한다.

【0026】 도 2에 도시된 BSS-3는 독립 BSS이며 AP를 포함하지 않기 때문에, 모든 스테이션(STA-6, STA-7)이 AP와 접속되지 않은 상태이다. 독립 BSS는 DS로의 접속이 허용되지 않으며, 자기 완비적 네트워크(self-contained network)를 이룬다. 독립 BSS에서 각각의 스테이션들(STA-6, STA-7)은 다이렉트로 서로 연결될 수 있다.

【0028】 STA(스테이션)의 구성

【0029】 도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도이다.

【0030】 도시된 바와 같이, 본 발명의 실시예에 따른 STA(100)은 프로세서(110), 하나 이상의 네트워크 인터페이스 카드(NIC, Network Interface Card, 120), 유저 인터페이스부(140), 디스플레이 유닛(150) 및 메모리(160)를 포함할 수 있다.

【0031】 먼저, 네트워크 인터페이스 카드(120)는 무선랜 접속을 수행하기 위한 모듈로서, STA(100)에 내장되거나 외장으로 구비될 수 있다. 본 발명의 실시예에 따르면, 네트워크 인터페이스 카드 (120)는 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈(120_1~120_n)을 포함할 수 있다. 이를테면, 네트워크 인터페이스 카드 모듈(120_1~120_n)은 2.4GHz, 5GHz 및 60GHz 등의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 본 발명의 실시예에 따르면, STA(100)은 6GHz 이상의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈(120_1~120_n)은 해당 네트워크 인터페이스 카드 모듈(120_1~120_n)이 지원하는 주파수 밴드의 무선랜 규격에 따라 AP 또는 외부 STA과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드(120)는 STA(100)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈(120_1~120_n)만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈(120_1~120_n)

을 함께 동작시킬 수 있다.

【0032】 한편, 도 3의 블록도에서 STA(100)의 복수의 네트워크 인터페이스 카드 모듈(120_1~120_n)은 서로 분리되어 도시되어 있으며, 각각의 네트워크 인터페이스 카드 모듈(120_1~120_n)의 MAC/PHY 계층이 서로 독립적으로 운영된다. 다만, 본 발명은 이에 한정하지 않으며, 복수의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈이 하나의 칩으로 통합된 상태로 STA(100)에 구비될 수도 있다.

【0033】 다음으로, 유저 인터페이스부(140)는 STA(100)에 구비된 다양한 형태의 입/출력 수단을 포함한다. 즉, 유저 인터페이스부(140)는 다양한 입력 수단을 이용하여 유저의 입력을 수신할 수 있으며, 프로세서(110)는 수신된 유저 입력에 기초하여 STA(100)을 제어할 수 있다. 또한, 유저 인터페이스부(140)는 다양한 출력 수단을 이용하여 프로세서(110)의 명령에 기초한 출력을 수행할 수 있다.

【0034】 다음으로, 디스플레이 유닛(150)은 디스플레이 화면에 이미지를 출력한다. 상기 디스플레이 유닛(150)은 프로세서(110)에 의해 실행되는 컨텐츠 또는 프로세서(110)의 제어 명령에 기초한 유저 인터페이스 등의 다양한 디스플레이 오브젝트를 출력할 수 있다. 또한, 메모리(160)는 STA(100)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 STA(100)이 AP 또는 외부 STA와 접속을 수행하는데 필요한 접속 프로그램이 포함될 수 있다.

【0035】 본 발명의 프로세서(110)는 다양한 명령 또는 프로그램을 실행하고, STA(100) 내부의 데이터를 프로세싱 할 수 있다. 또한, 프로세서(110)는 상술한 STA(100)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(110)는 STA(100)의 섹터 스윕 신호 전송/수신 및 이에 대응하는 피드백 신호 전송/수신 등의 커뮤니케이션 동작을 제어한다.

【0036】 또한, 프로세서(110)는 메모리(160)에 저장된 AP와의 접속을 실행하는 프로그램을 실행하여, AP가 전송한 통신 설정 메시지를 수신하고, 통신 설정 메시지에 포함된 STA(100)의 우선 조건에 대한 정보를 독출하고, STA(100)n의 우선 조건에 대한 정보에 따라 AP에 대한 접속을 요청한다. 이에 대한 구체적인 설명은 추후 기술하기로 한다.

【0037】 도 3에 도시된 STA(100)는 본 발명의 일 실시예에 따른 블록도로서, 분리하여 표시한 블록들은 디바이스의 엘리먼트들을 논리적으로 구별하여 도시한 것이다. 따라서 상술한 디바이스의 엘리먼트들은 디바이스의 설계에 따라 하나의 칩으로 또는 복수의 칩으로 장착될 수 있다. 또한, 본 발명의 실시예에서 STA(100)의 일부 구성들, 이를 테면 이동통신 모듈(130), 유저 인터페이스부(140) 및 디스플레이 유닛(150) 등은 STA(100)에 선택적으로 구비될 수 있다.

【0039】 AP(액세스 포인트)의 구성

【0040】도 4는 본 발명의 일 실시예에 따른 AP의 구성을 나타낸 블록도이다.

【0041】도시된 바와 같이, 본 발명의 실시예에 따른 AP(200)는 프로세서(210), NIC(Network Interface Card, 220) 및 메모리(160)를 포함할 수 있다. 도 4에서 AP(200)의 구성 중 도 3의 STA(100)의 구성과 동일하거나 상응하는 부분에 대해서는 중복적인 설명을 생략하도록 한다.

【0042】도 4를 참조하면, 본 발명에 따른 AP(200)는 적어도 하나의 주파수 밴드에서 BSS를 운영하기 위한 네트워크 인터페이스 카드(220)를 구비한다. 도 3의 실시예에서 전술한 바와 같이, AP(200)의 네트워크 인터페이스 카드 (220) 또한 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈(220_1~220_m)을 포함할 수 있다. 즉, 본 발명의 실시예에 따른 AP(200)는 서로 다른 주파수 밴드, 이를 테면 2.4GHz, 5GHz, 60GHz 중 두 개 이상의 네트워크 인터페이스 카드 모듈을 함께 구비할 수 있다. 바람직하게는, AP(200)는 6GHz 이상의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈(220_1~220_m)은 해당 네트워크 인터페이스 카드 모듈(220_1~220_m)이 지원하는 주파수 밴드의 무선랜 규격에 따라 STA과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드 (220)는 AP(200)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈(220_1~220_m)만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈

(220_1~220_m)을 함께 동작시킬 수 있다.

【0043】 다음으로, 메모리(260)는 AP(200)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 STA의 접속을 관리하는 접속 프로그램이 포함될 수 있다. 또한, 프로세서(210)는 AP(200)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다.

【0044】 또한, 프로세서(210)는 메모리(260)에 저장된 스테이션과의 접속을 실행하는 프로그램을 실행하여, 하나 이상의 STA(100)에 대하여 통신 설정 메시지를 전송하고, STA(100)의 접속 요청에 따라 접속 설정을 수행하되, 통신 설정 메시지는 각 스테이션의 접속 우선 조건에 대한 정보를 포함한다. 이에 대한 구체적인 설명은 추후 기술하기로 한다.

【0046】 링크 설정 단계

【0047】 도 5는 본 발명의 일 실시예에 관련된 STA이 AP와 링크를 설정하는 단계를 개략적으로 도시한 것이다.

【0048】 도 5를 참조하면, 본 발명에 따른 STA(100)가 AP(200)에 접속하는 단계는 크게 스캐닝(Scanning), 인증(Authentication) 및 결합(Association)의 3단계로 구분된다. 스캐닝단계는 STA(100)가 AP(200)가 운영하는 BSS의 접속 정보를 획득하는 단계이다. 스캐닝을 수행하기 위한 방법으로는 AP가 주기적으로 전송하는 비콘(Beacon) 메시지만을 활용하여 정보를 획득하는 패시브 스캐닝(Passive

Scanning) 기법(S101)과 STA가 AP에 프로브 요청(Probe Request)을 전송하고(S103), AP로부터 프로브 응답(Probe Response)을 수신하여(S105) 접속 정보를 획득하는 액티브 스캐닝(Active Scanning)기법이 있다.

【0049】 스캐닝 단계에서 성공적으로 무선 접속 정보를 수신한 STA(100)는 인증 요청(Authentication Request)을 송신(S107a)하고, 인증 응답(Authentication Response)을 수신(S107b)하여 인증 절차를 수행한다.

【0050】 성공적인 IEEE 802.11 계층에서의 인증 절차를 수행 후, 결합 단계(S109a, S109b)를 수행하고, 추가적으로 802.1X 기반의 인증(S111) 및 DHCP를 통한 IP 주소 획득(S113) 단계를 수행할 수 있다. AS(300)는 Authentication Server로서 STA(100)과 802.1X 기반의 인증을 처리하는 서버로서 AP(200)에 물리적으로 결합되어 존재하거나 별도의 서버로서 존재할 수 있다.

【0051】 도 6은 본 발명의 일 실시예에 관련된 STA의 패시브 스캐닝 방법을 도시한 것이다.

【0052】 도 6을 참조하면, 본 발명에 따른 제1 STA(110)는 주변에 위치한 제1 AP(210)와 제 2 AP(220)에서 주기적으로 송신하는 비콘 메시지를 수신하여 각각 AP들의 무선 접속 정보를 획득한다.

【0053】 도 7은 본 발명의 일 실시예에 관련된 STA의 액티브 스캐닝 방법을 도시한 것이다.

【0054】 도 7을 참조하면, 본 발명에 따른 제 1 STA(110)는 주변에 위치한 AP의 정보를 획득하기 위해 프로브 요청 메시지를 송신하고, 이에 대응하는 프로브 응답 메시지를 각각 제 1 AP(210)와 제 2 AP(220)로부터 수신하여 각각 AP들의 무선 접속 정보를 획득한다.

【0056】 다중 사용자 상향 전송

【0057】 도 8은 기본적인 다중 사용자 상향 데이터 전송 과정의 예시를 나타내고 있다. 다중 사용자 상향 전송의 경우 하향 전송과는 다르게 다수의 단말이 동시에 데이터를 전송해야 하기 때문에 BSS 내의 모든 단말과 통신을 수행할 수 있는 AP가 전송 과정을 관리하는 방법이 유력하다. 따라서 AP는 자원 할당과 데이터 전송의 충돌을 방지하기 위하여 실질적인 데이터 전송이 시작되는 이전 시점에 BSS 내 무선 단말들의 버퍼 내 상향 전송 데이터 존재 유무 및 TXOP 등의 정보를 알아야 하며, 또한 정확한 전송시점에 대한 정보를 단말들에게 전달해주어야 한다. 이러한 과정들은 다중 사용자 상향 데이터 전송을 위한 trigger 과정 및 scheduling 과정으로 나눌 수 있다. 사전에 미리 scheduiling에 관련된 정보를 수집한 뒤에 특정 조건을 만족했을 시에 trigger를 수행할 수도 있으며, 혹은 시간적인 조건에 따라 trigger를 수행한 뒤에 scheduling을 위한 정보를 그 즉시 수행하는 방법 역시 가능하다. Trigger 및 scheduling에는 AP와 무선 단말이 전송에 이용가능한 channel에 대한 정보를 서로 주고 받는 과정이 포함되며, 따라서 먼저 AP가 이용가능한 channel을 한정한 뒤에, 무선 단말들이 해당 channel들 중에서 이용가능한 모

든 channel 정보를 피드백 해야하는 방식으로 진행될 수 있다. 이 때 trigger는 이후에 이루어질 다중 사용자 상향 데이터 전송을 위한 NAV 설정 과정의 역할을 동시에 수행할 수 있다. 이때 trigger가 legacy format을 따르는 경우 trigger 프레임의 MAC header에 포함될 duration 값에 의하여 legacy 단말들도 trigger를 수신할 경우 정상적으로 NAV를 설정할 수 있다. Trigger를 활용한 NAV 설정의 경우 AP 만이 전송을 하기 때문에 AP 주변의 3rd party에 대한 NAV 설정은 정상적으로 이루어지지만 상향 전송 단말들은 trigger를 전송하지 않으므로 각 상향 전송 단말 주변의 3rd party에 대해서는 NAV 설정이 이루어지지 않을 수도 있다. 따라서 본 발명에서는 AP가 상향 전송 단말 주변에 부분적으로 존재할 수 있는 hidden node들에 대한 NAV 설정을 담당해 주기 위하여 trigger frame에 대해서만 증가된 파워로 송신하는 것이 가능하다.

【0058】 Trigger를 전송하면 AP가 정해준 시점에 AP로부터 할당받은 subcarrier를 통하여 다수의 단말이 동시에 데이터를 전송하며, 데이터 전송 후에는 AP가 상향 데이터 전송에 참여한 모든 단말에게 데이터 수신 여부를 알리는 ACK을 전송해야 한다.

【0059】 다중 사용자 상향 데이터 전송에서 과밀한 BSS 배치 환경으로 인하여 다수의 OBSS의 영향을 받게되면 무선 단말의 지리적인 위치에 따라 이용 가능한 채널이 각기 다르게 나타나게 되고, 이런 경우 각 채널에 전송 가능한 단말의 수가 각기 다르게 나타날 수 있다. 따라서 실질적인 상향 데이터 전송에 관여된 air time이 각 채널별로 각기 다르게 나타날 수 있다.

【0060】본 발명에서는 기존 802.11의 철학에 따라 모든 무선 단말이 primary channel을 통하여 UL-OFDMA trigger를 최초로 전송받고, 이후에 이용 가능한 secondary channel을 feedback 하는 것을 가정하기 때문에 primary channel을 이용할 수 없는 무선 단말은 다중 사용자 상향 전송에 참여할 수 없으며, 따라서 primary channel에 항상 가장 많은 무선 단말이 할당될 수 있다.

【0061】도 8의 예시와 같이 각 채널에 할당된 air time이 각기 다르게 나타나는 경우 각 channel 별로 ACK을 전송하지 않고 다중 사용자 상향 데이터 전송에 사용된 모든 channel의 ACK을 가장 긴 air time을 갖는 primary channel에 multiplexing 하여 전송할 수 있다.

【0062】Multiplexed group ACK을 이용하는 경우, secondary channel들은 상향 데이터 전송 air time이 끝난 시점에 바로 channel을 반환할 수 있기 때문에 해당 channel을 primary channel로 사용하는 OBSS가 더 이른 시점에 channel에 접속하는 것이 가능하다. 따라서 네트워크 전반의 spectral efficiency의 향상을 기대할 수 있다.

【0063】도 9는 본 발명의 실시예에 따른 multiplexed group ACK의 구조를 도시하고 있다.

【0064】Multiplexed group ACK은 기존의 Block ACK(BA)의 구조를 이용하여 구현할 수 있다. BA format의 BA control 내부 값들의 활성화 여부에 따라 BA information 부분이 가변적인 크기로 추가될 수 있다. 이 때 BA information 필드

내부의 Per TID info 부분에 reserved bit가 12개 존재하며 이 정보를 ACK 전송을 위한 단말의 AID 값으로 설정할 수 있다. 따라서 11bit로 구성되어 있는 B0~B10을 AID로 설정하고 B11 값은 해당 ACK이 일반 ACK의 형태인지 BA의 형태인지를 알려주는 indication bit로 활용할 수 있다. 따라서 B11이 도 9의 예시와 같이 ACK으로 설정된 경우는 뒤따라 전송되는 Block ACK start sequence control 및 Block ACK bitmap이 필요없기 때문에 해당 필드는 자동적으로 삭제될 수 있다. BA information 은 크기는 가변적이므로 해당 다중 사용자 상향 전송에 참여한 모든 단말에 대해 AID를 삽입할 수 있다. 즉, AID와 관련 block ack sequence control과 blockack bitmap을 단말당 반복하여 삽입하여 전송하는 것이다. B11이 ACK을 지시하는 경우는 block ack sequence control과 blockack bitmap은 생략되고 AID만 반복된다.

【0065】 도 10은 본 발명의 다른 실시예에 따른 multiplexed group ACK 전송 방법을 도시하고 있다.

【0066】 본 실시예에서는 trigger 이후에 전송되는 다중 사용자의 UL data가 scheduling 및 data padding 등에 의하여 동일한 시점에 전송이 종료되는 상황을 가정하고 있다. 이 경우 AP는 모든 ACK을 primary channel에 multiplexing 하지 않고, UL data를 전송한 송신 단말들에 대한 ACK을 각 채널에서 전송하도록 할 수 있다. 따라서 각 채널에 할당된 단말의 수가 서로 다를 경우, multiplexed group ACK에 사용되는 BA information 필드의 AID 값의 개수가 서로 다르기 때문에 각 20MHz 채널로 전송되는 multiplexed group ACK의 길이 역시 서로 다르게 설정될 수 있다.

그러나 802.11ax에서는 20MHz 이상의 wideband로 전송되는 PPDU에 대해서전송에 사용되는 모든 20MHz 단위의 채널에 동일한 L-SIG 및 HE-SIG A를 전송할 것을 명시하고 있기 때문에 L-SIG에 포함되는 PPDU length 값에 맞추어 모든 ACK이 동일한 길이를 갖도록 맞춰줄 필요성이 있다.

【0067】 도 11은 본 발명의 다른 실시예에 따른 BA length alignment를 위한 AID field padding 방법을 도시하고 있다.

【0068】 본 발명에서 사용하는 용어인 AID field padding 방법은 BA information의 구성 요소인 Per TID infor, block ack sequence control과 blockack bitmap을 각 채널마다 ACK을 하는 단말의 개수가 다를 경우에 길이를 맞춰 주기 위해 가장 길이가 긴 채널의 ACK만큼 길이가 짧은 ACK에 Per TID infor, block ack sequence control과 blockack bitmap을 반복하여 삽입하여 전송하는 것이다. B11이 ACK을 지시하는 경우는 block ack sequence control과 blockack bitmap은 생략되고 Per TID infor, 즉 AID만 반복된다.

【0070】 20MHz 단위 각 채널에 할당된 UL data 전송 단말의 수가 서로 다르게 나타날 경우 각 채널에 전송되는 multiplexed group ACK에서 BA information 부분의 길이가 달라질 수 있다. 따라서 L-SIG 등의 제약에 의하여 multiplexed group ACK들의 길이를 동일하게 맞추어야 할 경우 가장 긴 BA information이 할당된 채널을 기준으로 각 BA information의 길이를 잡을 수 있다. 따라서 남는 공간에는 zero padding을 하거나 BA information이 삽입된 순서대로 반복된 BA information

을 삽입할 수 있다. 또한 해당 PPDU가 BA가 아닌 ACK option을 활성화 할 경우에는 반복되는 모든 BA information에 대해서도 동일하게 ACK option을 활성화하여 BA starting sequence control/BA bitmap이 생략된 상태로 전송될 수 있다.

【0071】 도 12는 본 발명의 다른 실시예에 따른 다중 사용자 하향 데이터 전송 과정에서의 AID field padding의 활용과 Block ACK padding의 활용을 도시하고 있다.

【0072】 본 발명에서 제안한 BA의 AID field의 length alignment를 위한 padding 기법은 다중 사용자 하향 전송에서 AP가 각 채널에서 DL data를 전송받을 단말들을 알리는 DL-OFMDA trigger 과정에서 유사하게 활용될 수 있다. 다중 사용자 하향 데이터 전송 역시 각 채널별로 서로 다른 수의 단말이 수신 단말로 할당될 수 있으므로 DL-OFDMA trigger 과정에서 AP가 채널별로 할당된 단말의 AID를 알리는 과정에서 서로 다른 길이를 맞추어 주기 위하여 도 11과 동일한 형태로 zero padding을 삽입하거나 AID를 반복하는 형태로 trigger의 길이를 맞춰줄 수 있다.

【0073】 또한 본 발명에서 제안한 BA의 AID field padding 기법을 이용하여 BA가 전송되는 시간(air time)을 맞춰 줄 수 있다. 각 채널당 BA가 수신하는 단말의 개수만큼 전송되는데 본 실시예에서 보여지는 것과 같이 네번째 채널은 수신하는 단말이 한명이어서 BA가 하나만 전송되어 BA의 전송이 일찍 끝나게 된다. BA 전송 시간을 맞춰 주기 위해서 본 발명에서 제안한 AID field padding 기법을 이용하여 FCS전에 padding bit들을 삽입하여 전송 시간을 맞춰 줄 수 있다.

【0074】 본 발명에서 사용한 zero padding은 일 실시예이며 1을 padding해도

동일한 효과를 볼 수 있다.

【부호의 설명】

【특허청구범위】

【청구항 1】

무선랜을 위한 장치, 시스템 및 방법.

재출 일자 : 2015-03-17

【요약서】

【요약】

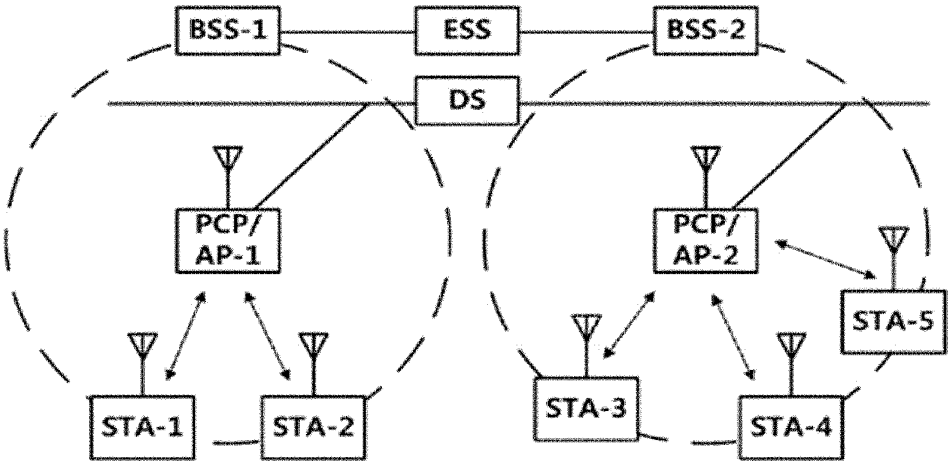
본 발명은 무선랜을 위한 장치, 시스템 및 방법에 관한 것으로, 본 발명의 실시예에 따르면, 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 group ACK 전송 및 padding 방법이 제공될 수 있다.

【대표도】

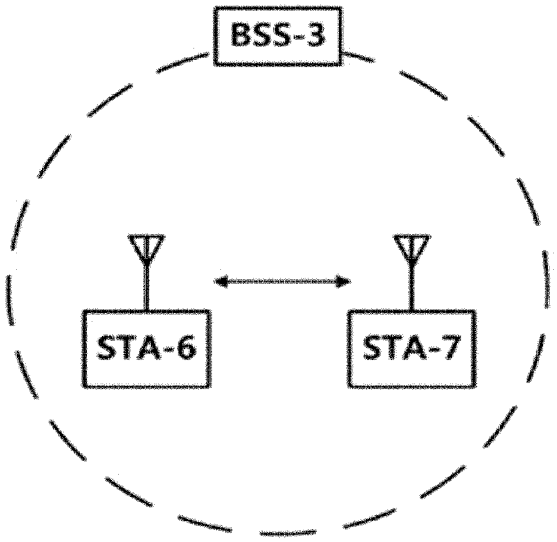
도 11

【도면】

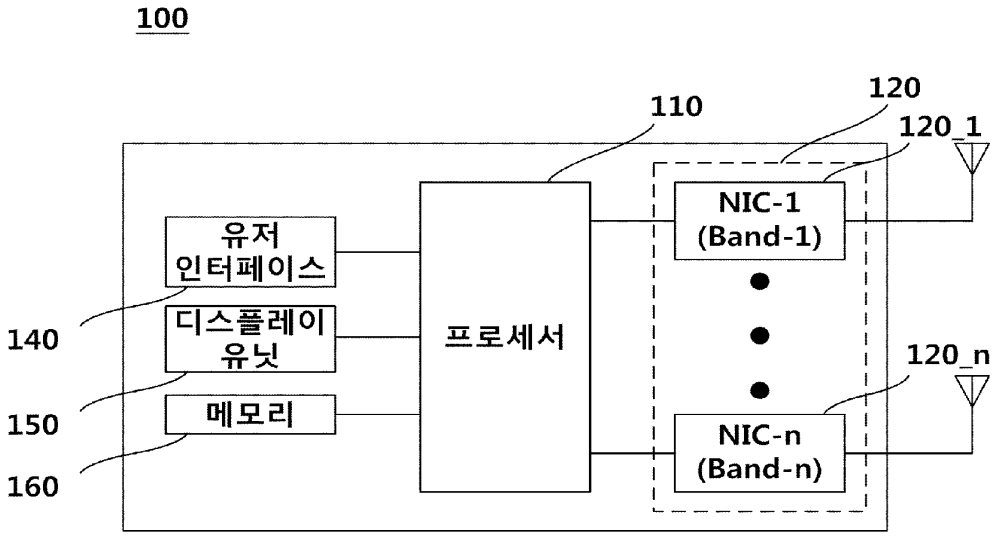
【도 1】



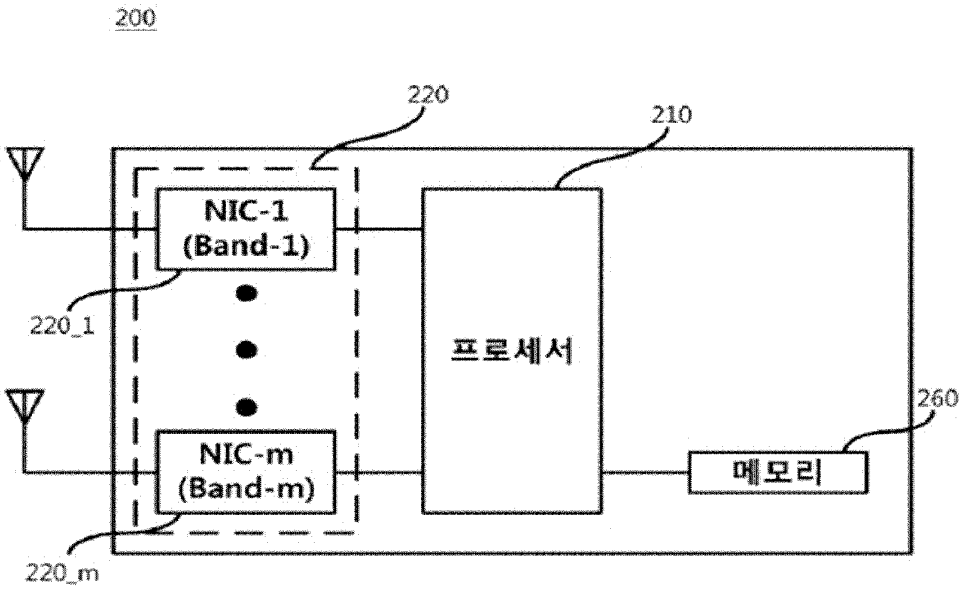
【도 2】



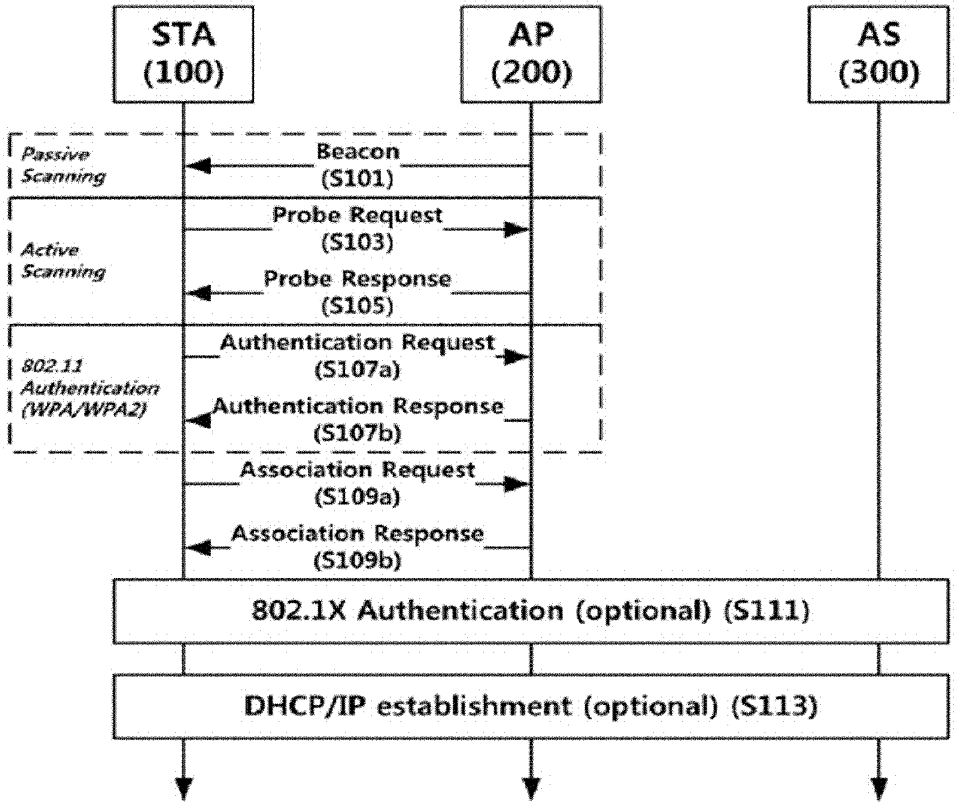
【도 3】


100
110
120
120_1
유저
인터페이스
디스플레이
유닛
메모리
프로세서
NIC-1
(Band-1)
NIC-n
(Band-n)
120_n
140
150
160

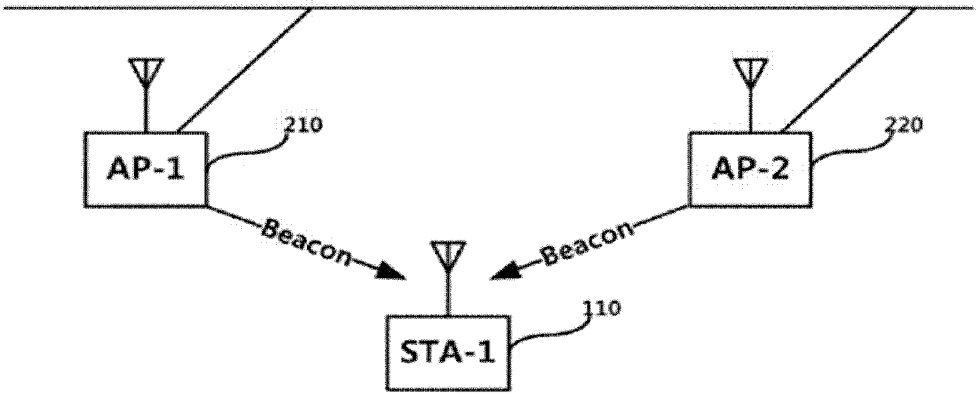
【도 4】



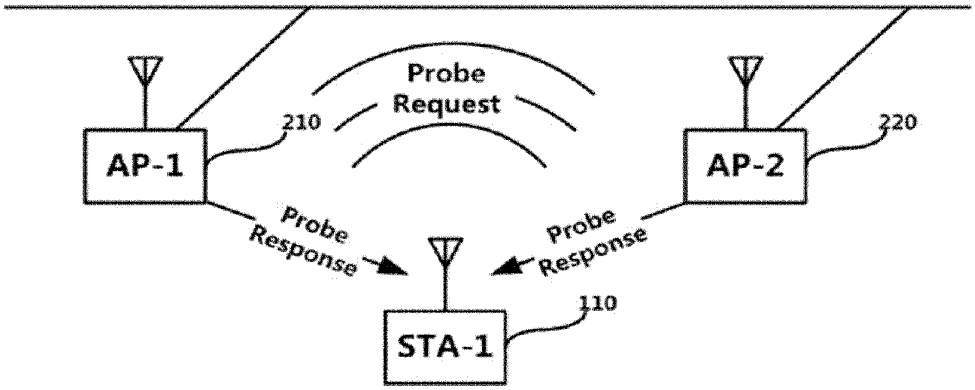
【도 5】


STA
(100)
AP
(200)
AS
(300)
Passive Scanning
Beacon
(S101)
Active Scanning
Probe Request
(S103)
Probe Response
(S105)
802.11 Authentication (WPA/WPA2)
Authentication Request
(S107a)
Authentication Response
(S107b)
Association Request
(S109a)
Association Response
(S109b)
802.1X Authentication (optional) (S111)
DHCP/IP establishment (optional) (S113)

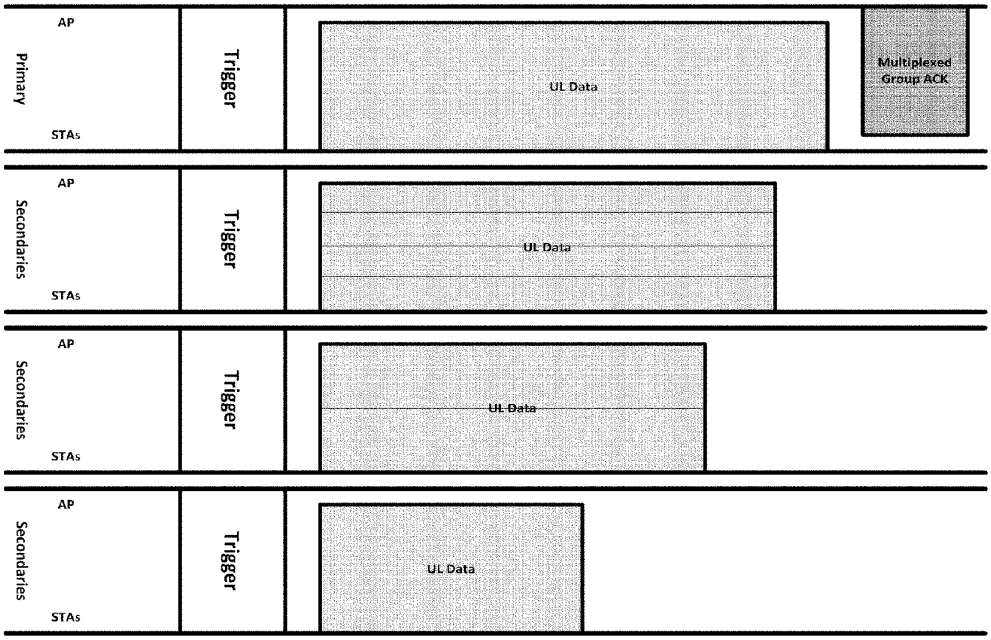
【도 6】


AP-1
210
AP-2
220
Beacon
Beacon
STA-1
110

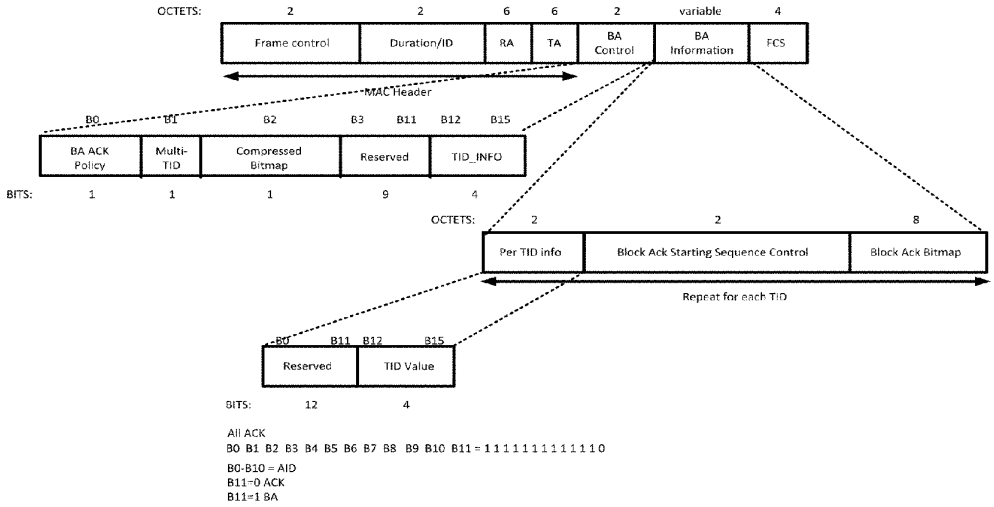
【도 7】


Probe
Request
AP-1
210
AP-2
220
Probe
Response
Probe
Response
STA-1
110

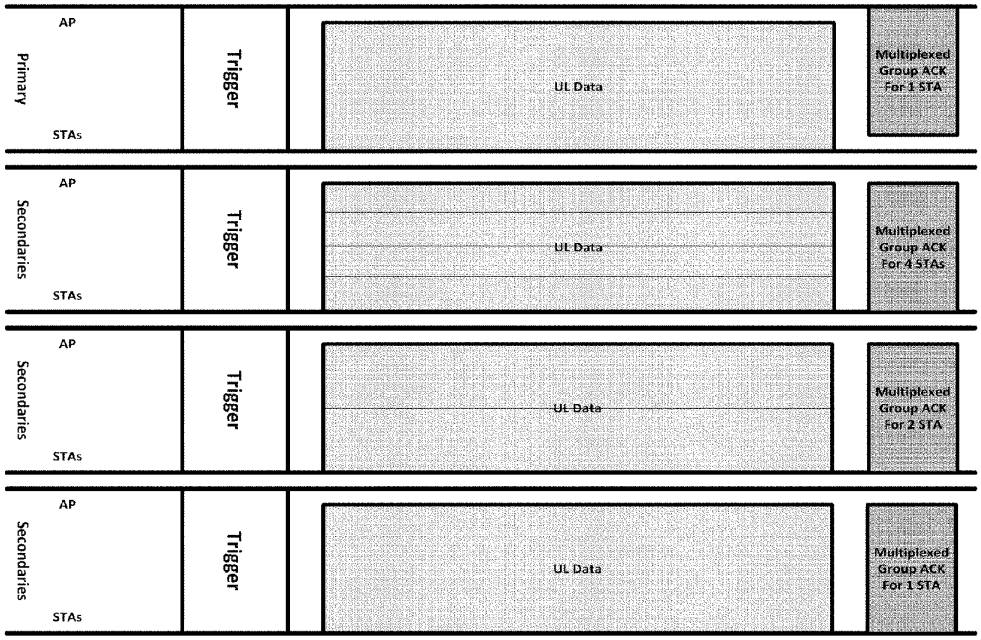
【도 8】


AP
Primary
STAs
Trigger
UL Data
Multiplexed Group ACK
AP
Secondaries
STAs
Trigger
UL Data
AP
Secondaries
STAs
Trigger
UL Data
AP
Secondaries
STAs
Trigger
UL Data

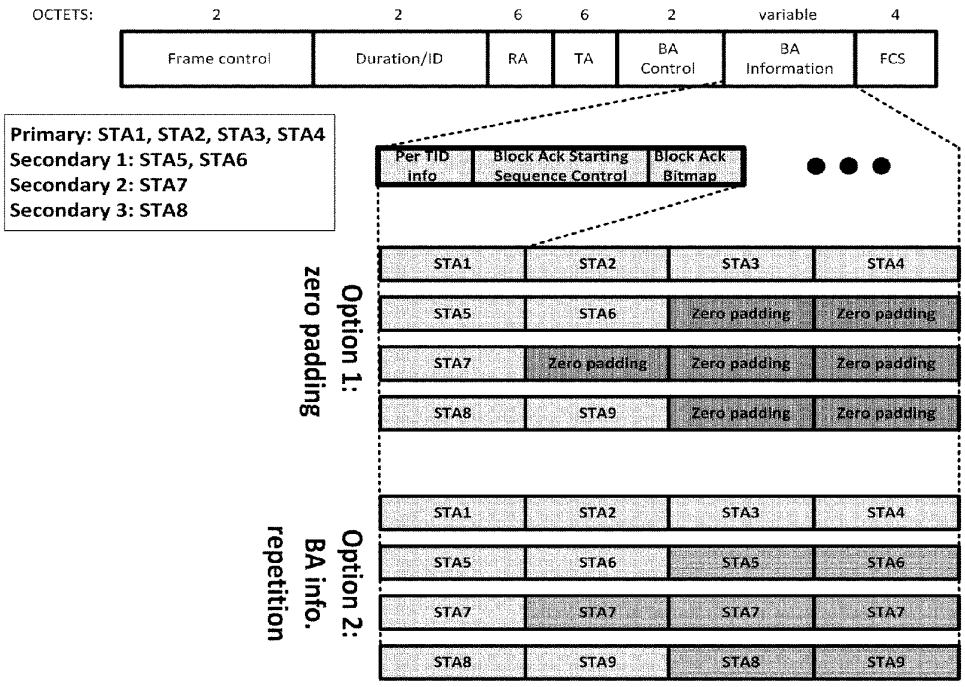
【도 9】


OCTETS:
2
2
6
6
2
variable
4
Frame control
Duration/ID
RA
TA
BA Control
BA Information
FCS
MAC Header
B0
B1
B2
B3
B11
B12
B15
BA ACK Policy
Multi-TID
Compressed Bitmap
Reserved
TID_INFO
BITS:
1
1
1
9
4
OCTETS:
2
2
8
Per TID info
Block Ack Starting Sequence Control
Block Ack Bitmap
Repeat for each TID
B0
B11
B12
B15
Reserved
TID Value
BITS:
12
4
All ACK
B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 = 1 1 1 1 1 1 1 1 1 1 1 0
B0-B10 = AID
B11=0 ACK
B11=1 BA

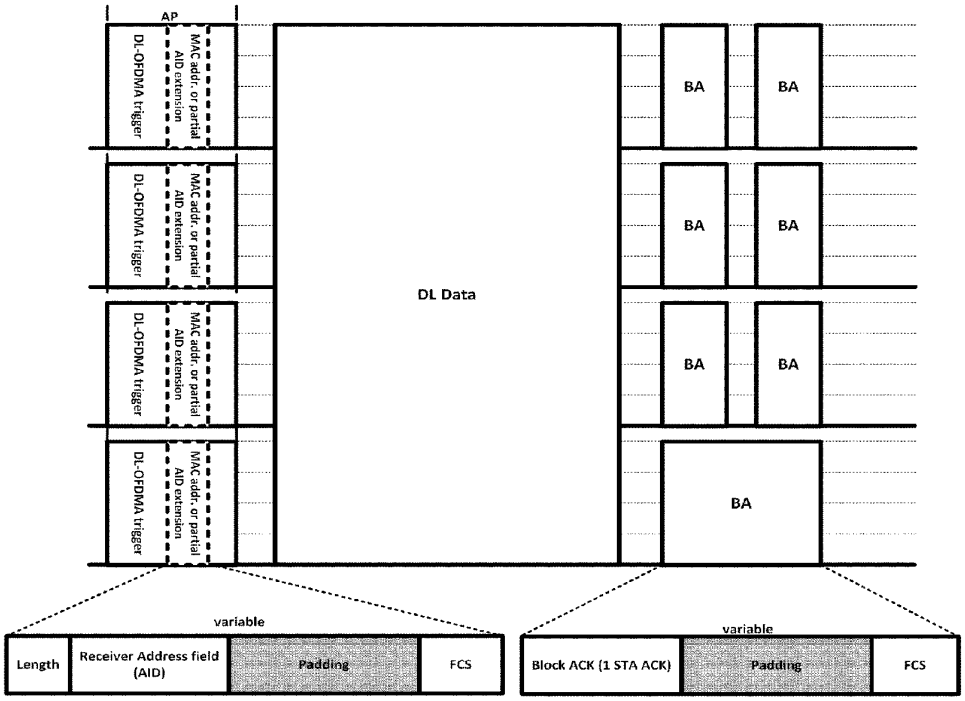
【도 10】


AP
Primary
STAs
Trigger
UL Data
Multiplexed Group ACK For 1 STA
AP
Secondaries
STAs
Trigger
UL Data
Multiplexed Group ACK For 4 STAs
AP
Secondaries
STAs
Trigger
UL Data
Multiplexed Group ACK For 2 STA
AP
Secondaries
STAs
Trigger
UL Data
Multiplexed Group ACK For 1 STA

【도 11】


OCTETS:
2
2
6
6
2
variable
4
Frame control
Duration/ID
RA
TA
BA Control
BA Information
FCS
Primary: STA1, STA2, STA3, STA4
Secondary 1: STA5, STA6
Secondary 2: STA7
Secondary 3: STA8
Per TID Info
Block Ack Starting Sequence Control
Block Ack Bitmap
Option 1: zero padding
STA1
STA2
STA3
STA4
STA5
STA6
Zero padding
STA7
STA8
STA9
Option 2: BA info. repetition

【도 12】


AP
DL-OFDMA trigger
MAC addr. or partial AID extension
DL Data
BA
variable
Length
Receiver Address field (AID)
Padding
FCS
Block ACK (1 STA ACK)

Digital Access Service
(DAS)

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【발명의 국문명칭】 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 ACK 전송 및 FREQUENCY MASKING 방법

【발명의 영문명칭】 ACK TRANSMISSION AND FREQUENCY MASKING METHODS FOR WIDEBAND WILRELESS LAN MULTIPLE USER UPLINK DATA TRANSMISSION

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【우선권주장료】	0	건	0 원
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【발명의 설명】

【발명의 명칭】

무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 ACK 전송 및 FREQUENCY MASKING 방법{ACK TRANSMISSION AND FREQUENCY MASKING METHODS FOR WIDEBAND WILRELESS LAN MULTIPLE USER UPLINK DATA TRANSMISSION}

【기술분야】

【0001】 본 발명은 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 ACK 전송 및 FREQUENCY MASKING 방법에 관한 것이다.

【발명의 배경이 되는 기술】

【0002】 최근 모바일 기기의 보급이 확대됨에 따라 이들에게 빠른 무선 인터넷 서비스를 제공할 수 있는 무선랜(Wireless LAN) 기술이 많은 각광을 받고 있다. 무선랜 기술은 근거리에서 무선 통신 기술을 바탕으로 스마트 폰, 스마트 패드, 랩탑 컴퓨터, 휴대형 멀티미디어 플레이어, 임베디드 기기 등과 같은 모바일 기기들이 무선으로 인터넷에 접속할 수 있도록 하는 기술이다.

【0003】 초기의 무선랜 기술은 IEEE(Institute of Electrical and Electronics Engineers) 802.11을 통해 2.4GHz 주파수를 사용하여 주파수 도약(hopping), 대역확산, 적외선 통신 등으로 1~2Mbps의 속도를 지원한 이래, 최근에는 OFDM(Orthogonal Frequency Division Multiplex)을 적용하여 최대 54Mbps의 속도를 지원할 수 있다. 이외에도 IEEE 802.11에서는 QoS(Quality for Service)의

향상, 액세스 포인트(Access Point, AP) 프로토콜 호환, 보안 강화(security enhancement), 무선 자원 측정(radio resource measurement), 차량 환경을 위한 무선 접속(wireless access vehicular environment), 빠른 로밍(fast roaming), 메쉬 네트워크(mesh network), 외부 네트워크와의 상호작용(interworking with external network), 무선 네트워크 관리(wireless network management) 등 다양한 기술의 표준을 실용화 또는 개발 중에 있다.

【0004】 IEEE 802.11 중에서 IEEE 802.11b는 2.4GHz 밴드의 주파수를 사용하면서 최고 11Mbps의 통신 속도를 지원한다. IEEE 802.11b 이후에 상용화된 IEEE 802.11a는 2.4GHz 밴드가 아닌 5GHz 밴드의 주파수를 사용함으로써 상당히 혼잡한 2.4GHz 밴드의 주파수에 비해 간섭에 대한 영향을 줄였으며, OFDM 기술을 사용하여 통신 속도를 최대 54Mbps까지 향상시켰다. 그러나 IEEE 802.11a는 IEEE 802.11b에 비해 통신 거리가 짧은 단점이 있다. 그리고 IEEE 802.11g는 IEEE 802.11b와 마찬가지로 2.4GHz 밴드의 주파수를 사용하여 최대 54Mbps의 통신속도를 구현하며, 하위 호환성(backward compatibility)을 만족하고 있어 상당한 주목을 받았는데, 통신 거리에 있어서도 IEEE 802.11a보다 우위에 있다.

【0005】 그리고, 무선랜에서 취약점으로 지적되어온 통신 속도에 대한 한계를 극복하기 위하여 제정된 기술 규격으로써 IEEE 802.11n이 있다. IEEE 802.11n은 네트워크의 속도와 신뢰성을 증가시키고, 무선 네트워크의 운영 거리를 확장하는데 목적을 두고 있다. 보다 구체적으로, IEEE 802.11n에서는 데이터 처리 속도가 최대 540Mbps 이상인 고처리율(High Throughput, HT)을 지원하며, 또한 전송 에

러를 최소화하고 데이터 속도를 최적화하기 위해 송신부와 수신부 양단 모두에 다중 안테나를 사용하는 MIMO(Multiple Inputs and Multiple Outputs) 기술에 기반을 두고 있다. 또한, 이 규격은 데이터 신뢰성을 높이기 위해 중복되는 사본을 여러 개 전송하는 코딩 방식을 사용할 뿐만 아니라, 속도를 증가시키기 위해 직교 주파수 분할 다중(Orthogonal Frequency Division Multiplex, OFDM)을 사용할 수도 있다.

【0006】무선랜의 보급이 활성화되고, 이를 이용한 어플리케이션이 다양화됨에 따라, 최근에는 IEEE 802.11n이 지원하는 데이터 처리 속도보다 더 높은 처리율(Very High Throughput, VHT)을 지원하기 위한 새로운 무선랜 시스템에 대한 필요성이 대두되고 있다. 이 중 IEEE 802.11ac는 5GHz 주파수에서 넓은 대역폭(80MHz~160MHz)을 지원한다. IEEE 802.11ac 표준은 5GHz 대역에서만 정의되어 있으나, 기존 2.4GHz 대역 제품들과의 하위 호환성을 위해 초기 11ac 칩셋들은 2.4GHz 대역에서의 동작도 지원할 것이다. 이때 802.11ac는 2.4GHz에서 최대 40MHz까지 대역폭을 지원한다. 이론적으로, 이 규격에 따르면 다중 단말의 무선랜 속도는 최소 1Gbps, 최대 단일 링크 속도는 최소 500Mbps까지 가능하게 된다. 이는 더 넓은 무선 주파수 대역폭(최대 160MHz), 더 많은 MIMO 공간적 스트림(최대 8개), 다중 사용자 MIMO, 그리고 높은 밀도의 변조(최대 256 QAM) 등 802.11n에서 받아들인 무선 인터페이스 개념을 확장하여 이루어진다. 또한, 기존 2.5GHz/5GHz 대신 60GHz 밴드를 사용해 데이터를 전송하는 방식으로 IEEE 802.11ad가 있다. IEEE 802.11ad는 빔포밍 기술을 이용하여 최대 7Gbps의 속도를 제공하는 전송규격

으로써, 대용량의 데이터나 무압축 HD 비디오 등 높은 비트레이트 동영상 스트리밍에 적합하다. 하지만 60GHz 주파수 밴드는 장애물 통과가 어려워 근거리 공간에서의 디바이스들 간에만 이용이 가능한 단점이 있다.

【0007】무선랜은 넓은 주파수 대역을 사용할 수 있다. 넓은 주파수 대역을 사용하기 위해 데이터를 전송하기 전에 일정 시간동안 가능한 대역이 있는지 살펴보고 데이터를 인접한 영역의 주파수 대역이 가용한지 여부에 따라 연접하여 주파수 대역을 사용한다. 예를 들어 20MHz 대역이 주 주파수 대역 (주 채널)이고 그 다음 20MHz가 사용가능하고 그 다음 20MHz가 사용 불가능 그 다음 20MHz가 사용 가능이라면 총 40MHz를 전송 대역으로 하여 데이터를 전송한다. 연접한 주파수 대역만을 데이터 전송 대역으로 사용하기 때문에 실제 가용한 주파수 대역이 있음에도 불구하고 사용하지 못하는 문제가 있다. 또한 종래의 무선 접속 기술은 동일한 Basic Service Set (BSS) 내에서 매 전송 시도마다 하나의 송신 단말 및 수신 단말의 일대일 접속만을 지원하기 때문에 단말들의 접속 환경이나 전송 데이터의 특성을 반영하지 못하여 비효율적이라는 문제를 지니고 있다.

【발명의 내용】

【해결하고자 하는 과제】

【0008】본 발명은 전술한 종래 기술의 문제점을 해결하기 위한 것으로서, 무선랜을 위한 다중채널 상향 패킷 전달 방법, 장치 및 시스템을 제공하기 위한 목적을 가지고 있다.

【과제의 해결 수단】

【0009】 이를 위해 본 발명은 경쟁 기반 채널 접근 시스템에서 다중 사용자 상향 전송 시의 ACK 처리 방법을 제안한다.

【발명의 효과】

【0010】 본 발명의 실시예에 따르면 multiplexed group ACK을 활용하여 불필요한 채널 점유를 줄임으로써 네트워크 전반의 spectral efficiency를 증가시킬 수 있는 효과가 있다.

【0011】 더욱 상세하게, 본 발명의 실시예에 따르면 multiplexed group ACK을 이용하여 OBSS의 primary channel의 점유 확률을 증가시킬 수 있으며, 과밀한 OBSS 환경에서 네트워크 전체의 spectral efficiency를 높일 수 있는 효과가 있다.

【0012】 또한, 본 발명의 실시예에 따르면 경쟁 기반 채널 접근 시스템에서 다중 사용자 상향 전송 시에 불필요한 채널 점유를 줄일 수 있는 효과가 있다.

【0013】 본 발명은 무선랜을 이용하는 스테이션 내지 액세스 포인트, 셀룰러 통신을 이용하는 스테이션 내지 기지국 등 다양한 통신 디바이스에 사용 가능하다.

【도면의 간단한 설명】

【0014】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시한 도면.

도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시한 도면.

도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도.

도 4는 본 발명의 일 실시예에 따른 AP의 구성을 나타낸 블록도.

도 5는 본 발명의 일 실시 예에 관련된 STA이 AP와 링크를 설정하는 단계를 개략적으로 도시한 도면.

도 6은 본 발명의 일 실시 예에 관련된 STA의 패시브 스캐닝 방법을 도시한 도면.

도 7은 본 발명의 일 실시 예에 관련된 STA의 액티브 스캐닝 방법을 도시한 도면.

도 8은 본 발명의 일 실시예에 관련된 무선랜 네트워크 구성을 나타낸 도면.

도 9는 기본적인 다중 사용자 상향 데이터 전송 과정의 예시를 나타낸 도면.

도 10은 본 발명의 실시예에 따른 다중 사용자 상향 데이터 전송을 위한 ACK 전송 방법을 도시한 도면.

도 11는 본 발명의 실시예에 따른 NAV 설정방법을 도시한 도면.

도 12는 본 발명의 다른 실시예에 따른 guard band 설정 방법을 도시한 도면.

도 13은 본 발명의 실시예에 따른 다중 사용자 상향 데이터 전송 과정에서의 preamble 처리 방법을 도시한 도면.

도 14는 본 발명의 실시예에 따른 HE preamble의 구성 방법을 도시한 도면.

【발명을 실시하기 위한 구체적인 내용】

【0015】 아래에서는 첨부한 도면을 참조하여 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 본 발명의 실시예를 상세히 설명한다. 그러나 본 발명은 여러 가지 상이한 형태로 구현될 수 있으며 여기에서 설명하는 실시예에 한정되지 않는다. 그리고 도면에서 본 발명을 명확하게 설명하기 위해서 설명과 관계없는 부분은 생략하였으며, 명세서 전체를 통하여 유사한 부분에 대해서는 유사한 도면 부호를 붙였다.

【0016】 명세서 전체에서, 어떤 부분이 다른 부분과 "연결"되어 있다고 할 때, 이는 "직접적으로 연결"되어 있는 경우뿐 아니라, 그 중간에 다른 소자를 사이에 두고 "전기적으로 연결"되어 있는 경우도 포함한다. 또한 어떤 부분이 어떤 구성요소를 "포함"한다고 할 때, 이는 특별히 반대되는 기재가 없는 한 다른 구성요소를 제외하는 것이 아니라 다른 구성요소를 더 포함할 수 있는 것을 의미한다.

【0017】 무선랜 시스템의 구조

【0018】 도 1은 본 발명의 일 실시예에 따른 무선랜 시스템을 도시하고 있다.

【0019】 무선랜 시스템은 하나 또는 그 이상의 기본 서비스 세트(Basic Service Set, BSS)를 포함하는데, BSS는 성공적으로 동기화를 이루어서 서로 통신할 수 있는 기기들의 집합을 나타낸다. 일반적으로 BSS는 인프라스트럭쳐 BSS(infrastructure BSS)와 독립 BSS(Independent BSS, IBSS)로 구분될 수 있으며, 도 1은 이 중 인프라스트럭쳐 BSS를 나타내고 있다.

【0020】 도 1에 도시된 바와 같이 인프라스트럭쳐 BSS(BSS1, BSS2)는 하나 또는 그 이상의 스테이션(STA-1, STA-2, STA-3, STA-4, STA-5), 분배 서비스(Distribution Service)를 제공하는 스테이션인 액세스 포인트(PCP/AP-1, PCP/AP-2), 및 다수의 액세스 포인트(PCP/AP-1, PCP/AP-2)를 연결시키는 분배 시스템(Distribution System, DS)을 포함한다.

【0021】 스테이션(Station, STA)은 IEEE 802.11 표준의 규정을 따르는 매체 접속 제어(Medium Access Control, MAC)와 무선 매체에 대한 물리층(Physical Layer) 인터페이스를 포함하는 임의의 디바이스로서, 광의로는 액세스 포인트(AP)와 비 액세스 포인트 STA(Non-AP Station)를 모두 포함한다. 무선 통신을 위한 스테이션은 프로세서(Processor)와 트랜시버(transceiver)를 포함하고, 실시예에 따라 사용자 인터페이스부와 디스플레이 유닛 등을 더 포함할 수 있다. 프로세서는 무선 네트워크를 통해 전송할 프레임을 생성하거나 또는 상기 무선 네트워크를 통해 수신된 프레임을 처리하며, 그 밖에 스테이션을 제어하기 위한 다양한 처리를 수행한다. 그리고, 트랜시버는 프로세서와 기능적으로 연결되어 있으며, 스테이션을 위하여 무선 네트워크를 통해 프레임을 송수신한다.

【0022】 액세스 포인트(Access Point, AP)는 자신에게 결합된 스테이션을 위하여 무선 매체를 경유하여 분배시스템(DS)에 대한 접속을 제공하는 개체이다. 인프라스트럭쳐 BSS에서 AP와 접속되지 않은 STA들 사이의 통신은 AP를 경유하여 이루어지는 것이 원칙이지만, 다이렉트 링크가 설정된 경우에는 AP와 접속되지 않은 STA들 사이에서도 직접 통신이 가능하다. 한편, 본 발명에서 AP는 PCP(Personal

BSS Coordination Point)를 포함하는 개념으로 사용되며, 광의적으로는 집중 제어기, 기지국(Base Station, BS), 노드-B, BTS(Base Transceiver System), 또는 사이트 제어기 등의 개념을 모두 포함할 수 있다.

【0023】 복수의 인프라스트럭쳐 BSS는 분배 시스템(DS)을 통해 상호 연결될 수 있다. 이때, DS를 통하여 연결된 복수의 BSS를 확장 서비스 세트(Extended Service Set, ESS)라 한다. ESS에 포함되는 STA들은 서로 통신할 수 있으며, 동일한 ESS 내에서 AP와 접속되지 않은 STA들은 끊김 없이 통신하면서 하나의 BSS에서 다른 BSS로 이동할 수 있다.

【0024】 도 2는 본 발명의 다른 실시예에 따른 무선랜 시스템인 독립 BSS를 도시하고 있다. 도 2의 실시예에서 도 1의 실시예와 동일하거나 상응하는 부분은 중복적인 설명을 생략하도록 한다.

【0025】 도 2에 도시된 BSS-3는 독립 BSS이며 AP를 포함하지 않기 때문에, 모든 스테이션(STA-6, STA-7)이 AP와 접속되지 않은 상태이다. 독립 BSS는 DS로의 접속이 허용되지 않으며, 자기 완비적 네트워크(self-contained network)를 이룬다. 독립 BSS에서 각각의 스테이션들(STA-6, STA-7)은 다이렉트로 서로 연결될 수 있다.

【0026】 STA(스테이션)의 구성

【0027】 도 3은 본 발명의 일 실시예에 따른 스테이션의 구성을 나타낸 블록도이다.

【0028】 도시된 바와 같이, 본 발명의 실시예에 따른 STA(100)은 프로세서(110), 하나 이상의 네트워크 인터페이스 카드(NIC, Network Interface Card, 120), 유저 인터페이스부(140), 디스플레이 유닛(150) 및 메모리(160)를 포함할 수 있다.

【0029】 먼저, 네트워크 인터페이스 카드(120)는 무선랜 접속을 수행하기 위한 모듈로서, STA(100)에 내장되거나 외장으로 구비될 수 있다. 본 발명의 실시예에 따르면, 네트워크 인터페이스 카드 (120)는 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈(120_1~120_n)을 포함할 수 있다. 이를 테면, 네트워크 인터페이스 카드 모듈(120_1~120_n)은 2.4GHz, 5GHz 및 60GHz 등의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈을 포함할 수 있다. 본 발명의 실시예에 따르면, STA(100)은 6GHz 이상의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈(120_1~120_n)은 해당 네트워크 인터페이스 카드 모듈(120_1~120_n)이 지원하는 주파수 밴드의 무선랜 규격에 따라 AP 또는 외부 STA과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드(120)는 STA(100)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈(120_1~120_n)만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈(120_1~120_n)을 함께 동작시킬 수 있다.

【0030】 한편, 도 3의 블록도에서 STA(100)의 복수의 네트워크 인터페이스 카드 모듈(120_1~120_n)은 서로 분리되어 도시되어 있으며, 각각의 네트워크 인터페이스 카드 모듈(120_1~120_n)의 MAC/PHY 계층이 서로 독립적으로 운영된다. 다만, 본 발명은 이에 한정하지 않으며, 복수의 서로 다른 주파수 밴드의 네트워크 인터페이스 카드 모듈이 하나의 칩으로 통합된 상태로 STA(100)에 구비될 수도 있다.

【0031】 다음으로, 유저 인터페이스부(140)는 STA(100)에 구비된 다양한 형태의 입/출력 수단을 포함한다. 즉, 유저 인터페이스부(140)는 다양한 입력 수단을 이용하여 유저의 입력을 수신할 수 있으며, 프로세서(110)는 수신된 유저 입력에 기초하여 STA(100)을 제어할 수 있다. 또한, 유저 인터페이스부(140)는 다양한 출력 수단을 이용하여 프로세서(110)의 명령에 기초한 출력을 수행할 수 있다.

【0032】 다음으로, 디스플레이 유닛(150)은 디스플레이 화면에 이미지를 출력한다. 상기 디스플레이 유닛(150)은 프로세서(110)에 의해 실행되는 컨텐츠 또는 프로세서(110)의 제어 명령에 기초한 유저 인터페이스 등의 다양한 디스플레이 오브젝트를 출력할 수 있다. 또한, 메모리(160)는 STA(100)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 STA(100)이 AP 또는 외부 STA와 접속을 수행하는데 필요한 접속 프로그램이 포함될 수 있다.

【0033】 본 발명의 프로세서(110)는 다양한 명령 또는 프로그램을 실행하고, STA(100) 내부의 데이터를 프로세싱 할 수 있다. 또한, 프로세서(110)는 상술한

STA(100)의 각 유닛들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다. 본 발명의 실시예에 따르면, 프로세서(110)는 STA(100)의 섹터 스윕 신호 전송/수신 및 이에 대응하는 피드백 신호 전송/수신 등의 커뮤니케이션 동작을 제어한다.

【0034】 또한, 프로세서(110)는 메모리(160)에 저장된 AP와의 접속을 실행하는 프로그램을 실행하여, AP가 전송한 통신 설정 메시지를 수신하고, 통신 설정 메시지에 포함된 STA(100)의 우선 조건에 대한 정보를 독출하고, STA(100)n의 우선 조건에 대한 정보에 따라 AP에 대한 접속을 요청한다. 이에 대한 구체적인 설명은 추후 기술하기로 한다.

【0035】 도 3에 도시된 STA(100)는 본 발명의 일 실시예에 따른 블록도로서, 분리하여 표시한 블록들은 디바이스의 엘리먼트들을 논리적으로 구별하여 도시한 것이다. 따라서 상술한 디바이스의 엘리먼트들은 디바이스의 설계에 따라 하나의 칩으로 또는 복수의 칩으로 장착될 수 있다. 또한, 본 발명의 실시예에서 STA(100)의 일부 구성들, 이를 테면 이동통신 모듈(130), 유저 인터페이스부(140) 및 디스플레이 유닛(150) 등은 STA(100)에 선택적으로 구비될 수 있다.

【0036】 AP(액세스 포인트)의 구성

【0037】 도 4는 본 발명의 일 실시예에 따른 AP의 구성을 나타낸 블록도이다.

【0038】 도시된 바와 같이, 본 발명의 실시예에 따른 AP(200)는 프로세서(210), NIC(Network Interface Card, 220) 및 메모리(160)를 포함할 수 있다. 도

4에서 AP(200)의 구성 중 도 3의 STA(100)의 구성과 동일하거나 상응하는 부분에 대해서는 중복적인 설명을 생략하도록 한다.

【0039】 도 4를 참조하면, 본 발명에 따른 AP(200)는 적어도 하나의 주파수 밴드에서 BSS를 운영하기 위한 네트워크 인터페이스 카드(220)를 구비한다. 도 3의 실시예에서 전술한 바와 같이, AP(200)의 네트워크 인터페이스 카드 (220) 또한 서로 다른 주파수 밴드를 이용하는 복수의 네트워크 인터페이스 카드 모듈(220_1~220_m)을 포함할 수 있다. 즉, 본 발명의 실시예에 따른 AP(200)는 서로 다른 주파수 밴드, 이를 테면 2.4GHz, 5GHz, 60GHz 중 두 개 이상의 네트워크 인터페이스 카드 모듈을 함께 구비할 수 있다. 바람직하게는, AP(200)는 6GHz 이상의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈과, 6GHz 이하의 주파수 밴드를 이용하는 적어도 하나의 네트워크 인터페이스 카드 모듈을 구비할 수 있다. 각각의 네트워크 인터페이스 카드 모듈(220_1~220_m)은 해당 네트워크 인터페이스 카드 모듈(220_1~220_m)이 지원하는 주파수 밴드의 무선랜 규격에 따라 STA과 무선 통신을 수행할 수 있다. 네트워크 인터페이스 카드 (220)는 AP(200)의 성능 및 요구 사항에 따라 한 번에 하나의 네트워크 인터페이스 카드 모듈(220_1~220_m)만을 동작시키거나 동시에 다수의 네트워크 인터페이스 카드 모듈(220_1~220_m)을 함께 동작시킬 수 있다.

【0040】 다음으로, 메모리(260)는 AP(200)에서 사용되는 제어 프로그램 및 그에 따른 각종 데이터를 저장한다. 이러한 제어 프로그램에는 STA의 접속을 관리하는 접속 프로그램이 포함될 수 있다. 또한, 프로세서(210)는 AP(200)의 각 유닛

들을 제어하며, 유닛들 간의 데이터 송수신을 제어할 수 있다.

【0041】 또한, 프로세서(210)는 메모리(260)에 저장된 스테이션과의 접속을 실행하는 프로그램을 실행하여, 하나 이상의 STA(100)에 대하여 통신 설정 메시지를 전송하고, STA(100)의 접속 요청에 따라 접속 설정을 수행하되, 통신 설정 메시지는 각 스테이션의 접속 우선 조건에 대한 정보를 포함한다. 이에 대한 구체적인 설명은 추후 기술하기로 한다.

【0042】 링크 설정 단계

【0043】 도 5는 본 발명의 일 실시 예에 관련된 STA이 AP와 링크를 설정하는 단계를 개략적으로 도시한 것이다.

【0044】 도 5를 참조하면, 본 발명에 따른 STA(100)가 AP(200)에 접속하는 단계는 크게 스캐닝(Scanning), 인증(Authentication) 및 결합(Association)의 3단계로 구분된다. 스캐닝단계는 STA(100)가 AP(200)가 운영하는 BSS의 접속 정보를 획득하는 단계이다. 스캐닝을 수행하기 위한 방법으로는 AP가 주기적으로 전송하는 비콘(Beacon) 메시지만을 활용하여 정보를 획득하는 패시브 스캐닝(Passive Scanning) 기법(S101)과 STA가 AP에 프로브 요청(Probe Request)을 전송하고(S103), AP로부터 프로브 응답(Probe Response)을 수신하여(S105) 접속 정보를 획득하는 액티브 스캐닝(Active Scanning)기법이 있다.

【0045】 스캐닝 단계에서 성공적으로 무선 접속 정보를 수신한 STA(100)는 인증 요청(Authentication Request)을 송신(S107a)하고, 인증 응답(Authentication

Response)을 수신(S107b)하여 인증 절차를 수행한다.

【0046】 성공적인 IEEE 802.11 계층에서의 인증 절차를 수행 후, 결합 단계(S109a, S109b)를 수행하고, 추가적으로 802.1X 기반의 인증(S111) 및 DHCP를 통한 IP 주소 획득(S113) 단계를 수행할 수 있다. AS(300)는 Authentication Server로서 STA(100)과 802.1X 기반의 인증을 처리하는 서버로서 AP(200)에 물리적으로 결합되어 존재하거나 별도의 서버로서 존재할 수 있다.

【0047】 도 6은 본 발명의 일 실시 예에 관련된 STA의 패시브 스캐닝 방법을 도시한 것이다.

【0048】 도 6을 참조하면, 본 발명에 따른 제1 STA(110)는 주변에 위치한 제 1 AP(210)와 제 2 AP(220)에서 주기적으로 송신하는 비콘 메시지를 수신하여 각각 AP들의 무선 접속 정보를 획득한다.

【0049】 도 7은 본 발명의 일 실시 예에 관련된 STA의 액티브 스캐닝 방법을 도시한 것이다.

【0050】 도 7을 참조하면, 본 발명에 따른 제 1 STA(110)는 주변에 위치한 AP의 정보를 획득하기 위해 프로브 요청 메시지를 송신하고, 이에 대응하는 프로브 응답 메시지를 각각 제 1 AP(210)와 제 2 AP(220)로부터 수신하여 각각 AP들의 무선 접속 정보를 획득한다.

【0051】 다중 사용자 상향 전송

【0052】 도 8은 본 발명의 일 실시예에 관련된 무선랜 네트워크 구성을 나타내고 있다.

【0053】 종래의 무선랜에서는 기본적으로 BSS 내에서 일대일로 통신하는 것을 원칙으로 하지만, 추가적인 채널과 OFDM 기술 혹은 추가적인 RF 모듈을 이용하게 되면 동시에 다수의 단말이 통신을 할 수 있는 환경이 조성된다. 그러나 일반적인 무선랜 환경에서는 하나의 AP가 다수의 단말과 통신을 주고 받기 때문에 상향전송을 가정할 경우, 다수의 단말이 동시에 AP에게 데이터를 전송하게 된다. 따라서 단말간에 대역 및 시간적으로 조정이 되어있어야 정상적인 데이터 전송이 가능하게 되고, 이러한 조정 과정의 효율에 따라 다중 사용자 상향 접속의 성능이 결정될 수 있다. 또한 여러 BSS가 인접해 있는 무선랜 환경이라면 각 BSS들이 점유하고 있는 채널 상황이 서로 다르게 나타나기 때문에, 도 8과 같이 같은 BSS내 단말인 경우에도 각자 인접한 BSS의 영향에 따라 접속 가능한 채널 역시 다르게 나타날 수 있다. 따라서 서로 다른 채널 상황 역시 다중 사용자 상향 접속을 지원하기 위한 고려사항이 될 수 있다.

【0054】 도 9는 기본적인 다중 사용자 상향 데이터 전송 과정의 예시를 나타내고 있다. 다중 사용자 상향 전송의 경우 하향 전송과는 다르게 다수의 단말이 동시에 데이터를 전송해야 하기 때문에 BSS 내의 모든 단말과 통신을 수행할 수 있는 AP가 전송 과정을 관리하는 방법이 유력하다. 따라서 AP는 자원 할당과 데이터 전송의 충돌을 방지하기 위하여 실질적인 데이터 전송이 시작되는 이전 시점에 BSS 내 무선 단말들의 버퍼 내 상향 전송 데이터 존재 유무 및 TXOP 등의 정보를 알아

야 하며, 또한 정확한 전송시점에 대한 정보를 단말들에게 전달해주어야 한다. 이러한 과정들은 다중 사용자 상향 데이터 전송을 위한 Initiation 과정 (S901) 및 scheduling 과정(S902)으로 나눌 수 있다. 사전에 미리 scheduiling에 관련된 정보를 수집한 뒤에 특정 조건을 만족 했을 시에 Initiation을 수행할 수도 있으며, 혹은 시간적인 조건에 따라 initiation을 수행한 뒤에 scheduling을 위한 정보를 그 즉시 수행하는 방법 역시 가능하다. Initiation 및 scheduling에는 AP와 무선 단말이 전송에 이용가능한 channel에 대한 정보를 서로 주고 받는 과정이 포함되며, 따라서 먼저 AP가 이용가능한 channel을 한정한 뒤에, 무선 단말들이 해당 channel들 중에서 이용가능한 모든 channel 정보를 피드백 해야하는 방식으로 진행될 수 있다. 본 발명에서는 initiation 및 scheduling의 상세한 구조 및 방법은 다루지 않는다.

【0055】 Initiation 과 scheduling 과정이 모두 마치면 AP가 정해준 시점에 AP로부터 할당받은 subcarrier를 통하여 다수의 단말이 동시에 데이터를 전송하며 (S903), 데이터 전송 후에는 AP가 상향 데이터 전송에 참여한 모든 단말에게 데이터 수신 여부를 알리는 ACK을 전송해야 한다 (S904). 802.11ax 표준에서는 20MHz 단위의 channel에 2.5/5/10 MHz의 subchannel 단위로 자원을 할당하는 방안을 고려하고 있기 때문에 하나의 channel에 다수의 단말이 전송에 참여할 수 있고, 따라서 AP는 각각의 channel에 group ACK의 형태로 각각의 channel에 전송한 단말들에 대한 ACK을 전송해야 한다.

【0056】 다중 사용자 상향 데이터 전송에서 과밀한 BSS 배치 환경으로 인하여 다수의 OBSS의 영향을 받게되면 무선 단말의 지리적인 위치에 따라 이용 가능한 채널이 각기 다르게 나타나게 되고, 이런 경우 각 채널에 전송 가능한 단말의 수가 각기 다르게 나타날 수 있다. 따라서 단계 S903과 같이 실질적인 상향 데이터 전송에 관여된 air time이 각 채널별로 각기 다르게 나타날 수 있다. 그러나 AP가 송신과 수신을 동시에 수행할 수 있는 기능이 없는 경우, air time이 긴 channel에서 수신을 하는 동안 상향 데이터 전송을 마친 channel에 대한 ACK을 송신할 수 없기 때문에 무선 단말들은 air time이 가장 긴 channel의 데이터 수신이 종료되는 시점까지 zero padding (S905) 등과 같은 방법으로 대기한 후에 ACK을 전송받을 수 있다. 이와 같이 padding으로 대기하는 경우 데이터 전송과 관련없이 해당 channel을 점유하게 되어 전반적인 spectral efficiency가 감소하게 되며, 특히 해당 channel을 primary channel로 사용하는 OBSS의 경우 padding 기간 동안 어떠한 동작도 할 수 없기 때문에 직접적인 성능 감소를 겪게 된다. 따라서 본 발명에서는 상기한 문제점을 해결하기 위한 다중 사용자 상향 데이터 전송을 위한 ACK 전송 방법을 제안한다.

【0057】 도 10은 본 발명의 실시예에 따른 다중 사용자 상향 데이터 전송을 위한 ACK 전송 방법을 도시하고 있다.

【0058】 본 발명에서는 기존 802.11의 철학에 따라 모든 무선 단말이 primary channel을 통하여 UL-OFDMA initiation을 최초로 전송받고, 이후에 이용 가능한 secondary channel을 feedback 하는 것을 가정하기 때문에 primary channel

을 이용할 수 없는 무선 단말은 다중 사용자 상향 전송에 참여할 수 없으며, 따라서 primary channel에 항상 가장 많은 무선 단말이 할당될 수 있다.

【0059】 도10의 예시와 같이 각 채널에 할당된 air time이 각기 다르게 나타나는 경우 각 channel 별로 ACK을 전송하지 않고 다중 사용자 상향 데이터 전송에 사용된 모든 channel의 ACK을 가장 긴 air time을 갖는 primary channel에 multiplexing 하여 전송할 수 있다(S1002). 따라서 secondary channel에 할당된 무선 단말들은 각 channel의 상향 전송 air time이 종료되는 시점부터 ACK 수신을 위한 timer를 설정하여 primary channel의 ACK 전송 시점까지 대기한 후에 ACK을 수신한다(S1002). 이를 위해서는 모든 channel이 multiplexed group ACK의 전송 시점을 인지하고 있어야하며 이러한 정보는 initiation/scheduling 과정에서 개별적으로 전송할 수 있다. 상기 ACK 수신을 위한 timer가 만료되기 까지 단말은 전원절약 모드 (sleep)로 천이하여 전원을 절약할 수도 있다.

【0060】 Multiplexed group ACK을 이용하는 경우, secondary channel들은 상향 데이터 전송 air time이 끝난 시점에 바로 channel을 반환할 수 있기 때문에 해당 channel을 primary channel로 사용하는 OBSS가 더 이른 시점에 channel에 접속하는 것이 가능하다. 따라서 네트워크 전반의 spectral efficiency의 향상을 기대할 수 있다.

【0061】 도 11는 본 발명의 실시예에 따른 NAV 설정방법을 도시하고 있다.

【0062】다중 사용자 상향 데이터 전송에서는 무선 단말들의 채널 상황 feedback과 자원할당이 완료하는 시점까지는 정확한 전송 완료 시점을 알 수 없기 때문에 AP가 UL-OFDMA 과정을 시작하는 시점에CTS-to-self 나?CTS-to-group를 전송하여Initiation 과 Scheduling 시점까지의 NAV를 우선적으로 설정한다 (S1101). 이후에 scheduling 과정에서 자원할당을 마치게 되면 각 channel에 할당된 전송 air time이 산출되고 따라서Initiation 및 Scheduling의 마지막 시점에 AP와 각 channel에 할당된 무선 단말들이 동시에 identical waveform으로 common CTS를 전송하는 과정을 통해 각 channel에 요구되는 NAV를 설정할 수 있다 (S1102). 따라서 secondary channel의 NAV를 들은 OBSS는 해당 NAV가 완료되는 시점에 바로 channel에 접속하는 것이 가능하다. Secondary channel로 상향 데이터를 전송한 STA들은 데이터를 전송한 channel과 ACK을 전송받는 channel이 서로 다르게 된다. 만약 해당 STA들이 상향 데이터를 전송하는 secondary channel에 대해서만 NAV를 설정할 경우 secondary channel의 데이터 전송에 대한 protection은 이루어지지만, primary channel에 대해서는 NAV가 설정되어 있지 않기 때문에 secondary 상향 전송 STA의 인접 AP 혹은 STA들은 primary channel에 대해서는 idle 하다고 간주하여 primary channel에 대한 접속을 시도할 수 있다. 이런 경우 secondary channel의 상향 전송 STA는 AP의 ACK을 수신할 수 없기 때문에 불필요한 재전송 과정을 거치게 된다. 따라서 본 발명에서는 secondary channel을 통해 데이터를 전송하는 STA들이 multiplexed group ACK이 전송되는 primary channel에 대한 protection을 추가적으로 수행할 수 있도록 S1102의 common CTS를 primary와 secondary channel에

전송해야 한다. 이 때 primary channel에 전송하는 common CTS의 duration은 primary channel의 multiplexed group ACK이 완료되는 시점을 가리켜야 한다. Primary channel에 상향 데이터를 전송하는 STA들은 secondary channel에 대한 추가적인 common CTS 전송이 요구되지 않는다.

【0063】 도 12는 본 발명의 다른 실시예에 따른 guard band 설정 방법을 도시하고 있다.

【0064】 802.11에서는 서로 다른 단말들이 인접한 channel을 통해 통신하는 경우 상호간에 간섭의 영향을 최소화하기 위하여 channel의 경계의 주파수에는 의도적으로 파워를 줄이는 frequency masking 기법을 이용한다. Frequency masking은 현재 이용 중인 전체 대역의 최소, 최대 주파수 일부의 파워를 줄여 guard frequency 를 구성하는 식으로 이루어지기 때문에 40MHz 단위로 전송하는 frequency masking과 (S1201), 인접한 두 20MHz channel에서 독립적인 두개의 전송이 이루어지는 경우의 frequency masking (S1202)의 경우 중앙 주파수 부분의 guard frequency(S1203)의 유무에 따라 frequency masking의 형태가 다르게 나타난다. 따라서 본 발명에서 S1204와 같이 특정 STA가 40MHz의 단위로 전송을 시작한 뒤에 scheduling 및 자원할당 결과에 따라 특정 20MHz의 전송만 없어지고 전송이 계속 되는 경우 RF chain의 frequency masking은 최초의 형태 그대로 유지될 수 있기 때문에 guard frequency가 없는 형태의 20MHz 전송이 될 가능성이 있다. 이 경우, OBSS에서 비어있는 20MHz의 대역에 대하여 전송을 시도하게되면 guard frequency의 부재에 따라 상호간의 간섭이 발생할 수 있다. 따라서 본 발명에서는

다중 사용자 상향 데이터 전송시이 이루어 질 시에는 S1205와 같이 20MHz 단위의 guard frequency가 항시 형성될 수 있도록 하기 위하여 단일 단말의 20MHz 이상의 자원 할당이 되지 않도록하거나, frequency masking에 상관없이 guard frequency에 해당하는 주파수 성분에는 nulling을 하여 OBSS와의 간섭이 발생하지 않도록 한다.

【0065】 도 13은 본 발명의 실시예에 따른 다중 사용자 상향 데이터 전송 과정에서의 preamble 처리 방법을 도시하고 있다.

【0066】 802.11ax에서는 ax 지원 단말을 위한 HE preamble과 backward compatibility를 위한 legacy preamble을 PSDU 전반부에 삽입하여 함께 전송한다. 기존의 802.11에서는 64 FFT size만을 지원하였으나 802.11ax 표준 이후부터는 그 이상의 256 FFT까지 지원될 계획이므로 HE preamble 역시 256 FFT size로 각 상향 전송 단말이 각자 할당된 sub-channel에 자신의 common control information을 삽입하여 전송한다. 그러나 legacy preamble의 경우는 20MHz의 단위로 전송되기 때문에 sub-channel 단위로 자원을 할당받은 상향 데이터 전송 단말들이 할당 받은 sub-channel에 대하여 부분적으로 legacy preamble을 전송하는 것이 불가능하다. 따라서 본 발명에서는 다중 사용자 상향 데이터 전송에 참여하는 단말들이 legacy preamble을 전송하기 위한 방법으로 두 가지를 제안한다. 첫 번째로 특정 기준에 의하여 선정된 하나의 단말이 같은 20MHz channel에 할당된 단말들의 대표로서 단독으로 legacy preamble을 전송할 수 있다. 단말을 선정하기 위한 기준으로는 RSSI가 가장 높은 단말이 전송하거나 혹은 sub-channel 단위로 가장 상위의 sub-channel에 할당된 단말이 전송하도록 하는 방법 등이 있다. 따라서 선정된 단말은

20MHz 단위로 legacy preamble을 전송하고 바로 이어서 256 FFT size의 HE preamble을 자신이 할당된 sub-channel에 전송하고, 나머지 단말들은 선정된 단말의 legacy preamble이 전송된 이후에 같은 시점에 각자 할당된 sub-channel 단위로 HE preamble을 전송한다. 두 번째 방법으로는 같은 20MHz에 할당된 모든 단말이 동일한 common control information으로 identical waveform의 형태로 동시에 legacy preamble을 전송하는 것이다. 따라서 동일한 legacy preamble을 전송한 뒤에 이어서 각자 할당된 sub-channel에서의 HE preamble을 전송하게 된다. 위와 같은 방식으로 preamble을 전송하기 위해서는 scheduling 과정 등에서 legacy preamble에 해당하는 값들을 사전에 AP가 전달해 주는 방식 등으로 동시 전송하는 단말들이 모두 공유해야 한다.

【0067】 도 14는 본 발명의 실시예에 따른 HE preamble의 구성 방법을 도시하고 있다.

【0068】 802.11ax의 표준에서는 legacy preamble 이후에 ax 단말간의 동작 및 컨트롤을 위한 HE preamble을 이어서 전송할 것을 명시하고 있다. 그 중 ax 단말의 common control information을 담고 있는 HE-SIG A는 legacy preamble과 같은 64 FFT size로 이루어질 것이 유력하다. 따라서 HE-SIG A는 다중 사용자 상향 데이터 전송에 참여하는 모든 단말이 20MHz의 단위로 같은 common control information을 전송하도록 구성이 될 수 있으며, 혹은 64 FFT를 각 단말에게 할당된 sub-channel의 최소 단위별로 독립적으로 구성하여 각각 다른 정보를 전송하도록 할 수도 있다. 따라서 sub-channel 최소단위의 한 개 이상의 sub-channel을 할당 받은

단말은 할당 받은 모든 sub-channel에 같은 HE-SIG A를 복사하여 전송하여야 한다. 또한 HE-SIG A에는 컨트롤 메시지, 데이터, ACK 등의 상향 혹은 하향 중 어떠한 데이터 전송인지를 다른 단말들에게 알릴 수 있게 하기 위하여 상향/하향을 표시하는 indication bit가 포함될 수 있다.

【0069】 상기와 같이 무선랜 통신을 예로 들어 본 발명을 설명하였지만, 본 발명은 이에 한정하지 않으며 셀룰러 통신 등 다른 통신 시스템에서도 동일하게 적용될 수 있다. 또한 본 발명의 방법, 장치 및 시스템은 특정 실시예와 관련하여 설명되었지만, 본 발명의 구성 요소, 동작의 일부 또는 전부는 범용 하드웨어 아키텍쳐를 갖는 컴퓨터 시스템을 사용하여 구현될 수 있다.

【0070】 전술한 본 발명의 설명은 예시를 위한 것이며, 본 발명이 속하는 기술분야의 통상의 지식을 가진 자는 본 발명의 기술적 사상이나 필수적인 특징을 변경하지 않고서 다른 구체적인 형태로 쉽게 변형이 가능하다는 것을 이해할 수 있을 것이다. 그러므로 이상에서 기술한 실시예들은 모든 면에서 예시적인 것이며 한정적인 것이 아닌 것으로 해석해야 한다. 예를 들어, 단일형으로 설명되어 있는 각 구성 요소는 분산되어 실시될 수도 있으며, 마찬가지로 분산된 것으로 설명되어 있는 구성 요소들도 결합된 형태로 실시될 수 있다.

【0071】 본 발명의 범위는 상기 상세한 설명보다는 후술하는 특허청구범위에 의하여 나타내어지며, 특허청구범위의 의미 및 범위 그리고 그 균등 개념으로부터 도출되는 모든 변경 또는 변형된 형태가 본 발명의 범위에 포함되는 것으로 해석되어야 한다.

【부호의 설명】

【0072】 100: 스테이션

200: 액세스 포인트

【특허청구범위】

【청구항 1】

무선랜을 위한 방법, 장치 및 시스템

재출 일자 : 2015-03-04

【요약서】

【요약】

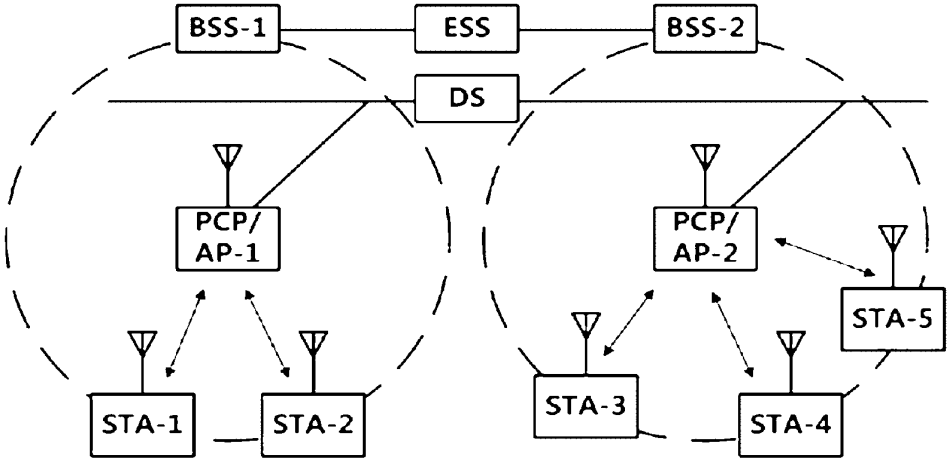
본 발명은 무선랜 광대역 다중 사용자 상향 데이터 전송을 위한 ACK 전송 및 FREQUENCY MASKING 방법에 관한 것이다. 이를 위해 본 발명은 경쟁 기반 채널 접근 시스템에서 다중 사용자 상향 전송 시의 ACK 처리 방법을 제안한다.

【대표도】

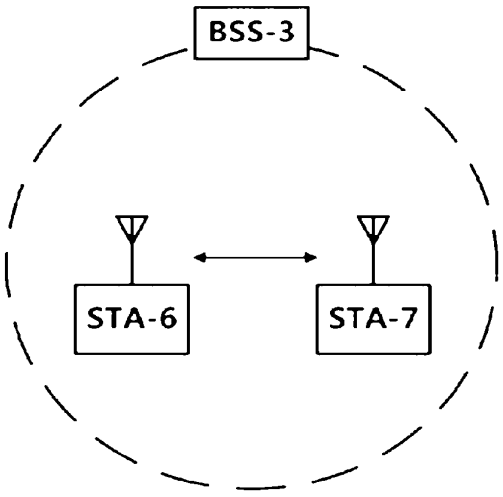
도 10

【도면】

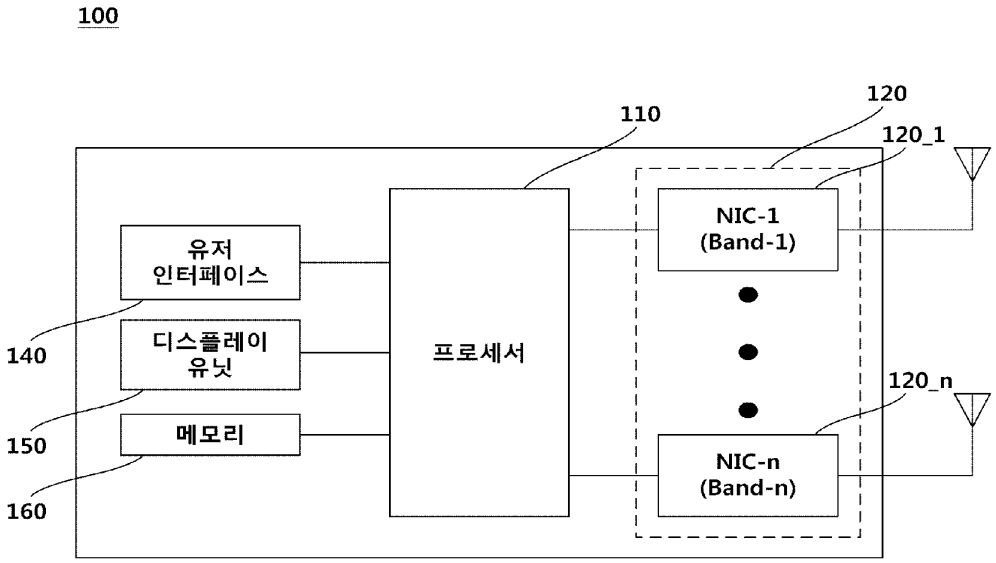
【도 1】



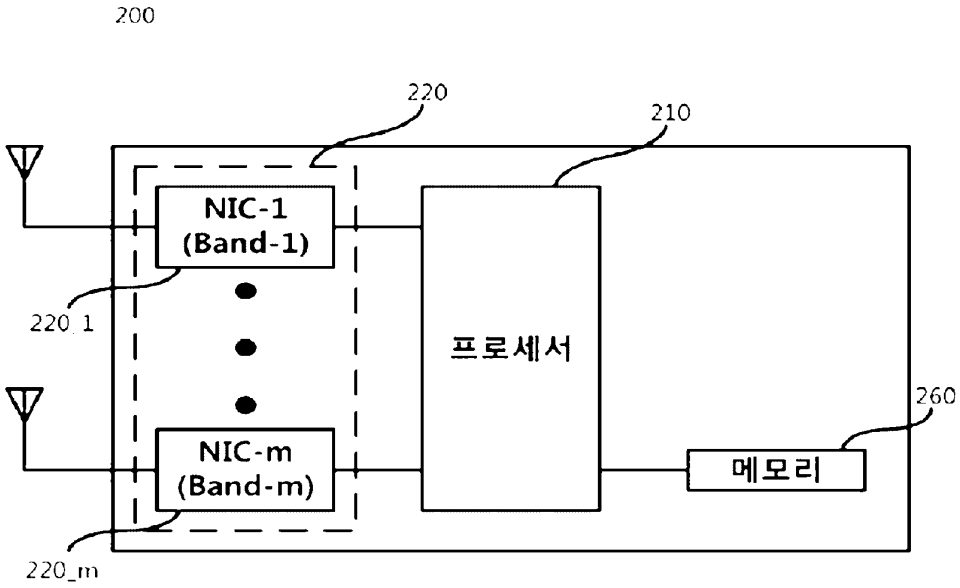
【도 2】



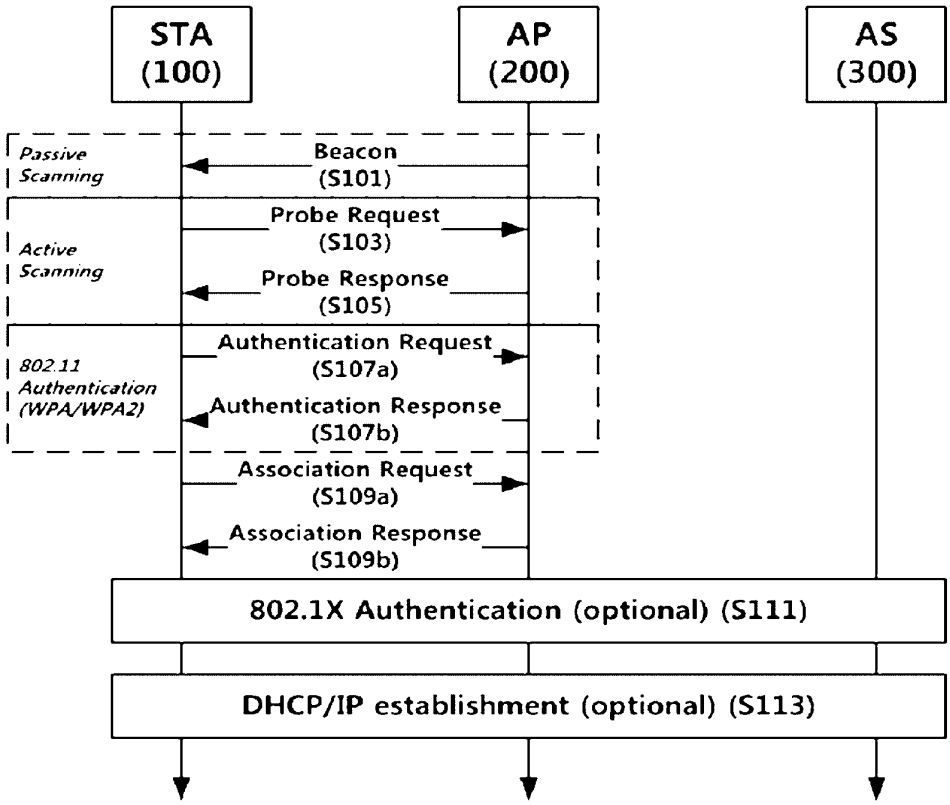
【도 3】


100
110
120
120_1
유저
인터페이스
디스플레이
유닛
메모리
140
150
160
프로세서
NIC-1
(Band-1)
NIC-n
(Band-n)
120_n

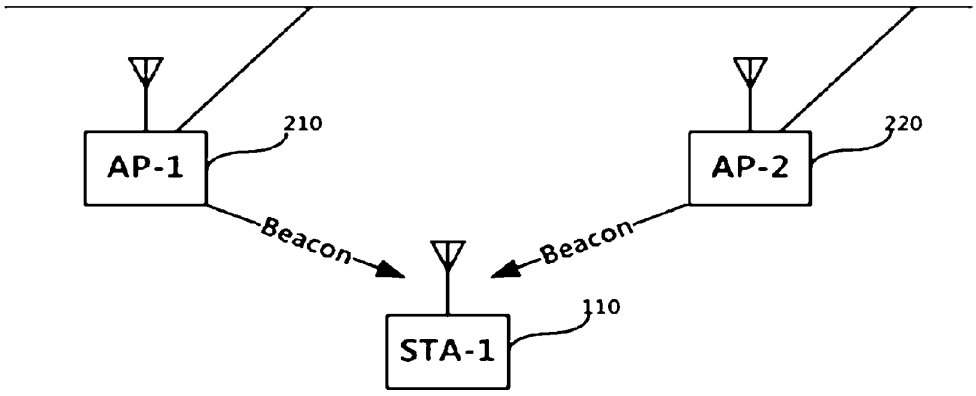
【도 4】



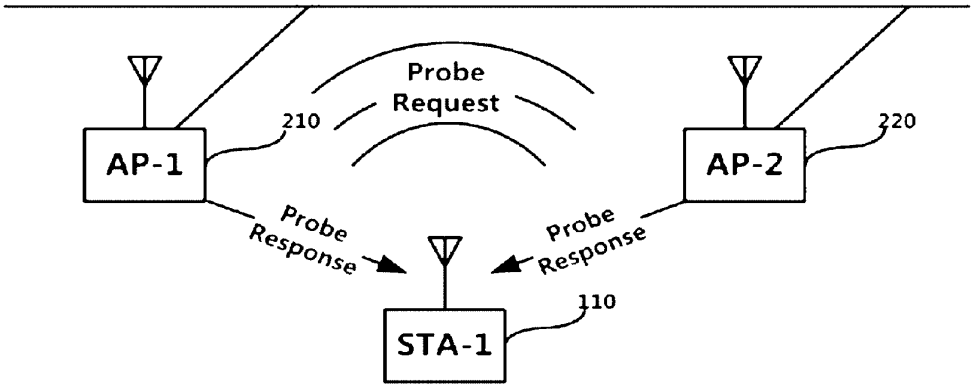
【도 5】


STA
(100)
AP
(200)
AS
(300)
Passive Scanning
Beacon
(S101)
Active Scanning
Probe Request
(S103)
Probe Response
(S105)
802.11 Authentication (WPA/WPA2)
Authentication Request
(S107a)
Authentication Response
(S107b)
Association Request
(S109a)
Association Response
(S109b)
802.1X Authentication (optional) (S111)
DHCP/IP establishment (optional) (S113)

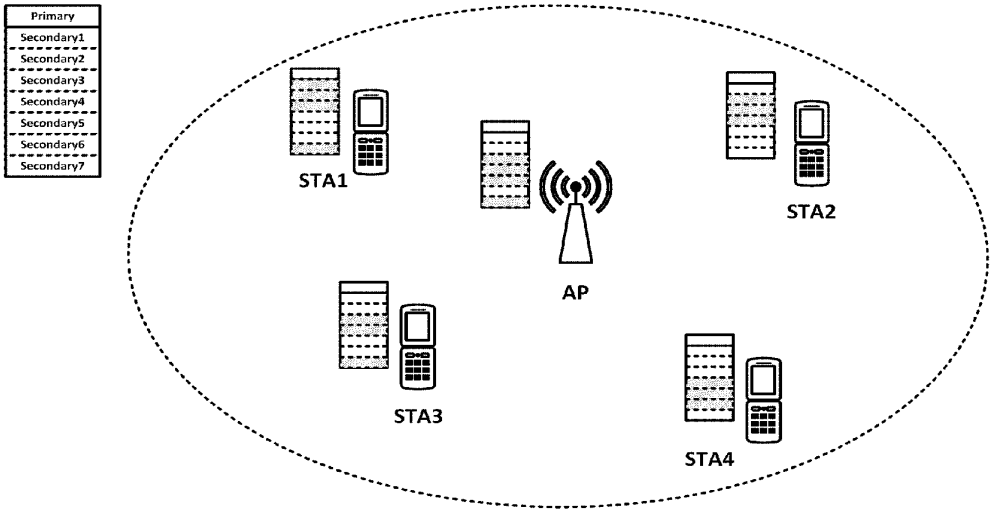
【도 6】


AP-1
210
AP-2
220
Beacon
Beacon
STA-1
110

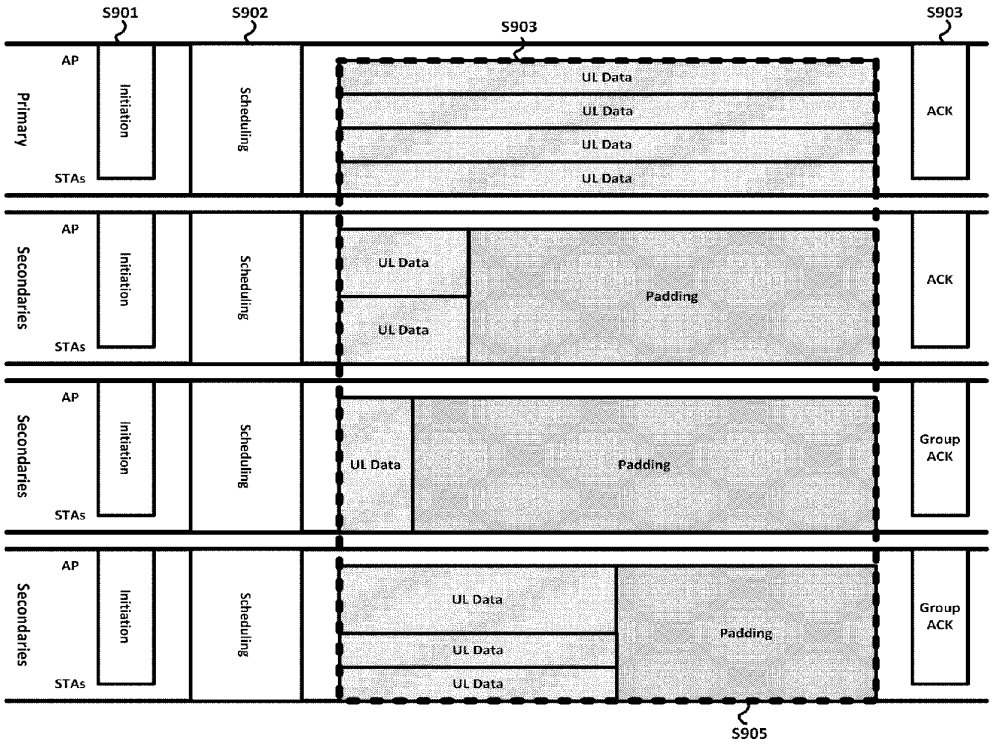
【도 7】


Probe
Request
AP-1
210
AP-2
220
Probe
Response
Probe
Response
STA-1
110

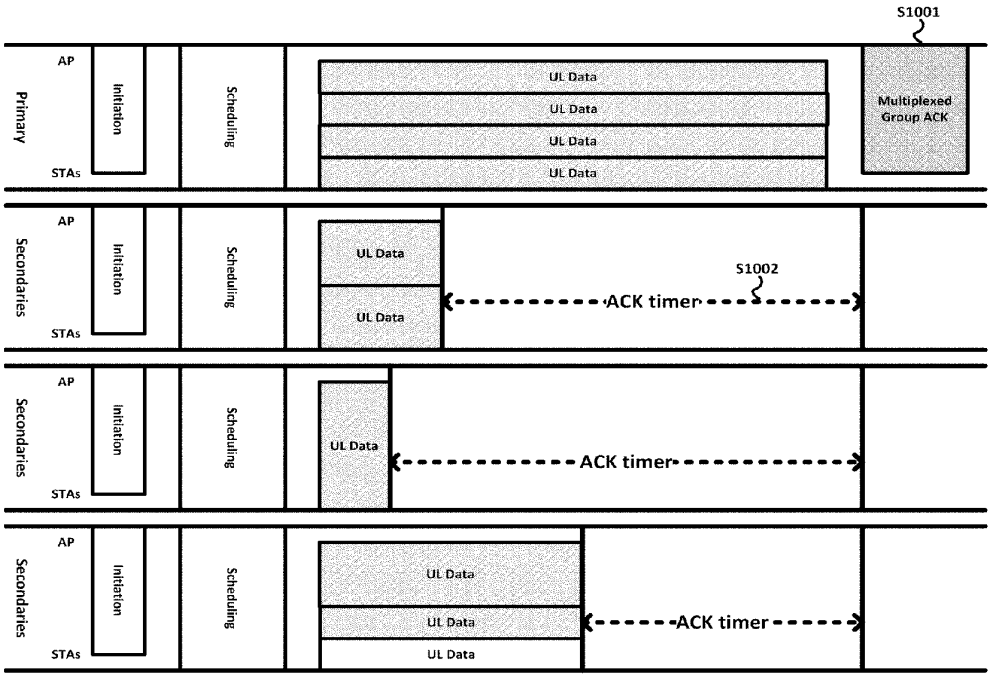
【도 8】


Primary
Secondary1
Secondary2
Secondary3
Secondary4
Secondary5
Secondary6
Secondary7
STA1
AP
STA2
STA3
STA4
Target BSS

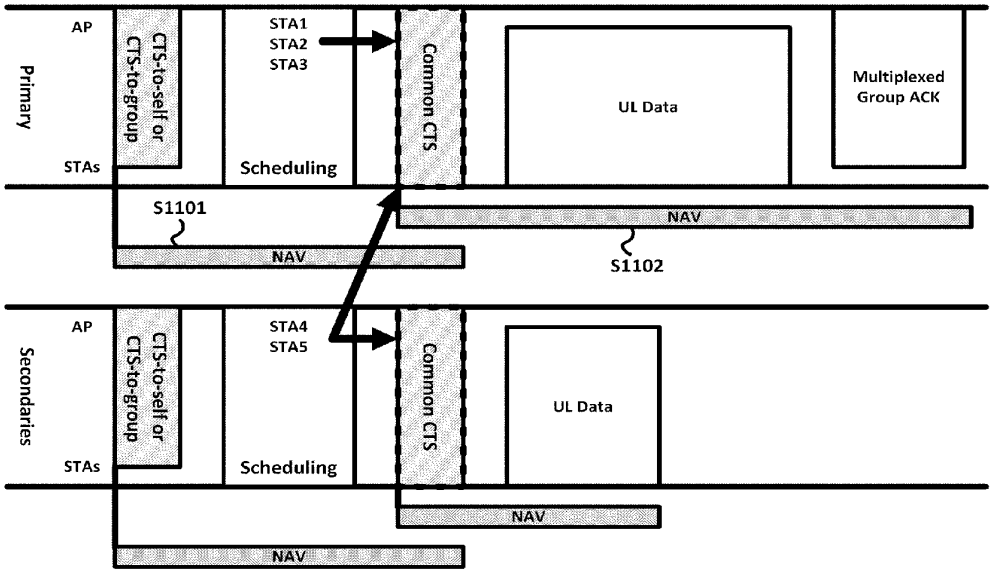
【도 9】


S901
S902
S903
S903
Primary
AP
STAs
Initiation
Scheduling
UL Data
UL Data
UL Data
UL Data
ACK
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
UL Data
Padding
ACK
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
Padding
Group ACK
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
UL Data
UL Data
Padding
Group ACK
S905

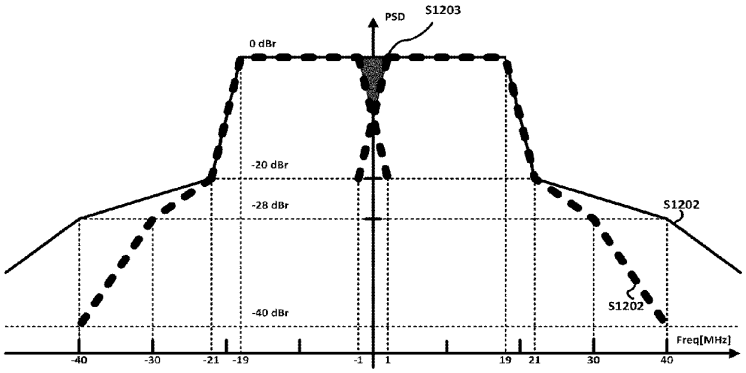
【도 10】

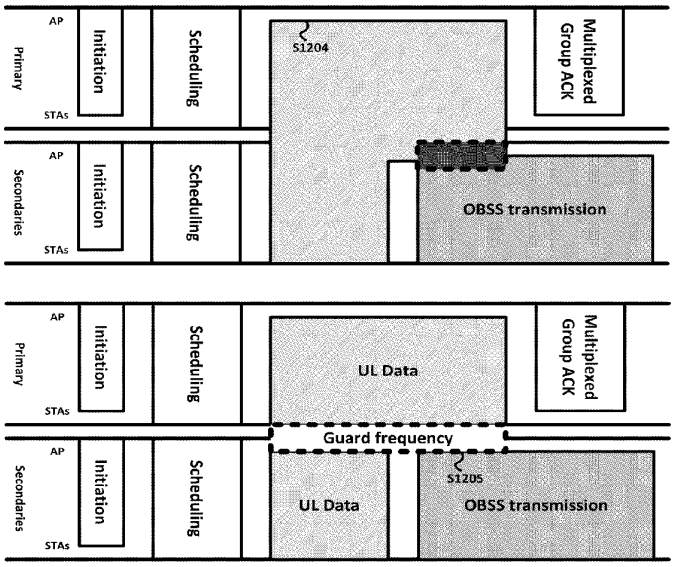

S1001
AP
Primary
STAs
Initiation
Scheduling
UL Data
UL Data
UL Data
UL Data
Multiplexed Group ACK
AP
Secondaries
STAs
Initiation
Scheduling
UL Data
UL Data
S1002
ACK timer
AP
Secondaries
STAs
Initiation
Scheduling
UL Data
ACK timer
AP
Secondaries
STAs
Initiation
Scheduling
UL Data
UL Data
UL Data
ACK timer

【도 11】


Primary
AP
STAs
CTS-to-self or CTS-to-group
STA1
STA2
STA3
Scheduling
Common CTS
UL Data
Multiplexed Group ACK
S1101
NAV
NAV
S1102
Secondaries
AP
STAs
CTS-to-self or CTS-to-group
STA4
STA5
Scheduling
Common CTS
UL Data
NAV
NAV

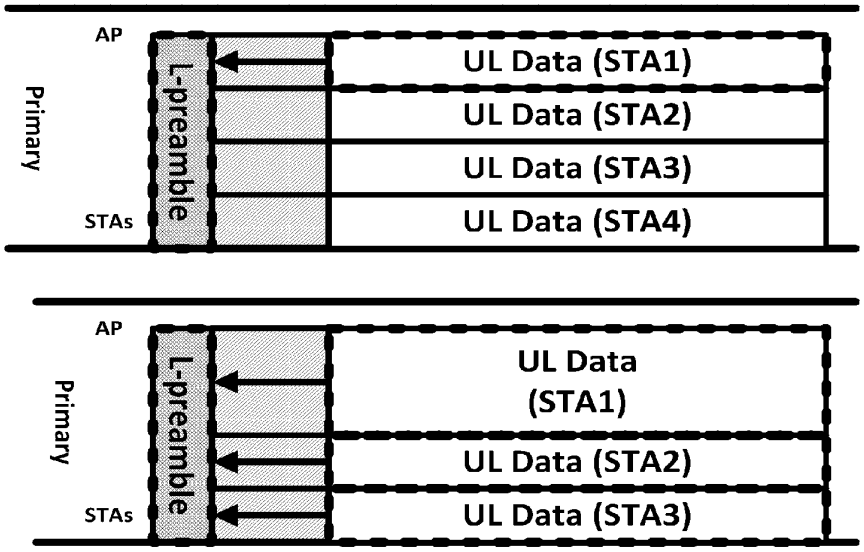
【도 12】


PSD
S1203
0 dBr
-20 dBr
-28 dBr
-40 dBr
S1202
S1202
Freq[MHz]
-40
-30
-21
-19
-1
1
19
21
30
40

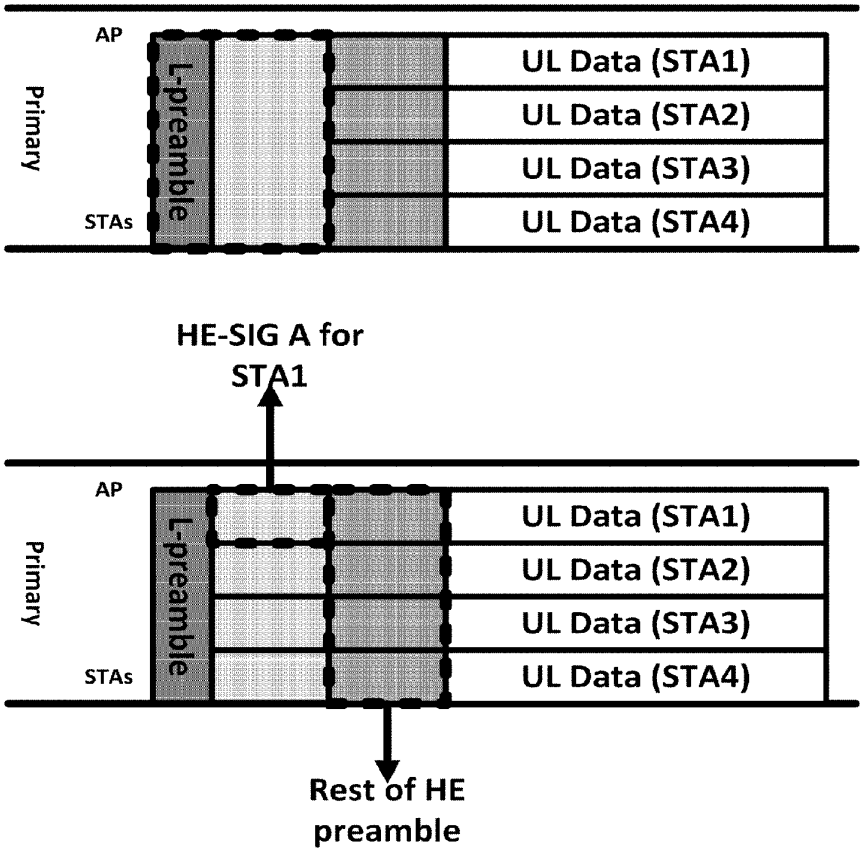

AP
Primary
STAs
Initiation
Scheduling
S1204
Multiplexed Group ACK
AP
Secondaries
STAs
Initiation
Scheduling
OBSS transmission
AP
Primary
STAs
Initiation
Scheduling
UL Data
Multiplexed Group ACK
Guard frequency
AP
Secondaries
STAs
Initiation
Scheduling
S1205
UL Data
OBSS transmission

UL Data

【도 13】


AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
UL Data (STA4)
AP
Primary
STAs
L-preamble
UL Data
(STA1)
UL Data (STA2)
UL Data (STA3)

【도 14】


AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
UL Data (STA4)
HE-SIG A for STA1
AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
UL Data (STA4)
Rest of HE preamble

Doc Code: PD.REQ.RETR
Document Description: Request for USPTO to retrieve priority docs

PTO/SB/38 (02-20)
Approved for use through 11/30/2020. OMB 0651-0031
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Request to Retrieve Electronic Priority Application(s)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

COMPLETE IF KNOWN	
Application Number	16/377,829
Filing Date	April 8, 2019
First Named Inventor	Woojin AHN
Art Unit	2467
Examiner Name	Gautam Sharma
Attorney Docket Number	QUS-0003

Pursuant to 37 CFR 1.55(i), the undersigned hereby requests that the USPTO retrieve an electronic copy of each of the following foreign applications for which priority has been claimed under 35 U.S.C. 119(a)-(d) from a foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement. This Request must be submitted:

- within the later of sixteen months from the filing date of the prior foreign application or four months from the actual filing date of an application under 35 U.S.C. 111(a),
- within four months from the later of the date of commencement (37 CFR 1.491(a)) or the date of the initial submission under 35 U.S.C. 371 of an application entering the national stage under 35 U.S.C. 371, or
- with a petition under 37 CFR 1.55(e) or (f).

☐ **OPTION A**

Please retrieve the priority application identified in Column C, a certified copy of which is contained in the EP or JP application identified in Columns A and B:

	A	B			C	
	Code for Participating Office (EP or JP only)	Application containing the non-participating priority application			Non-participating priority application to be retrieved	
		App. No.	Filing Date	Access Code (for JP only)	Country Code	App. No.
1						

☑ **OPTION B**

This Request may be used for the infrequent circumstance when a claim for priority to an application filed in a participating foreign intellectual property office was made prior to that foreign intellectual property office becoming a participating foreign intellectual property office.

Please retrieve the priority application identified in Columns A and B:

	A	B		
	Code for Participating Office (e.g., EP) or WIPO DAS Depositing Office (e.g., AU, BR, CN, DK, EA, EE, ES, FI, GB, IB, IN, JP, KR, MA, NL, NZ, SE)	Application to be retrieved		
		App. No.	Filing Date	Access Code (for WIPO DAS Depositing Office)
1	KR	10-2015-006670	05/13/2015	1889
2				

The USPTO will not attempt to retrieve the identified priority application(s) unless an identical claim for foreign priority to the application identified above is made pursuant to 37 CFR 1.55(d) or a petition is granted under 37 CFR 1.55(e) or (f). Applicants are advised to consult Private PAIR (accessed through www.uspto.gov) to assure that the retrieval has been successful. The 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 set forth in 37 CFR 1.55(g)(1).

I hereby declare that I have the authority to grant access to the above-identified foreign application(s).

/David C. Oren/	October 8, 2020
Signature	Date
David C. Oren	703-766-3756
Printed or Typed Name	Telephone Number
Attorney	38,694
Title	Registration Number, if applicable

This collection of information is required by 37 CFR 1.55(d). 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 8 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.

Electronic Acknowledgement Receipt

EFS ID:	40790335
Application Number:	16377829
International Application Number:	
Confirmation Number:	4240
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Kathy Humphries
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	QUS-0003
Receipt Date:	08-OCT-2020
Filing Date:	08-APR-2019
Time Stamp:	10:49:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for USPTO to retrieve priority docs	QUS-3-Request-Retrieve-Priority-Doc.pdf	271456 6f5a86ad42726ea09939e3268630d1c6143f11a7	no	2

Warnings:

Information:					
2	Request for USPTO to retrieve priority docs	QUS-3-Request-Retrieve-Priority-Doc-2.pdf	261358 7770a81680b232648c6042d5d33423d0cdeb07f9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	532814		

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.

Doc Code: PD.REQ.RETR
Document Description: Request for USPTO to retrieve priority docs

PTO/SB/38 (02-20)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Request to Retrieve Electronic Priority Application(s)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

COMPLETE IF KNOWN	
Application Number	16/377,829
Filing Date	April 8, 2019
First Named Inventor	Woojin AHN
Art Unit	2467
Examiner Name	Gautam Sharma
Attorney Docket Number	QUS-0003

Pursuant to 37 CFR 1.55(i), the undersigned hereby requests that the USPTO retrieve an electronic copy of each of the following foreign applications for which priority has been claimed under 35 U.S.C. 119(a)-(d) from a foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement. This Request must be submitted:

- within the later of sixteen months from the filing date of the prior foreign application or four months from the actual filing date of an application under 35 U.S.C. 111(a),
- within four months from the later of the date of commencement (37 CFR 1.491(a)) or the date of the initial submission under 35 U.S.C. 371 of an application entering the national stage under 35 U.S.C. 371, or
- with a petition under 37 CFR 1.55(e) or (f).

☐ **OPTION A**

Please retrieve the priority application identified in Column C, a certified copy of which is contained in the EP or JP application identified in Columns A and B:

	A	B			C	
	Code for Participating Office (EP or JP only)	Application containing the non-participating priority application			Non-participating priority application to be retrieved	
		App. No.	Filing Date	Access Code (for JP only)	Country Code	App. No.
1						

☑ **OPTION B**

This Request may be used for the infrequent circumstance when a claim for priority to an application filed in a participating foreign intellectual property office was made prior to that foreign intellectual property office becoming a participating foreign intellectual property office.

Please retrieve the priority application identified in Columns A and B:

	A	B		
	Code for Participating Office (e.g., EP) or WIPO DAS Depositing Office (e.g., AU, BR, CN, DK, EA, EE, ES, FI, GB, IB, IN, JP, KR, MA, NL, NZ, SE)	Application to be retrieved		
		App. No.	Filing Date	Access Code (for WIPO DAS Depositing Office)
1	KR	10-2015-0030369	03/04/2015	2EB1
2	KR	10-2015-0036754	03/17/2015	573C

The USPTO will not attempt to retrieve the identified priority application(s) unless an identical claim for foreign priority to the application identified above is made pursuant to 37 CFR 1.55(d) or a petition is granted under 37 CFR 1.55(e) or (f). Applicants are advised to consult Private PAIR (accessed through www.uspto.gov) to assure that the retrieval has been successful. The 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 set forth in 37 CFR 1.55(g)(1).

I hereby declare that I have the authority to grant access to the above-identified foreign application(s).

/David C. Oren/	October 8, 2020
Signature	Date
David C. Oren	703-766-3756
Printed or Typed Name	Telephone Number
Attorney	38,694
Title	Registration Number, if applicable

This collection of information is required by 37 CFR 1.55(d). 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 8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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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.
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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

34610 7590 09/23/2020

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER
SHARMA, GAUTAM

ART UNIT	PAPER NUMBER
2467	

DATE MAILED: 09/23/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

TITLE OF INVENTION: WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	12/23/2020

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

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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

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

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence 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)

34610 7590 09/23/2020
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

TITLE OF INVENTION: WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	12/23/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SHARMA, GAUTAM	2467	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 03-09 or more recent) attached. **Use of a Customer Number is required.**

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

1_____
2_____
3_____

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

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

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

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

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

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

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

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

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ 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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

34610 7590 09/23/2020

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P.O. Box 8638
Reston, VA 20195

EXAMINER	
SHARMA, GAUTAM	

ART UNIT	PAPER NUMBER
2467	

DATE MAILED: 09/23/2020

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

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

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

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

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

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

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

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Notice of Allowability	Application No. 16/377,829	Applicant(s) AHN et al.	
	Examiner GAUTAM SHARMA	Art Unit 2467	AIA (FITF) Status Yes

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

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

1. ☑ This communication is responsive to 08/19/2020.
   ☐ 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 13-30 . 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. 15/555,075 .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

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

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

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

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

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. 20200902.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/GAUTAM SHARMA/ Examiner, Art Unit 2467	/HASSAN A PHILLIPS/ Supervisory Patent Examiner, Art Unit 2467

Allowability Notice

Notice of Pre-AIA or AIA Status

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

2. Claims 13-28 are allowed.

EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

4. Authorization for this examiner's amendment was given in an interview with David Oren on 09/15/2020.

5. The application has been amended as follows: In the abstract, Please change from two paragraphs to one paragraph by **replacing the original**:

> " *The present invention relates to a wireless communication terminal and a wireless communication method for efficiently managing simultaneous data transmissions of a plurality of terminals.*
>
> *To this end, provided are a base wireless communication terminal including: a transceiver configured to transmit and receive a wireless signal; and a processor configured to control an operation of the base wireless communication terminal, wherein the processor is configured to: transmit a trigger frame triggering a multi-user uplink transmission of a plurality of terminals, receive multi-user uplink data through resources allocated to the plurality of terminals, and transmit a block ACK through the resources in response to the received multi-user uplink data, wherein the transmission of the block ACK in each resource is terminated at the same time, and a wireless communication method using the same.*"

By the amended version:

> " *The present invention relates to a wireless communication terminal and a wireless communication method for efficiently managing simultaneous data transmissions of a plurality of terminals. To this end, provided are a base wireless communication terminal including: a transceiver configured to transmit and receive a wireless signal; and a processor configured to control an operation of the base wireless communication terminal, wherein the processor is configured to: transmit a trigger frame triggering a multi-user uplink transmission of a plurality of terminals, receive multi-user uplink data through resources allocated to the plurality of terminals, and transmit a block ACK through the resources in response to the received multi-user uplink data, wherein the transmission of the block ACK in each resource is terminated at the same time, and a wireless communication method using the same.*"

Allowable Subject Matter

1. The following is an examiner's statement of reasons for allowance**: As to claim 13,** the following limitations are novel and not obvious over the art of record in combination with the remaining limitations "*receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals, wherein the trigger frame includes an association identifier (AID) field, and perform, through the transceiver, an uplink transmission in response to the trigger frame, wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and wherein the trigger frame further includes the padding field when the AID field is set to a specific value* ".

2. **As to claims 14-20, 29 and 30,** the claims are allowed as being dependent from an allowable claim.

3. **As to claim 21,** the claim are allowed as applied to claim 1 above with similar limitations.

4. **As to claims 22-28,** the claims are allowed as being dependent from an allowable claim.

5. 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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GAUTAM SHARMA whose telephone number is (571)270-7182. The examiner can normally be reached on 11am-8pm.

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

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

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. 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.

/GAUTAM SHARMA/
Examiner, Art Unit 2467

/HASSAN A PHILLIPS/
Supervisory Patent Examiner, Art Unit 2467

Examiner-Initiated Interview Summary	Application No. 16/377,829	Applicant(s) AHN, Woojin	
	Examiner GAUTAM SHARMA	Art Unit 2467	AIA (FITF) Status Yes

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

(1) GAUTAM SHARMA. (3) _____.

(2) David Oren. (4) _____.

Date of Interview: 15 September 2020.

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: no.

Identification of prior art discussed: no.

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...)

Applicant's representative and Examiner discussed changes to the abstract to the place the application in condition for allowance. Examiner expressed the abstract is required to be one paragraph instead of two. Agreement was reached. Examiner will amend the abstract to combine the two paragraphs into as part of Notice of allowance..

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

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

☐ Attachment

/GAUTAM SHARMA/ Examiner, Art Unit 2467	/HASSAN A PHILLIPS/ Supervisory Patent Examiner, Art Unit 2467

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	Art Unit
	GAUTAM SHARMA	2467

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	Art Unit
	GAUTAM SHARMA	2467

Search Notes		
Search Notes	**Date**	**Examiner**
East Search	09/27/2019	Gautam Sharma
Inventor Search	09/27/2019	Gautam Sharma
Classification Search (H04W: 74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/ 0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	09/27/2019	Gautam Sharma
East Search	04/21/2020	Gautam Sharma
Inventor Search	04/21/2020	Gautam Sharma
Classification Search (H04W: 74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/ 0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	04/21/2020	Gautam Sharma
East Search	09/02/2020	Gautam Sharma
Inventor Search	09/02/2020	Gautam Sharma
Classification Search (H04W: 74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/ 0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	09/02/2020	Gautam Sharma

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
H04W	74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/ 0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	09/02/2020	Gautam Sharma

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	**Art Unit**
	GAUTAM SHARMA	2467

CPC						
Symbol					**Type**	**Version**
H04L	/	1	/	1664	F	2013-01-01
H04L	/	1	/	1614	I	2013-01-01
H04L	/	1	/	1671	I	2013-01-01
H04L	/	1	/	1621	I	2013-01-01
H04W	/	72	/	0413	I	2013-01-01
H04W	/	72	/	121	I	2013-01-01
H04W	/	72	/	1231	I	2013-01-01
H04W	/	72	/	1284	I	2013-01-01
H04W	/	74	/	085	A	2013-01-01

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

/GAUTAM SHARMA/ Examiner, Art Unit 2467	02 September 2020	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	18	
/HASSAN A PHILLIPS/ Supervisory Patent Examiner, Art Unit 2467	09 September 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

U.S. Patent and Trademark Office — Part of Paper No.: 20200902

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	**Art Unit**
	GAUTAM SHARMA	2467

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04L	/	1	/	16

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

/GAUTAM SHARMA/ Examiner, Art Unit 2467	02 September 2020	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	18	
/HASSAN A PHILLIPS/ Supervisory Patent Examiner, Art Unit 2467	09 September 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	6

U.S. Patent and Trademark Office — Part of Paper No.: 20200902

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	**Art Unit**
	GAUTAM SHARMA	2467

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

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10	7	19	18	28								
	2		11	8	20	9	29								
	3		12	11	21	10	30								
	4	1	13	12	22										
	5	2	14	13	23										
	6	3	15	14	24										
	7	4	16	15	25										
	8	5	17	16	26										
	9	6	18	17	27										

/GAUTAM SHARMA/ Examiner, Art Unit 2467 (Assistant Examiner)	02 September 2020 (Date)	**Total Claims Allowed:** 18	
/HASSAN A PHILLIPS/ Supervisory Patent Examiner, Art Unit 2467 (Primary Examiner)	09 September 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 6

U.S. Patent and Trademark Office — Part of Paper No.: 20200902

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	**Art Unit**
	GAUTAM SHARMA	2467

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

CLAIMS

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

CLAIM		DATE								
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	14	✓	✓	=						
	15	✓	✓	=						
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	17	✓	✓	=						
	18	✓	✓	=						
	19	✓	O	=						
	20	✓	✓	=						
	21	✓	✓	=						
	22	✓	✓	=						
	23	✓	✓	=						
	24	✓	✓	=						
	25	✓	✓	=						
	26	✓	✓	=						
	27	✓	O	=						
	28	✓	✓	=						
	29			=						
	30			=						

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	4	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L2	3	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L3	4	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L4	52	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L5	4	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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L8	205	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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L11	195	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L12	284	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L13	884	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L14	524	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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L16	1,835	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
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L18	13,954	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L19	9,278	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L20	12,143	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L21	9,159	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L22	19,898	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L23	8,392	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L24	5,413	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
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L28	42,071	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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L30	47,760	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L31	11,062	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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			FPRS; EPO; JPO			
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L37	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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L39	6	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L40	0	wo2011102575	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
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L42	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L43	852	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
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L45	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L46	15	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L47	395	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L48	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
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L50	87	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L51	6	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L52	18,728	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L53	1,666	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L54	782	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L55	199	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L56	14	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L57	21	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L58	572	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L59	233	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L60	126	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L61	20	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L62	55	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L63	35	L62 not L61	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L64	6	"predetermined association id"	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L65	5,118	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L66	56	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L67	293	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L68	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L69	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L70	5	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L71	9	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L72	4	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L73	3	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L74	4	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L75	52	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L76	4	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L77	3	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L78	464	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L79	205	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L80	63	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L81	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L82	195	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L83	284	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L84	884	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L85	524	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L86	4,786	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L87	1,835	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L88	27,437	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L89	13,954	H04W74/08.cpc.	US-PGPUB;	OR	OFF	2020/09/02 19:00

			USPAT; USOCR; FPRS; EPO; JPO			
L90	9,278	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L91	12,143	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L92	9,159	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L93	19,898	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L94	8,392	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L95	5,413	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L96	5,669	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L97	4,791	H04W72/1205.cpc.	US-PGPUB; USPAT;	OR	OFF	2020/09/02 19:00

			USOCR; FPRS; EPO; JPO			
L98	11,062	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L99	42,071	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L100	32,171	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L101	47,760	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L102	11,062	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L103	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L104	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L105	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L106	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L107	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L108	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L109	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L110	6	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L111	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L112	27	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L113	1	2011-102575	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L114	852	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L115	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L116	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L117	15	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L118	395	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L119	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L120	79	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L121	87	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L122	6	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L123	18,728	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L124	1,666	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L125	782	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L126	199	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L127	14	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L128	21	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L129	572	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L130	233	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L131	126	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L132	20	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L133	55	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L134	35	L133 not L132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L135	6	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L136	5,118	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L137	56	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L138	293	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L139	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L140	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L141	5	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L142	5	L71 and L86	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L143	0	L71 and L87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L144	0	L71 and L88	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L145	0	L71 and L89	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L146	0	L71 and L90	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L147	3	L71 and L91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L148	0	L71 and L92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L149	0	L71 and L93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L150	3	L71 and L94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L151	0	L71 and L95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L152	5	L71 and L96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L153	0	L71 and L97	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L154	0	L71 and L98	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L155	7	L71 and L99	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L156	0	L71 and L100	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L157	0	L71 and L101	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L158	0	L71 and L102	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L159	0	L71 and L103	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L160	0	L71 and L104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L161	0	L71 and L105	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L162	0	L71 and L106	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L163	0	L71 and L107	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L164	0	L71 and L108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L165	3	L71 and L109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L166	3	L71 and L110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L167	0	L71 and L111	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L168	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L169	514	("predetermined assocaition id" or "aid") with ("trigger frame")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L170	5	("predetermined assocaition id" or "aid") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L171	5	("predetermined assocaition id" or"association identifier" or "predetermined assocaition identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L172	5	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L173	525	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L174	525	("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L175	358	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and (pad or padding or add or adding or exten or extending or encapsulat$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L176	207	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and ((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L177	19	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame"))	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

		same((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	FPRS; EPO; JPO			
L178	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L222	1	"16377829"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L223	27	("block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L224	6	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L225	337	("trigger frame") with ("bar" or "block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L226	236	("trigger frame") with ("block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L227	1	("trigger frame") with ("bar" or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L228	53	(("trigger frame") with ("bar")) and (pad or padding)	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L229	200	("trigger frame") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L230	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L231	41,260	("block ack" or BA or "bar") with (aid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L232	128	("block ack") with (aid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L233	3	("block ack") with (aid) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L234	288	("block ack" or BA or "bar") with (aid) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L235	1	"16320158"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L236	142	"trigger frame" with "aid" with (ulink or "ul")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:00

			FPRS; EPO; JPO			
L237	177	"trigger frame" with "aid" with (ulink or "ul" or ack or multiuser or "block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L238	0	"trigger frame" with "aid" with (ulink or "ul" or ack or multiuser or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L239	51	"aid" with (ulink or "ul" or ack or multiuser or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L240	4	"partial aid" with (frame or packet) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L241	293	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L242	519	(frame or packet) with (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L243	71	(frame or packet) near5 (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:00
L244	15	(frame or packet).clm. and (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id").clm. and (pad or padding).clm. and (trigger).clm.	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:08

			FPRS; EPO; JPO			
L269	4	l244 and l15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L270	0	l244 and l16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L271	0	l244 and l17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L272	0	l244 and l18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L273	0	l244 and l19	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L274	3	l244 and l20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L275	0	l244 and l21	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L276	1	l244 and l22	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:11

			FPRS; EPO; JPO			
L277	3	l244 and l23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L278	0	l244 and l24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L279	3	l244 and l25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L280	0	l244 and l26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L281	0	l244 and l27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:11
L282	3	l244 and l28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L283	0	l244 and l29	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L284	2	l244 and l30	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:12

			FPRS; EPO; JPO			
L285	0	l244 and l31	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L286	0	l244 and l32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L287	0	l244 and l33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L288	0	l244 and l34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L289	0	l244 and l35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L290	0	l244 and l36	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L291	0	l244 and l37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/02 19:12
L292	3	l244 and l38	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/09/02 19:12

			FPRS; EPO; JPO			
S1	2	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S2	2	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S3	3	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S4	41	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S5	3	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S6	2	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S7	358	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S8	169	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S9	57	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S10	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:25
S11	128	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S12	245	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S13	728	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S14	380	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S15	3,533	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S16	1,441	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S17	18,726	H04W74/0833.cpc.	US-PGPUB;	OR	OFF	2019/09/27 16:25

			USPAT; USOCR; FPRS; EPO; JPO			
S18	10,061	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S19	7,707	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S20	8,445	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S21	6,677	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S22	13,418	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S23	6,421	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S24	3,880	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S25	4,091	H04W72/121.cpc.	US-PGPUB; USPAT;	OR	OFF	2019/09/27 16:25

			USOCR; FPRS; EPO; JPO			
S26	3,427	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S27	8,631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S28	29,929	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S29	23,745	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S30	32,544	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S31	8,631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S32	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S33	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S34	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S35	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S36	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S37	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S38	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S39	5	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S40	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S41	22	"2011102575"	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S42	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S43	833	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S44	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S45	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S46	12	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S47	362	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S48	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S49	67	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S50	74	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S51	5	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S52	17,490	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S53	1,519	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S54	673	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S55	154	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S56	13	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S57	19	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S58	527	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S59	222	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S60	118	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S61	15	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S62	48	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S63	33	S62 not S61	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S64	5	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S65	4,163	("trigger frame")	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S66	27	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S67	192	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S68	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S69	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S70	4	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S71	7	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S72	2	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S73	2	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S74	3	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S75	41	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S76	3	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S77	2	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S78	358	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S79	169	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S80	57	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S81	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:25
S82	128	ahn-woojin.in.	US-PGPUB;	OR	OFF	2019/09/27 16:25

			USPAT; USOCR; FPRS; EPO; JPO			
S83	245	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S84	728	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S85	380	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S86	3,533	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S87	1,441	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S88	18,726	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S89	10,061	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S90	7,707	H04W74/00.cpc.	US-PGPUB; USPAT;	OR	OFF	2019/09/27 16:25

			USOCR; FPRS; EPO; JPO			
S91	8,445	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S92	6,677	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S93	13,418	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S94	6,421	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S95	3,880	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S96	4,091	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S97	3,427	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S98	8,631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S99	29,929	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S100	23,745	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S101	32,544	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S102	8,631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S103	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S104	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S105	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S106	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S107	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S108	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S109	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S110	5	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S111	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S112	22	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S113	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S114	833	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S115	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S116	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S117	12	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S118	362	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S119	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S120	67	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S121	74	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S122	5	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S123	17,490	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S124	1,519	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S125	673	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S126	154	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S127	13	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S128	19	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S129	527	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S130	222	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S131	118	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S132	15	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S133	48	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S134	33	S133 not S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S135	5	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S136	4,163	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S137	27	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S138	192	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:26

			FPRS; EPO; JPO			
S139	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S140	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S141	4	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S142	4	S71 and S86	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S143	0	S71 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S144	0	S71 and S88	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S145	0	S71 and S89	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S146	0	S71 and S90	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:26

			FPRS; EPO; JPO			
S147	3	S71 and S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S148	0	S71 and S92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S149	0	S71 and S93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S150	3	S71 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S151	0	S71 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S152	5	S71 and S96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S153	0	S71 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S154	0	S71 and S98	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:26

			FPRS; EPO; JPO			
S155	6	S71 and S99	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S156	0	S71 and S100	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S157	0	S71 and S101	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S158	0	S71 and S102	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S159	0	S71 and S103	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S160	0	S71 and S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S161	0	S71 and S105	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S162	0	S71 and S106	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:26

			FPRS; EPO; JPO			
S163	0	S71 and S107	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S164	0	S71 and S108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S165	3	S71 and S109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S166	3	S71 and S110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S167	0	S71 and S111	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S168	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S169	352	("predetermined assocaition id" or "aid") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S170	2	("predetermined assocaition id" or "aid") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:59

			FPRS; EPO; JPO			
S171	2	("predetermined assocaition id" or"association identifier" or "predetermined assocaition identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:13
S172	2	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:26
S173	359	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:27
S174	359	("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:27
S175	237	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and (pad or padding or add or adding or exten or extending or encapsulat$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:28
S176	132	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and ((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:29
S177	14	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) same((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:29
S178	3	"15555075"	US-PGPUB; USPAT;	OR	OFF	2019/09/27 18:33

			USOCR; FPRS; EPO; JPO			
S222	1	"16377829"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 17:49
S223	26	("block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 17:51
S224	6	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:05
S225	300	("trigger frame") with ("bar" or "block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:06
S226	211	("trigger frame") with ("block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:07
S227	0	("trigger frame") with ("bar" or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:07
S228	43	(("trigger frame") with ("bar")) and (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:07
S229	168	("trigger frame") near5 (pad or padding)	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/04/09 18:09

			FPRS; EPO; JPO			
S230	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:22
S231	40,960	("block ack" or BA or "bar") with (aid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:25
S232	115	("block ack") with (aid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:25
S233	3	("block ack") with (aid) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:28
S234	285	("block ack" or BA or "bar") with (aid) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:29
S235	1	"16320158"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/10 12:43
S236	121	"trigger frame" with "aid" with (ulink or "ul")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:46
S237	150	"trigger frame" with "aid" with (ulink or "ul" or ack or multiuser or "block ack")	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/04/17 17:46

			FPRS; EPO; JPO			
S238	0	"trigger frame" with "aid" with (ulink or "ul" or ack or multiuser or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:46
S239	47	"aid" with (ulink or "ul" or ack or multiuser or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:47
S240	4	"partial aid" with (frame or packet) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:20
S241	248	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:20
S242	503	(frame or packet) with (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:52
S243	70	(frame or packet) near5 (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:54

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L179	9	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00

L180	1,619	H04W74/085.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L181	554	H04W74/0841.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L182	8,204	H04W74/0833.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L183	3,431	H04W74/08.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L184	2,577	H04W74/00.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L185	3,445	H04W72/1284.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L186	2,624	H04W72/1278.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L187	4,966	H04W72/12.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L188	2,656	H04W72/1231.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L189	1,679	H04W72/1226.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L190	1,862	H04W72/121.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L191	1,357	H04W72/1205.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L192	3,137	H04W72/00.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L193	0	H04W7/0413.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L194	0	H04W7/0406.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00

L195	0	H04W1/1664.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L196	0	H04W1/1621.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L197	0	H04W1/1607.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L198	0	H04W1/16.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L199	0	H04W1/12.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L200	0	H04W1/00.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L201	5	L179 and L180	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L202	0	L179 and L181	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L203	0	L179 and L182	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L204	0	L179 and L183	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L205	0	L179 and L184	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L206	3	L179 and L185	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L207	0	L179 and L186	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L208	0	L179 and L187	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L209	3	L179 and L188	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00

L210	0	L179 and L189	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L211	5	L179 and L190	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L212	0	L179 and L191	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L213	0	L179 and L192	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L214	0	L179 and L193	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L215	0	L179 and L194	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L216	0	L179 and L195	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L217	0	L179 and L196	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L218	0	L179 and L197	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L219	0	L179 and L198	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L220	0	L179 and L199	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L221	0	L179 and L200	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:00
L245	15	(frame or packet).clm. and (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id").clm. and (pad or padding).clm. and (trigger).clm.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:09
L246	1,619	H04W74/085.cpc.	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:09
L247	4	l245 and l180	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:09

L248	0	l245 and l181	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:09
L249	0	l245 and l182	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:09
L250	0	l245 and l183	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:09
L251	0	l245 and l184	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L252	3	l245 and l185	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L253	0	l245 and l186	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L254	1	l245 and l187	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L255	3	l245 and l188	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L256	0	l245 and l189	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L257	3	l245 and l190	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L258	0	l245 and l191	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L259	0	l245 and l192	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L260	0	l245 and l193	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L261	0	l245 and l194	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L262	0	l245 and l195	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10

L263	0	l245 and l196	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L264	0	l245 and l197	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L265	0	l245 and l198	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L266	0	l245 and l199	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L267	0	l245 and l200	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
L268	3	l245 and l201	US-PGPUB; USPAT	OR	OFF	2020/09/02 19:10
S179	7	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S180	1,397	H04W74/085.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S181	491	H04W74/0841.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S182	6,469	H04W74/0833.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S183	2,924	H04W74/08.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S184	2,425	H04W74/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S185	2,730	H04W72/1284.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S186	2,244	H04W72/1278.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S187	4,073	H04W72/12.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

S188	2,362	H04W72/1231.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S189	1,483	H04W72/1226.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S190	1,552	H04W72/121.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S191	1,114	H04W72/1205.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S192	2,959	H04W72/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S193	0	H04W7/0413.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S194	0	H04W7/0406.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S195	0	H04W1/1664.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S196	0	H04W1/1621.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S197	0	H04W1/1607.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S198	0	H04W1/16.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S199	0	H04W1/12.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S200	0	H04W1/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S201	4	S179 and S180	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S202	0	S179 and S181	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

S203	0	S179 and S182	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S204	0	S179 and S183	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S205	0	S179 and S184	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S206	3	S179 and S185	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S207	0	S179 and S186	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S208	0	S179 and S187	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S209	3	S179 and S188	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S210	0	S179 and S189	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S211	5	S179 and S190	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S212	0	S179 and S191	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S213	0	S179 and S192	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S214	0	S179 and S193	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S215	0	S179 and S194	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S216	0	S179 and S195	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S217	0	S179 and S196	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

S218	0	S179 and S197	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S219	0	S179 and S198	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S220	0	S179 and S199	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S221	0	S179 and S200	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

9/2/2020 7:12:48 PM
C:\Users\gsharma\Documents\EAST\Workspaces\16377829.wsp

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/377,829	Filing Date 04/08/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	08/19/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/SHERRY A DAVIS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Electronic Acknowledgement Receipt

EFS ID:	40326953
Application Number:	16377829
International Application Number:	
Confirmation Number:	4240
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Kathy Humphries
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	QUS-0003
Receipt Date:	19-AUG-2020
Filing Date:	08-APR-2019
Time Stamp:	13:54:28
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	qus-3-Amendment.pdf	383569 fa2807cbb4c7f5adfcedc01f70aed446bd1030e4	no	12

Warnings:

Information:	
Total Files Size (in bytes):	383569

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: **QUS-0003** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: **4240**
Woojin AHN et al.	Group Art Unit: **2467**
Serial No.: **16/377,829**	Examiner: **Guatam SHARMA**
Filed: **April 8, 2019**	Customer No.: **34610**

For: **WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION**

AMENDMENT

U.S. Patent and Trademark Office
Customer Window, Mail Stop Amendment
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

In reply to the Office Action dated May 19, 2020, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims.

Remarks begin after the listing of the claims.

AMENDMENTS TO THE CLAIMS

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

Listing of Claims:

1-12. (Canceled)

13. (Currently Amended) A wireless communication terminal, the terminal comprising:

a transceiver; and

a processor,

wherein the processor is configured to:

receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals,

wherein the trigger frame includes an association identifier (AID) field, and

perform, through the transceiver, an uplink transmission in response to the trigger frame,

~~wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame~~

wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and

wherein the trigger frame further includes the padding field when the AID field is set to a specific value.

14. (Currently Amended) The wireless communication terminal of claim 13, wherein a duration of the padding field is set based on a time needed for the one or more terminals to process the trigger frame.

15. (Currently Amended) The wireless communication terminal of claim 13, wherein the padding field is contained before a frame check sequence (FCS) field [[of]] included in the trigger frame.

16. (Currently Amended) The wireless communication terminal of claim 13, wherein the ~~predetermined~~ AID field ~~information~~ indicates a start of the padding, when the AID field is set to the specific value.

17. (Previously Presented) The wireless communication terminal of claim 16, wherein the predetermined AID field information is duplicated bit information in an AID field.

18. (Previously Presented) The wireless communication terminal of claim 13, wherein the padding is applied in the trigger frame by using duplicated information.

19. (Previously Presented) The wireless communication terminal of claim 18, wherein the padding is applied in the trigger frame by duplicating the predetermined AID field information.

20. (Previously Presented) The wireless communication terminal of claim 13, wherein the processor is further configured to:

generate an uplink packet to perform the uplink transmission, and

perform the uplink transmission in response to the trigger frame by using the generated uplink packet,

wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated time.

21. (Currently Amended) A wireless communication method of a wireless communication terminal, comprising:

receiving a trigger frame indicating uplink transmission of one or more terminals[[;]]。

~~identifying a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame~~

wherein the trigger frame includes an association identifier (AID field); and

performing an uplink transmission in response to the trigger frame。

wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and

wherein the trigger frame further includes the padding field when the AID field is set to a specific value.

22. (Currently Amended) The wireless communication method of claim 21, wherein a duration of the padding field is set based on a time needed for the one or more terminals to process the trigger frame.

23. (Currently Amended) The wireless communication method of claim 21, wherein the padding field is contained before a frame check sequence (FCS) field [[of]] included in the trigger frame.

24. (Currently Amended) The wireless communication method of claim 21, wherein the ~~predetermined~~ AID field ~~information~~ indicates a start of the padding, when the AID field is set to the specific value.

25. (Previously Presented) The wireless communication method of claim 24, wherein the predetermined AID field information is duplicated bit information in an AID field.

26. (Previously Presented) The wireless communication method of claim 21, wherein the padding is applied in the trigger frame by using duplicated information.

27. (Previously Presented) The wireless communication method of claim 26, wherein the padding is applied in the trigger frame by duplicating the predetermined AID field information.

28. (Previously Presented) The wireless communication method of claim 21, further comprising:

generating an uplink packet to perform the uplink transmission, and

performing the uplink transmission in response to the trigger frame by using the generated uplink packet,

wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated time.

29. (New) The wireless communication terminal of claim 13,

wherein the AID field is set to the specific value according to the number of user information for the one or more terminal.

30. (New) The wireless communication terminal of claim 13,

wherein all bits of the padding field are set by repeating a specific value when the padding field is included in the trigger frame.

REMARKS

Claims 13-30 are pending in the application. By this Amendment, claims 13-16 and 21-24 are amended, and new claims 29-30 are added. No new matter is added. Various amendments may be made for clarity, and may be unrelated to issues of patentability.

Applicant gratefully acknowledges the Office Action's indication that dependent claims 19 and 27 contain allowable subject matter. However, as set forth below, all claims are believed to be allowable.

The Office Action rejects claims 13-18, 20-26 and 28 under 35 U.S.C. §103 over U.S. Patent Publication 2017/0272138 to Chun et al. (hereafter Chun) in view of newly-cited U.S. Patent Publication 2016/0165574 to Chu et al. (hereafter Chu). The rejection is respectfully traversed with respect to the pending claims.

Claim 13 recites the following:

> a transceiver; and
> a processor,
> wherein the processor is configured to:
> receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals,
> wherein the trigger frame includes an association identifier (AID) field, and
> perform, through the transceiver, an uplink transmission in response to the trigger frame,
> wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and
> wherein the trigger frame further includes the padding field when the AID field is set to a specific value.

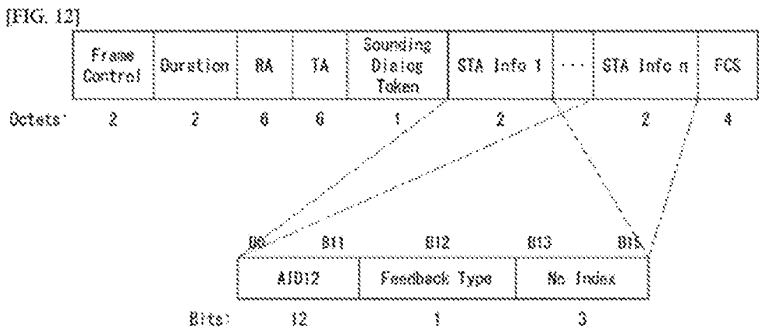
Chun does not teach or suggest that the trigger frame includes an association identifier (AID) field, wherein the AID field is used to identify whether the trigger frame

includes a padding field to which padding is applied, wherein the trigger frame further includes the padding field when the AID field is set to a specific value, as recited in independent claim 13.

The Office Action (on page 3) states that Chun does not disclose that the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame.

Chun merely discloses the use of the AID field in NDPA frames (regardless of whether the padding field is identified by the trigger frame).

See Chun's FIG. 12 and paragraphs [0312], [0320] and [0321]:



[0312] FIG. 12 is a diagram illustrating a VHT NDPA frame in the wireless communication system to which the present invention may be applied.

[0320] Each STA Info field may be constituted by an AID12 subfield, a Feedback Type subfield, and an Nc Index subfield.

[0321] Table 5 shows the subfield of the STA Info field included in the VHT NDPA frame.

TABLE 5

Subfield	Description
AID12	Includes the AID of the STA which becomes the sounding feedback target When the target STA is the AP, a mesh STA, or the STA which is an IBSS member, the AID12 subfield value is set to '0'
Feedback Type	Indicates the feedback request type for the sounding target STA In the case of the SU-MIMO, '0' In the case of the MU-MIMO, '1'
Nc Index	When the Feedback Type subfield indicates the MU-MIMO, Nc Index indicates a value acquired by subtracting 1 from the number (Nc) of columns of the compressed beamforming feedback matrix In the case of Nc = 1, '0', In the case of Nc = 2, '1', . . . In the case of Nc = 8, '7' In the case of the SU-MIMO, the Nc Index is set as a reserved subfield

Chun's FIG. 12 and paragraphs [0312], [0320] and [0321] do not teach or suggest the trigger frame includes an association identifier (AID) field, wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and the trigger frame further includes the padding field when the AID field is set to a specific value as recited in independent claim 13.

That is, what contains the AID12 subfield (FIG. 12 and paragraphs [0312], [0320], [0321]) is not a trigger frame, but an NDPA frame that is a response to the trigger frame.

Chun's AID12 is not used to identify whether the trigger frame is padded. Rather, Chun's AID12 is used to identify whether the STA is the target of sounding feedback, the mesh STA, or the STA included in the IBSS.

Chun only discloses to identify whether the STA is the target of sounding feedback, the Mesh STA, or the STA included in the IBSS using the AID12 subfield regardless of identifying whether the trigger frame is padded using the AID12 subfield.

Chun's AID12 subfield is not included in the trigger frame, and its purpose is not used to identify whether the trigger frame includes a padding field tow which padding is applied.

Chu also does not teach or suggest that the trigger frame includes an association identifier(AID) field, wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and wherein the trigger frame further includes the padding field when the AID field is set to a specific value as recited in independent claim 13.

The Office Action (on page 3) also cites Chu's FIGs. 3A-9B (and paragraph [0091]. Chu simply discloses that the trigger frame contains bits related to padding bits.

Chu's paragraph [0091] is as follows (emphasis added):

> [0091] Time t2 at each client station 25 begins upon expiration of a predetermined time interval, such as for example a time interval corresponding to a short inter-frame space (SIFS), after completion of reception of the trigger frame 402 at the client station 25, in an embodiment. In another embodiment, a predetermined time period that is greater than SIFS is defined, and time t2 at each client station 25 begins upon expiration of a predetermined time interval corresponding to the predetermined time interval greater than SIFS. For example, a predetermined time period that is greater than SIFS and less than point coordination function (PCF) interframe space (PIFS) is defined. The greater predetermined time interval may provide sufficient time for the client stations 25 to decode the trigger frame 402 and to prepare for uplink transmission based on the uplink scheduling information provided by the trigger frame 402, in at least some embodiments. Additionally or alternatively, the trigger frame 402 includes one or more padding bits at the end of the trigger frame 402 to provide sufficient time for the client stations 25 to prepare for uplink transmission based on the uplink scheduling information provided by the trigger frame 402, in some embodiments. For example, a MAC header included in the trigger frame 402 indicates a length of a valid payload, wherein the one or more padding bits follow the valid

> payload, in an embodiment. Further, a signal field of a PHY preamble of the trigger frame 402 includes an indication of the entire length of the trigger frame 402, which includes the one or more padding bits at the end of the trigger frame 402, in an embodiment.

Chu does not disclose a specific field (ex, AID field) for identifying whether the trigger frame contains padding bits. Chu discloses that the padding bit is included in the trigger frame to provide time for performing uplink transmission in response to the trigger frame. Chu does not disclose an AID field for identifying whether the STA receiving the trigger frame includes a padding field in the trigger frame.

Chun and Chu do not teach or suggest the following:

> wherein the trigger frame includes an association identifier (AID) field, and
> wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and
> wherein the trigger frame further includes the padding field when the AID field is set to a specific value.

For at least these reasons, Chun and Chu do not teach or suggest all the features of independent claim 13. Independent claim 13 therefore defines patentable subject matter.

For at least similar reason, Chun and Chu do not teach or suggest the following features of independent claim 21:

> wherein the trigger frame includes an association identifier (AID field); and
> wherein the AID field is used to identify whether the trigger frame includes a padding field to which padding is applied, and
> wherein the trigger frame further includes the padding field when the AID field is set to a specific value.

Accordingly, independent claim 21 defines patentable subject matter.

For at least the reasons set forth above, each of independent claims 13 and 21 defines patentable subject matter. Each of the dependent claims depends from one of the independent claims and therefore defines patentable subject matter at least for this reason. In addition, the dependent claims recite features that further and independently distinguish over the applied references.

CONCLUSION

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Favorable consideration and prompt allowance of claims 13-30 are earnestly solicited. If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

34610 7590 05/19/2020

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EXAMINER	
SHARMA, GAUTAM	

ART UNIT	PAPER NUMBER
2467	

NOTIFICATION DATE	DELIVERY MODE
05/19/2020	ELECTRONIC

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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):

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Office Action Summary	Application No. 16/377,829	Applicant(s) AHN et al.	
	Examiner GAUTAM SHARMA	Art Unit 2467	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 04/08/2019.

☐ 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) 13-28 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) 13-18,20-26 and 28 is/are rejected.

8) ☑ Claim(s) 19 and 27 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 04/08/2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☑ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☑ Interview Summary (PTO-413) Paper No(s)/Mail Date 20200409.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

2. Claims 13-28 are pending.

Claim Rejections - 35 USC § 103

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

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. **Claims 13-18, 20-26 and 28 are rejected** under 35 U.S.C. 103 as being unpatentable over Chun et al, application no. 2017/0272138, hereinafter known as Chun further in view of Chu et al, application no. 2016/0165574j, hereinafter known as Chu.

3. **As to claim 13,** Chun discloses *a wireless communication terminal, the terminal comprising: a transceiver; and a processor, wherein the processor is configured to* (Chun, Figure 1 and 47, [0076]-[0095], Apparatus of a either stations and AP's)*: receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals, and perform, through the transceiver, an uplink transmission in response to the trigger frame* (Chun, Figure 41-45, [00536]-[00548], sending trigger frame to stations and receiving responses). **Chun does not disclose however Chu discloses** *wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame* (Chu, figure 3A-9B; plural trigger frame disclosed; [0091] Trigger frame with padding, the padding allowing sufficient processing time for terminals before responding; Figure 5A and 5B, trigger frame with plural sections including duration/ID section that indicates the length of trigger frame that has bearing on padding required, that is analogous to AID; Frame body 510 further explained in figure 5B including padding, the padding being before Frame Check Section 512).

4. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the teachings of Chun to include the limitations of *wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame* as taught by Chu. Adding padding to frame allows the frame to end at a desired duration for terminals to complete processing.

5. **As to claim 14,** Chun disclose *the wireless communication terminal of claim 13.* Chun does not expressly disclose however Chu discloses *wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame* (Chu, [0091] Trigger frame with padding, the padding allowing sufficient processing time for terminals before responding).

6. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the teachings of Chun to include the limitations of *wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame* as taught by Chu. Adding padding time to allow for processing time may reduce number of components needed in a device.

7. **As to claim 15,** Chun disclose *the wireless communication terminal of claim 13.* Chun does not expressly disclose however Chu discloses *wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame* (Chu, Figure 5A with Frame body 510 further explained in 5B includes padding, the padding being before Frame Check Section 512).

8. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the teachings of Chun to include the limitations of *wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame* as taught by Chu. Padding sections are commonly used in the art so frames in network communications are of a uniform size.

9. **As to claim 16,** Chun discloses *wherein the predetermined ID field information indicates a start of the padding* (Chun, page 35, Table 15, AID used as padding data).

10. **As to claim 17,** Chun discloses *wherein the predetermined AID field information is duplicated bit information in an AID field* (Chun, Figure 12, Repeating AID information frame).

11. **As to claim 18,** Chun disclose *the wireless communication terminal of claim 13*. Chun does not expressly disclose however Chu discloses *wherein the padding is applied by using duplicated information* (Chu, [0091], padding with duplicated bits as needed).

12. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the teachings of Chun to include the limitations of *wherein the padding is applied by using duplicated information* as taught by Chu. Padding can be made of duplicated information to allow for redundant processing of information if needed.

13. **As to claim 20,** Chun discloses *wherein the processor is further configured to: generate an uplink packet to perform the uplink transmission, and perform the uplink transmission in response to the trigger frame by using the generated uplink packet* (Chun, Figure 41-45, [00536]-[00548], sending trigger frame to stations and receiving responses), *wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated timed field information* (Chun, page 35, table 15, AID and other data used to pad a frame, used in the art to terminate a frame at a particular length and duration).

14. **As to claims 21-26 and 28,** the claims are rejected as applied to claims 13-18 and 20 respectively above by Chun in view Chu.

Response to Arguments

1. Applicant's arguments with respect to claims 13 and 21 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Allowable Subject Matter

4. **Claims 19 and 27 are objected** to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GAUTAM SHARMA whose telephone number is (571)270-7182. The examiner can normally be reached on 11am-8pm.

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

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

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

/GAUTAM SHARMA/
Examiner, Art Unit 2467

/HASSAN A PHILLIPS/
Supervisory Patent Examiner, Art Unit 2467

Examiner-Initiated Interview Summary	Application No. 16/377,829	Applicant(s) AHN, Woojin	
	Examiner GAUTAM SHARMA	Art Unit 2467	AIA (FITF) Status Yes

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

(1) GAUTAM SHARMA. (3) _____.

(2) David Oren. (4) _____.

Date of Interview: 04 May 2020.

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: 13,19,21 and 27.

Identification of prior art discussed: no.

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...)

Applicant's representative and examiner discussed amendments to the claims to place the application in condition for allowance. Examiner proposed amending limitation of claims 19 and 27 to the associated independent claims to place thereby adding allowable limitation of adding padding to the frame by duplicating AID data. Amendments were not agreed to by Applicant. No agreement was reached..

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

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

☐ Attachment

/GAUTAM SHARMA/ Examiner, Art Unit 2467	/HASSAN A PHILLIPS/ Supervisory Patent Examiner, Art Unit 2467

Notice of References Cited	Application/Control No. 16/377,829	Applicant(s)/Patent Under Reexamination AHN et al.	
	Examiner GAUTAM SHARMA	Art Unit 2467	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-20160165574-A1	06-2016	CHU; Liwen	H04L5/0007	370/312
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

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.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	Art Unit
	GAUTAM SHARMA	2467

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	Art Unit
	GAUTAM SHARMA	2467

Search Notes		
Search Notes	**Date**	**Examiner**
East Search	09/27/2019	Gautam Sharma
Inventor Search	09/27/2019	Gautam Sharma
Classification Search (H04W: 74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/ 0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	09/27/2019	Gautam Sharma
East Search	04/21/2020	Gautam Sharma
Inventor Search	04/21/2020	Gautam Sharma
Classification Search (H04W: 74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/ 0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	04/21/2020	Gautam Sharma

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	**Art Unit**
	GAUTAM SHARMA	2467

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

CLAIMS

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

CLAIM		DATE								
Final	Original	09/27/2019	04/21/2020							
	1	-	-							
	2	-	-							
	3	-	-							
	4	-	-							
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	6	-	-							
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	10	-	-							
	11	-	-							
	12	-	-							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	O							
	20	✓	✓							
	21	✓	✓							
	22	✓	✓							
	23	✓	✓							
	24	✓	✓							
	25	✓	✓							
	26	✓	✓							
	27	✓	O							
	28	✓	✓							

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S2	2	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S3	3	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S4	41	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S5	3	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S6	2	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S7	358	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S8	169	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S9	57	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S10	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:25
S11	128	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S12	245	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S13	728	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S14	380	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S15	3533	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S16	1441	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

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S17	18726	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S18	10061	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S19	7707	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S20	8445	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S21	6677	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S22	13418	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S23	6421	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S24	3880	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S25	4091	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S26	3427	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S27	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S28	29929	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S29	23745	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
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			FPRS; EPO; JPO			
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S36	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
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S39	5	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S40	0	wo2011102575	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
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S45	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S46	12	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S47	362	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S48	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
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S50	74	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S51	5	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S52	17490	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S53	1519	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S54	673	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S55	154	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S56	13	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S57	19	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S58	527	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S59	222	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S60	118	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S61	15	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S62	48	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S63	33	S62 not S61	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S64	5	"predetermined association id"	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S65	4163	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S66	27	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S67	192	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S68	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S69	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S70	4	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S71	7	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S72	2	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S73	2	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S74	3	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S75	41	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S76	3	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S77	2	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S78	358	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S79	169	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S80	57	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
S81	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:25
S82	128	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S83	245	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S84	728	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S85	380	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S86	3533	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S87	1441	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S88	18726	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S89	10061	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S90	7707	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S91	8445	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S92	6677	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S93	13418	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S94	6421	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S95	3880	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S96	4091	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S97	3427	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S98	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S99	29929	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S100	23745	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S101	32544	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S102	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S103	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S104	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S105	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S106	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S107	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S108	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S109	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S110	5	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S111	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S112	22	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S113	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S114	833	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S115	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S116	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S117	12	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S118	362	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S119	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S120	67	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S121	74	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S122	5	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S123	17490	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S124	1519	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S125	673	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S126	154	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S127	13	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S128	19	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

S129	527	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S130	222	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
S131	118	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S132	15	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S133	48	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S134	33	S133 not S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S135	5	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S136	4163	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26

S137	27	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S138	192	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S139	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S140	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S141	4	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S142	4	S71 and S86	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S143	0	S71 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S144	0	S71 and S88	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26

S145	0	S71 and S89	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S146	0	S71 and S90	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S147	3	S71 and S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S148	0	S71 and S92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S149	0	S71 and S93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S150	3	S71 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S151	0	S71 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S152	5	S71 and S96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26

S153	0	S71 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S154	0	S71 and S98	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S155	6	S71 and S99	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S156	0	S71 and S100	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S157	0	S71 and S101	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S158	0	S71 and S102	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S159	0	S71 and S103	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S160	0	S71 and S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26

S161	0	S71 and S105	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S162	0	S71 and S106	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S163	0	S71 and S107	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S164	0	S71 and S108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S165	3	S71 and S109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S166	3	S71 and S110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S167	0	S71 and S111	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S168	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26

S169	352	("predetermined assocaition id" or "aid") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
S170	2	("predetermined assocaition id" or "aid") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:59
S171	2	("predetermined assocaition id" or"association identifier" or "predetermined assocaition identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:13
S172	2	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:26
S173	359	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:27
S174	359	("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:27
S175	237	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and (pad or padding or add or adding or exten or extending or encapsulat$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:28
S176	132	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and ((pad or padding or add or adding or	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:29

		exten or extending or encapsulat$6) with (packet or frame or message))				
S177	14	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) same((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:29
S178	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 18:33
S222	1	"16377829"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 17:49
S223	26	("block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 17:51
S224	6	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:05
S225	300	("trigger frame") with ("bar" or "block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:06
S226	211	("trigger frame") with ("block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:07

S227	0	("trigger frame") with ("bar" or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:07
S228	43	(("trigger frame") with ("bar")) and (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:07
S229	168	("trigger frame") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:09
S230	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:22
S231	40960	("block ack" or BA or "bar") with (aid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:25
S232	115	("block ack") with (aid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:25
S233	3	("block ack") with (aid) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:28
S234	285	("block ack" or BA or "bar") with (aid) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/09 18:29

S235	1	"16320158"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/10 12:43
S236	121	"trigger frame" with "aid" with (ulink or "ul")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:46
S237	150	"trigger frame" with "aid" with (ulink or "ul" or ack or multiuser or "block ack")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:46
S238	0	"trigger frame" with "aid" with (ulink or "ul" or ack or multiuser or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:46
S239	47	"aid" with (ulink or "ul" or ack or multiuser or "block ack") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 17:47
S240	4	"partial aid" with (frame or packet) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:20
S241	248	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:20
S242	503	(frame or packet) with (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:52

S243	70	(frame or packet) near5 (staid or "sta-id" or aid or "partial aid" or "predetermined association Id" or "sta id") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/04/17 18:54

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S179	7	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S180	1397	H04W74/085.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S181	491	H04W74/0841.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S182	6469	H04W74/0833.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S183	2924	H04W74/08.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S184	2425	H04W74/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S185	2730	H04W72/1284.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S186	2244	H04W72/1278.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S187	4073	H04W72/12.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

S188	2362	H04W72/1231.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S189	1483	H04W72/1226.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S190	1552	H04W72/121.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S191	1114	H04W72/1205.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S192	2959	H04W72/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S193	0	H04W7/0413.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S194	0	H04W7/0406.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S195	0	H04W1/1664.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S196	0	H04W1/1621.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S197	0	H04W1/1607.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S198	0	H04W1/16.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S199	0	H04W1/12.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

S200	0	H04W1/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S201	4	S179 and S180	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S202	0	S179 and S181	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S203	0	S179 and S182	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S204	0	S179 and S183	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S205	0	S179 and S184	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S206	3	S179 and S185	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S207	0	S179 and S186	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S208	0	S179 and S187	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S209	3	S179 and S188	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S210	0	S179 and S189	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S211	5	S179 and S190	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

S212	0	S179 and S191	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S213	0	S179 and S192	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S214	0	S179 and S193	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S215	0	S179 and S194	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S216	0	S179 and S195	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S217	0	S179 and S196	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S218	0	S179 and S197	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S219	0	S179 and S198	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S220	0	S179 and S199	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S221	0	S179 and S200	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

4/21/2020 5:49:30 PM
C:\Users\gsharma\Documents\EAST\Workspaces\16377829.wsp

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/377,829	Filing Date 04/08/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ 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	01/06/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/PATIENCE RESPER/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Electronic Acknowledgement Receipt

EFS ID:	38218489
Application Number:	16377829
International Application Number:	
Confirmation Number:	4240
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Customer Number:	34610
Filer:	David Carlton Oren
Filer Authorized By:	
Attorney Docket Number:	QUS-0003
Receipt Date:	06-JAN-2020
Filing Date:	08-APR-2019
Time Stamp:	21:14:26
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	Amendment.pdf	135988 a8f9a51800f233b714251782c2e2a6068632471b	no	10
Warnings:					

Information:	
Total Files Size (in bytes):	135988

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.

Docket No.: **QUS-0003** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: **4240**
Woojin AHN et al.	Group Art Unit: **2467**
Serial No.: **16/377,829**	Examiner: **Gautam SHARMA**
Filed: **April 8, 2019**	Customer No.: **34610**

For: **WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION**

AMENDMENT

U.S. Patent and Trademark Office
Customer Window, Mail Stop Amendment
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

In reply to the Office Action dated October 4, 2019, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims.

Remarks begin after the listing of the claims.

AMENDMENTS TO THE CLAIMS

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

Listing of Claims:

1-12. (Canceled)

13. (Previously Presented) A wireless communication terminal, the terminal comprising:

a transceiver; and

a processor,

wherein the processor is configured to:

receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals, and

perform, through the transceiver, an uplink transmission in response to the trigger frame,

wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame.

14. (Previously Presented) The wireless communication terminal of claim 13, wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame.

15. (Previously Presented) The wireless communication terminal of claim 13, wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame.

16. (Previously Presented) The wireless communication terminal of claim 13, wherein the predetermined AID field information indicates a start of the padding.

17. (Previously Presented) The wireless communication terminal of claim 16, wherein the predetermined AID field information is duplicated bit information in an AID field.

18. (Currently Amended) The wireless communication terminal of claim 13, wherein the padding is applied in the trigger frame by using duplicated information.

19. (Currently Amended) The wireless communication terminal of claim 18, wherein the padding is applied in the trigger frame by duplicating the predetermined AID field information.

20. (Previously Presented) The wireless communication terminal of claim 13, wherein the processor is further configured to:

generate an uplink packet to perform the uplink transmission, and

perform the uplink transmission in response to the trigger frame by using the generated uplink packet,

wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated time.

21. (Previously Presented) A wireless communication method of a wireless communication terminal, comprising:

receiving a trigger frame indicating uplink transmission of one or more terminals;

identifying a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame; and

performing an uplink transmission in response to the trigger frame.

22. (Previously Presented) The wireless communication method of claim 21, wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame.

23. (Previously Presented) The wireless communication method of claim 21, wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame.

24. (Previously Presented) The wireless communication method of claim 21, wherein the predetermined AID field information indicates a start of the padding.

25. (Previously Presented) The wireless communication method of claim 24, wherein the predetermined AID field information is duplicated bit information in an AID field.

26. (Currently Amended) The wireless communication method of claim 21, wherein the padding is applied in the trigger frame by using duplicated information.

27. (Currently Amended) The wireless communication method of claim 26, wherein the padding is applied in the trigger frame by duplicating the predetermined AID field information.

28. (Currently Amended) The wireless communication method of claim 21, ~~wherein the method~~ further comprising:

generating an uplink packet to perform the uplink transmission, and

performing the uplink transmission in response to the trigger frame by using the generated uplink packet,

wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated time.

REMARKS

Claims 13-28 are pending in the application. By this Amendment, claims 18, 19 and 26-28 are amended. No new matter is added. Various amendments may be made for clarity, and may be unrelated to issues of patentability.

The Office Action rejects claims 13-15 and 21-22 on the ground of non-statutory obviousness-type double patenting over claims 1 and 3 of U.S. Patent 10,305,638. An eTerminal Disclaimer (with respect to U.S. Patent 10,305,638) is being filed simultaneously. Withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 13, 16-21 and 24-28 under 35 U.S.C. §102(a)(2) over U.S. Patent Publication 2017/0272138 to Chun et al. (hereafter Chun). The Office Action also rejects claims 14 and 22 under 35 U.S.C. §103 over Chun in view of U.S. Patent Publication 2016/0227437 to Blanksby et al. (hereafter Blanksby). Still further, the Office Action rejects claims 15 and 23 under 35 U.S.C. §103 over Chun in view of U.S. Patent Publication 2006/0034317 to Hong et al. (hereafter Hong). These rejections are respectfully traversed with respect to the pending claims.

The applied references do not teach or suggest all the features of independent claim 13. More specifically, Chun, Blanksby and Hong do not teach or suggest the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame, as recited in independent claim 13.

When discussing features of "to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information," the Office Action (on page 5) cites Chun's Table 15 on page 35, Table 15 as allegedly teaching a trigger frame with AID padding information. Applicant hereafter refers to the Office Action citation as "the cited trigger frame-padding information."

Chun's Table 15 includes three header, namely (1) Trigger Frame Type, (2) Contents, and (3) Remarks.

The Office Action citation to the cited trigger frame-padding information corresponds to the first row of Table 15 since it is the only row that discusses both trigger frame and padding. The cited first row of Table 15 has the Trigger Frame Type of "trigger frame for UL MU data transmission" and has the following "Remarks:"

Information on the length of a UL data frame is required. The STA configures and transmits data according to the value, (padding when data is insufficient)

Chun does not teach or suggest identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame" as recited in independent claim 1. More specifically, the "padding" cited in the first row of Chun's Table 15 is applied to a UL data frame. However, the UL (upload) data frame is not a trigger frame. Further, as shown above, Chun "remarks" (for the first row) recites that padding is applied "when data is insufficient." In this example, the "data" represents UL data in a UL data frame transmitted by the STA (station). The expression "insufficient" means that the "data" is insufficient as compared to the "length of a UL data frame" informed by

the trigger frame. Accordingly, Chun applies the padding only when the UL data in a UL data frame is insufficient to meet the requirement of the "length of a UL data frame" informed by the trigger frame. Chun does not teach to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame, as recited in independent claim 1.

Additionally, Chun does not teach or suggest identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame, as recited in independent claim 13. There is no teaching that Chun's "a predetermined association ID (AID) field information" is used to "identify a padding applied in the trigger frame." Chun's Table 15 discloses, as a "contents" of the "trigger frame for UL MU data transmission" the following:

n × AID, (n × MCS, n × STBC), n × N_sts, n × N_subband, UL MU frame Length

Chun merely discloses that n AID fields are contained in the trigger frame. Chun does not discuss any AID field information that is used to "identify a padding applied in the trigger frame." Chun does not teach or suggest identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame, as recited in independent claim 13.

For at least these reasons, Chun does not teach or suggest all the features of independent claim 13. Blanksby and Hong do not teach or suggest the missing features of independent claim 13. Independent claim 13 therefore defines patentable subject matter.

For at least similar reasons as set forth above, the applied references do not teach or suggest all the features of independent claim 21. More specifically, Chun, Blanksby and Hong do not teach or suggest identifying a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame, as recited in independent claim 21. Accordingly, independent claim 21 defines patentable subject matter.

For at least the reasons set forth above, each of independent claims 13 and 21 defines patentable subject matter. Each of the dependent claims depends from one of the independent claims and therefore defines patentable subject matter at least for this reason. In addition, the dependent claims recite features that further and independently distinguish over the applied references.

CONCLUSION

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Favorable consideration and prompt allowance of claims 13-28 are earnestly solicited. If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David C. Oren/

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Please direct all correspondence to Customer Number 34610

Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	16377829
Filing Date	08-Apr-2019
First Named Inventor	Woojin AHN
Attorney Docket Number	QUS-0003
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.	100%
SK TELECOM CO., LTD.	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

10305638

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicant claims the following fee status:

○ Small Entity

○ Micro Entity

◉ Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Registration Number 38694

○ A sole inventor

○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application

○ A joint inventor; all of whom are signing this request

Signature	/David C. Oren/
Name	David C. Oren

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	16377829
Filing Date:	08-Apr-2019
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Filer:	Daniel Y.J. Kim/Shannon Burke
Attorney Docket Number:	QUS-0003

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 16377829

Filing Date: 08-Apr-2019

Applicant/Patent under Reexamination: AHN

Electronic Terminal Disclaimer filed on January 6, 2020

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	38217012
Application Number:	16377829
International Application Number:	
Confirmation Number:	4240
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Shannon Burke
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	QUS-0003
Receipt Date:	06-JAN-2020
Filing Date:	08-APR-2019
Time Stamp:	18:14:31
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	yes
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Payment was successfully received in RAM	$160
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	34841 d7820716e65a380b0dae5362051da061b116e6b2	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30738 a706e8773c75a988dfc378a6a90e53ff9773351b	no	2
Warnings:					
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/377,829	04/08/2019	Woojin AHN	QUS-0003	4240

34610 7590 10/04/2019

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER	
SHARMA, GAUTAM	

ART UNIT	PAPER NUMBER
2467	

NOTIFICATION DATE	DELIVERY MODE
10/04/2019	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):

ked-docket@ked-iplaw.com
keddocket@gmail.com
mydocket@icloud.com

Office Action Summary	**Application No.** 16/377,829	**Applicant(s)** AHN et al.	
	Examiner GAUTAM SHARMA	**Art Unit** 2467	**AIA (FITF) Status** Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 04/08/2019.

☐ 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) 13-28 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) 13-28 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 04/08/2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☑ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

2. Claims 13-28 are pending.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

4. A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file

provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

5. The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

6. Claims 13-15 and 21-22 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1 and 3 of U.S. Patent No. 10,305,638 as mapped below. Although the claims at issue are not identical, they are not patentably distinct from each other because they cover the same scope.

Instant Application	*Parent Patent 10,305,638*
13. (New) A wireless communication terminal, the terminal comprising: a transceiver; and a processor, wherein the processor is configured to: receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals, and perform, through the transceiver, an uplink transmission in response to	*1. A base wireless communication terminal, the terminal comprising: a transceiver; and a processor, wherein the processor is configured to: transmit, through the transceiver, a trigger frame triggering a multi-user uplink transmission of one or more terminals, and receive, through the transceiver, uplink packet(s) transmitted from*

the trigger frame, wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame. *15. (New) The wireless communication terminal of claim 13, wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame.*	*one or more terminals in response to the trigger frame, wherein a predetermined padding is performed before a frame check sequence (FCS) field of the trigger frame, and wherein a predetermined association ID (AID) field information is inserted to the trigger frame to indicate the predetermined padding.*
14. (New) The wireless communication terminal of claim 13, wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame.	*3. The base wireless communication terminal of claim 1, wherein the predetermined padding is set based on a processing time needed for the one or more terminals to respond to the trigger frame.*

7. **As to claims 21-23,** the claims are double patent rejected as applied to claims 1-3 above by parent patent 10,305,638.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

9. **Claims 13, 16-21 and 24-28 are rejected** under 35 U.S.C. 102(a)(2) as being anticipate by Chun et al, application no. 2017/0272138, hereinafter known as Chun.

10. **As to claim 13,** Chun discloses *a wireless communication terminal, the terminal comprising: a transceiver; and a processor, wherein the processor is configured to* (Chun, Figure 1 and 47, [0076]-[0095], Apparatus of a either stations and AP's)*: receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals, and perform, through the transceiver, an uplink transmission in response to the trigger frame* (Chun, Figure 41-45, [00536]-[00548], sending trigger frame to stations and receiving responses) *wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame* (Chun, Page 35, Table 15, Trigger frame with AID padding information).

11. **As to claim 16,** Chun discloses *wherein the predetermined ID field information indicates a start of the padding* (Chun, page 35, Table 15, AID used as padding data).

12. **As to claim 17,** Chun discloses *wherein the predetermined AID field information is duplicated bit information in an AID field* (Chun, Figure 12, Repeating AID information frame).

13. **As to claim 18,** Chun discloses *wherein the padding is applied by using duplicated information* (Chun, Figure 12, Repeating AID information frame).

14. **As to claim 19,** Chun discloses *wherein the padding is applied by duplicating the predetermined AID* (Chun, Figure 12, repeating AID information frame).

15. **As to claim 20,** Chun discloses *wherein the processor is further configured to: generate an uplink packet to perform the uplink transmission, and perform the uplink transmission in response to the trigger frame by using the generated uplink packet* (Chun, Figure 41-45, [00536]-[00548], sending trigger frame to stations and receiving responses), *wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated timed field information* (Chun, page 35, table 15, AID and other data used to pad a frame, used in the art to terminate a frame at a particular length and duration).

16. **As to claims 21, 24-28,** the claims are rejected as applied to claims 13 and 16-20 respectively above by Chun.

Claim Rejections - 35 USC § 103

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

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

18. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

19. **Claims 14 and 22 are rejected** under 35 U.S.C. 103 as being unpatentable over Chun in view of Blanksby et al, application no. 2016/0227437, hereinafter known as Blanksby.

20. **As to claim 14,** Chun disclose *the wireless communication terminal of claim 13.* Noh and Chun do not expressly disclose however Blanksby discloses *wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame* (Blanksby, [0044], adding padding to account for processing time).

21. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the teachings of Chun to include the limitations of *wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame* as taught by Blanksby. Adding padding time to allow for processing time may reduce number of components needed in a device (Blanksby, [0044]).

22. **As to claim 22,** the claim is rejected as applied to claim 14 above by Chun in view of Blanksby.

23. **Claims 15 and 23 are rejected** under 35 U.S.C. 103 as being unpatentable over Chun in view of Hong et al, 2006/0034317, hereinafter known as Hong.

24. **As to claim 15,** Chun disclose *the wireless communication terminal of claim 13*. Chun does not expressly disclose however Hong discloses *wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame* (Hong, Figure 20, padding before FCS).

25. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the teachings of Chun to include the limitations of *wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame* as taught by Hong. Padding sections are commonly used in the art so frames in network communications are of a uniform size.

26. **As to claim 23,** the claim is rejected as applied to claim 15 above by Chun in view of Hong.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GAUTAM SHARMA whose telephone number is (571)270-7182. The examiner can normally be reached on 11am-8pm.

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

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

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

/GAUTAM SHARMA/
Examiner, Art Unit 2467

/HASSAN A PHILLIPS/
Supervisory Patent Examiner, Art Unit 2467

Notice of References Cited	Application/Control No. 16/377,829	Applicant(s)/Patent Under Reexamination AHN et al.	
	Examiner GAUTAM SHARMA	Art Unit 2467	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-20170272138-A1	09-2017	CHUN; Jinyoung	H04L29/08	1/1
*	B	US-20150003367-A1	01-2015	Seok; Yongho	H04W74/002	370/329
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

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.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	**Art Unit**
	GAUTAM SHARMA	2467

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

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant						☐ CPA	☐ T.D.		☐ R.1.47	
CLAIM		**DATE**								
Final	Original	09/27/2019								
	1	-								
	2	-								
	3	-								
	4	-								
	5	-								
	6	-								
	7	-								
	8	-								
	9	-								
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	24	✓								
	25	✓								
	26	✓								
	27	✓								
	28	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/377,829	AHN et al.
	Examiner	Art Unit
	GAUTAM SHARMA	2467

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
East Search	09/27/2019	Gautam Sharma
Inventor Search	09/27/2019	Gautam Sharma
Classification Search (H04W: 74/085, 74/0841, 74/0833, 74/08, 74/00, 72/1284, 72/1278, 72/12, 72/1231, 72/1226, 72/121, 72/1205, 72/00, 72/0413, 72/0406, 72/04, 72/00, 1/1664, 1/1621, 1/16, 1/12, 1/00)	09/27/2019	Gautam Sharma

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
QUS-0003	Continuation of U.S. Patent Application Serial No. 15/555,075
APPLICANT(S)	
Woojin AHN; Yongho KIM; Jinsam KWAK; and Juhyung SON	
FILING DATE	GROUP
	To Be Assigned

U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	*PATENT NO.	*ISSUE DATE	*INVENTOR NAME	CLASS	SUBCLASS	FILING DATE

U.S. PATENT APPLICATION PUBLICATIONS

EXAMINER'S INITIALS	*APPLICATION PUBLICATION NO.	*PUBLICATION DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE
	2017/0373813	12/2017	ASTERJADHI, Alfred			
	2016/0227437	08/2016	BLANKSBY, Andrew			
	2006/0034317	02/2006	HONG, Jin-woo			
	2012/0314697	12/2012	NOH, Yu Jin			
	2017/0250784	08/2017	SAKAI, Eisuke			
	2013/0301569	11/2013	WANG et al.			
	2013/0286959	10/2013	LOU et al.			

U.S. PATENT APPLICATIONS

EXAMINER'S INITIALS	*APPLICATION NO.	*FILING DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE

FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	Translation Yes	Translation No
	2011/102575	08/2011	WIPO			X	
	2014/171788	10/2014	WIPO			X	

OTHER ART (Including Author, Title, Date, Pertinent Pages, Publisher, Place of Publication, Etc.)

	International Search Report for PCT/KR2016/002199 mailed on July 8, 2016 and its English translation from WIPO
	Written Opinion of the International Searching Authority for PCT/KR2016/002199 mailed on July 8, 2016 and its English machine translation by Google Translate
	AHN, Woo Jin et al., "UL-OFMA Procedure in IEEE 802.11ax", IEEE 802.11-15/0091rl, 13 January 2015, slides 3-10
	U.S. Office Action dated July 2, 2018 issued in Application No. 15/555,075

EXAMINER	DATE CONSIDERED
/GAUTAM SHARMA/	09/27/2019

EXAMINER: Initial if reference has been considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.S/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	2	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L3	2	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L4	3	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L5	41	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L6	3	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L7	2	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L8	358	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L9	169	(("20 mhz") with ("he-sig-a") with legacy)	US-	OR	OFF	2019/09/27

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			16:25
L10	57	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L11	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:25
L12	128	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L13	245	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L14	728	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L15	380	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L16	3533	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L17	1441	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L18	18726	H04W74/0833.cpc.	US-PGPUB; USPAT;	OR	OFF	2019/09/27 16:25

			USOCR; FPRS; EPO; JPO			
L19	10061	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L20	7707	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L21	8445	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L22	6677	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L23	13418	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L24	6421	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L25	3880	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L26	4091	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L27	3427	H04W72/1205.cpc.	US-	OR	OFF	2019/09/27

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			16:25
L28	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L29	29929	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L30	23745	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L31	32544	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L32	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L33	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L34	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L35	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2019/09/27 16:25

			JPO			
L36	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L37	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L38	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L39	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L40	5	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L41	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L42	22	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L43	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L44	833	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
L45	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L46	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L47	12	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L48	362	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L49	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L50	67	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L51	74	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L52	5	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L53	17490	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB;	OR	OFF	2019/09/27 16:25

			USPAT; USOCR; FPRS; EPO; JPO			
L54	1519	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L55	673	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L56	154	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L57	13	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L58	19	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L59	527	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L60	222	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L61	118	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25

L62	15	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L63	48	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L64	33	L63 not L62	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L65	5	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L66	4163	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L67	27	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L68	192	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L69	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L70	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2019/09/27 16:25

			EPO; JPO			
L71	4	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L72	7	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L73	2	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L74	2	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L75	3	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L76	41	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L77	3	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L78	2	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L79	358	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT;	OR	OFF	2019/09/27 16:25

			USOCR; FPRS; EPO; JPO			
L80	169	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L81	57	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L82	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:25
L83	128	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L84	245	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L85	728	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L86	380	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L87	3533	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L88	1441	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2019/09/27 16:25

			EPO; JPO			
L89	18726	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L90	10061	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L91	7707	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L92	8445	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L93	6677	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L94	13418	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L95	6421	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L96	3880	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L97	4091	H04W72/121.cpc.	US-PGPUB; USPAT;	OR	OFF	2019/09/27 16:25

			USOCR; FPRS; EPO; JPO			
L98	3427	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L99	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L100	29929	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L101	23745	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L102	32544	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L103	8631	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L104	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L105	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L106	0	H04W1/1607.cpc.	US-	OR	OFF	2019/09/27

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			16:25
L107	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L108	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L109	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L110	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L111	5	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L112	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L113	22	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L114	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2019/09/27 16:25

			JPO			
L115	833	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L116	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L117	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L118	12	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L119	362	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L120	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L121	67	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L122	74	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L123	5	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/27 16:25

			FPRS; EPO; JPO			
L124	17490	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L125	1519	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L126	673	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L127	154	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L128	13	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L129	19	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L130	527	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L131	222	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:25
L132	118	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB;	OR	OFF	2019/09/27 16:26

			USPAT; USOCR; FPRS; EPO; JPO			
L133	15	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L134	48	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L135	33	L134 not L133	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L136	5	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L137	4163	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L138	27	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L139	192	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L140	2	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26

L141	2	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L142	4	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L143	4	L72 and L87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L144	0	L72 and L88	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L145	0	L72 and L89	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L146	0	L72 and L90	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L147	0	L72 and L91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L148	3	L72 and L92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L149	0	L72 and L93	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2019/09/27 16:26

			EPO; JPO			
L150	0	L72 and L94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L151	3	L72 and L95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L152	0	L72 and L96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L153	5	L72 and L97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L154	0	L72 and L98	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L155	0	L72 and L99	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L156	6	L72 and L100	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L157	0	L72 and L101	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L158	0	L72 and L102	US-PGPUB; USPAT;	OR	OFF	2019/09/27 16:26

			USOCR; FPRS; EPO; JPO			
L159	0	L72 and L103	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L160	0	L72 and L104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L161	0	L72 and L105	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L162	0	L72 and L106	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L163	0	L72 and L107	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L164	0	L72 and L108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L165	0	L72 and L109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L166	3	L72 and L110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L167	3	L72 and L111	US-	OR	OFF	2019/09/27

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			16:26
L168	0	L72 and L112	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L212	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L213	352	("predetermined assocaition id" or "aid") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:26
L214	2	("predetermined assocaition id" or "aid") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 16:59
L215	2	("predetermined assocaition id" or"association identifier" or "predetermined assocaition identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:13
L216	2	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame") with (pad or padding or add or adding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:26
L217	359	("predetermined assocaition id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:27
L218	359	("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2019/09/27 17:27

			JPO			
L219	237	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and (pad or padding or add or adding or exten or extending or encapsulat$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:28
L220	132	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) and ((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:29
L221	14	(("predetermined association id" or "association identifier" or "predetermined association identifier" or "aid" or "association id") with ("trigger frame")) same((pad or padding or add or adding or exten or extending or encapsulat$6) with (packet or frame or message))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 17:29
L222	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 18:33
S1	1	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 18:46
S2	0	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 18:47
S3	1	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 18:47
S4	24	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 18:59
S5	0	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR;	OR	OFF	2018/06/22 19:00

			FPRS; EPO; JPO			
S6	0	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:00
S7	196	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:01
S8	95	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:01
S9	46	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:06
S10	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2018/06/22 19:10
S11	52	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:11
S12	212	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:11
S13	572	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:12
S14	236	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2018/06/22 19:13

			JPO			
S15	3060	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:13
S16	1278	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:13
S17	15485	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:13
S18	8650	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:13
S19	7584	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:14
S20	6674	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:14
S21	6202	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:14
S22	11494	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:14
S23	6203	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR;	OR	OFF	2018/06/22 19:14

			FPRS; EPO; JPO			
S24	3982	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:14
S25	3211	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S26	2911	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S27	9246	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S28	26676	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S29	22096	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S30	29000	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S31	9246	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:15
S32	0	H04W1/1664.cpc.	US-PGPUB;	OR	OFF	2018/06/22 19:16

			USPAT; USOCR; FPRS; EPO; JPO			
S33	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:16
S34	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:16
S35	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:16
S36	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:16
S37	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:16
S38	1	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:18
S39	3	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/22 19:30
S40	0	wo2011102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 15:47

S41	16	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 15:47
S42	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 15:49
S43	791	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 15:49
S44	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 15:50
S45	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 15:51
S46	9	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:07
S47	320	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:14
S48	5	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:25
S49	57	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2018/06/23 16:27

			EPO; JPO			
S50	63	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:27
S51	4	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:41
S52	15875	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:42
S53	1370	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:48
S54	560	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:49
S55	122	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:49
S56	9	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:51
S57	14	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 16:52
S58	464	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT;	OR	OFF	2018/06/23 17:01

			USOCR; FPRS; EPO; JPO			
S59	203	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 17:12
S60	109	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 17:12
S61	13	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 17:13
S62	39	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 17:16
S63	26	S62 not S61	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/06/23 17:17
S64	3	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/12 19:04
S65	3398	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/12 19:09
S66	15	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/12 19:09
S67	133	("trigger frame") with (pad or padding)	US-	OR	OFF	2018/12/13

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			14:32
S68	0	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 14:32
S69	0	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 14:32
S70	2	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 14:33
S71	5	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S72	1	sharma-gautam.xa. and ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S73	0	sharma-gautam.xa. and ("legacy preamble")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S74	1	sharma-gautam.xa. and (legacy with preamble)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S75	31	sharma-gautam.xa. and ("20 mhz")	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2018/12/13 15:45

			JPO			
S76	0	sharma-gautam.xa. and (("20 mhz") with (legacy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S77	0	sharma-gautam.xa. and (("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S78	249	(("20 mhz") with ("he-sig-a"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S79	122	(("20 mhz") with ("he-sig-a") with legacy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S80	50	("same time") with ("block ack" or "block acknowledge$5")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S81	2	("20130286959" | "20130301569").PN.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:45
S82	71	ahn-woojin.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S83	221	kim-yongho.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S84	623	kwak-jinsam.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45

S85	281	son-juhyung.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S86	3636	H04W74/085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S87	1429	H04W74/0841.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S88	18329	H04W74/0833.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S89	9807	H04W74/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S90	7873	H04W74/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S91	8230	H04W72/1284.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S92	7015	H04W72/1278.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S93	13163	H04W72/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2018/12/13 15:45

			EPO; JPO			
S94	6896	H04W72/1231.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S95	4426	H04W72/1226.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S96	4075	H04W72/121.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S97	3497	H04W72/1205.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S98	9815	H04W72/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S99	32130	H04W72/0413.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S100	25873	H04W72/0406.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S101	32500	H04W72/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S102	9815	H04W72/00.cpc.	US-PGPUB; USPAT;	OR	OFF	2018/12/13 15:45

			USOCR; FPRS; EPO; JPO			
S103	0	H04W1/1664.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S104	0	H04W1/1621.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S105	0	H04W1/1607.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S106	0	H04W1/16.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S107	0	H04W1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S108	0	H04W1/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S109	1	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S110	3	"predetermined association ID"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S111	0	wo2011102575	US-	OR	OFF	2018/12/13

			PGPUB; USPAT; USOCR; FPRS; EPO; JPO			15:45
S112	17	"2011102575"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S113	1	2011-102575	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S114	808	noh.in. and seok.in. and lg.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S115	1	"20130314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S116	1	"20120314697".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S117	10	"ba bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S118	339	"bitmap" with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S119	6	"bitmap" with (pad or padding) with (duplicat$5 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2018/12/13 15:45

			JPO			
S120	61	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S121	67	("bitmap" with (pad or padding)) and (multiuser or mimo or "mu mimo" or "multi-user")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S122	4	(pad or padding) with (multiuser or mimo or "mu mimo" or "multi-user") with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S123	16431	(pad or padding) with (duplicat$4 or repeat$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S124	1412	(ba or "block ack" or "block acknowledge") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S125	591	(ba or "block ack" or "block acknowledge") near7 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S126	128	((ba or "block ack" or "block acknowledge") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S127	10	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding)) and ("same time")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S128	15	(("block ack" or "block acknowledge" or "block acknowledgment") near7 (pad or padding))	US-PGPUB; USPAT; USOCR;	OR	OFF	2018/12/13 15:45

			FPRS; EPO; JPO			
S129	483	("time to process" or "processing time") with ((pad or padding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S130	211	("time to process" or "processing time") near5 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S131	114	("time to process" or "processing time") near3 (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S132	14	(("time to process" or "processing time") near3 (pad or padding)) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S133	41	("time to process" or "processing time") with (pad or padding) with (frame or packet or datagram or pdu or ppdu)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S134	27	S133 not S132	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S135	3	"predetermined association id"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S136	3403	("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S137	15	("trigger frame") with (fcs) with (pad or padding)	US-PGPUB;	OR	OFF	2018/12/13 15:45

			USPAT; USOCR; FPRS; EPO; JPO			
S138	133	("trigger frame") with (pad or padding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S139	0	("trigger frame" or "trigger packet") with (pad or padding) with ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S140	0	(("trigger frame" or "trigger packet") with (pad or padding)) same ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S141	2	(("trigger frame" or "trigger packet") with (pad or padding)) and ("predetermined association")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:45
S142	2	S71 and S86	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S143	0	S71 and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S144	0	S71 and S88	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S145	0	S71 and S89	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53

S146	0	S71 and S90	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S147	1	S71 and S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S148	0	S71 and S92	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S149	0	S71 and S93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S150	1	S71 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S151	0	S71 and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S152	3	S71 and S96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S153	0	S71 and S97	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S154	0	S71 and S98	US-PGPUB; USPAT; USOCR; FPRS;	OR	OFF	2018/12/13 15:53

			EPO; JPO			
S155	4	S71 and S99	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:53
S156	0	S71 and S100	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S157	0	S71 and S101	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S158	0	S71 and S102	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S159	0	S71 and S103	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S160	0	S71 and S104	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S161	0	S71 and S105	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S162	0	S71 and S106	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S163	0	S71 and S107	US-PGPUB; USPAT;	OR	OFF	2018/12/13 15:54

			USOCR; FPRS; EPO; JPO			
S164	0	S71 and S108	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S165	1	S71 and S109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S166	1	S71 and S110	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S167	0	S71 and S111	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/12/13 15:54
S211	3	"15555075"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 12:31
S212	352	("predetermined assocaition id" or "aid") with ("trigger frame")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/09/27 12:34

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L169	7	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L170	1397	H04W74/085.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L171	491	H04W74/0841.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

L172	6469	H04W74/0833.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L173	2924	H04W74/08.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L174	2425	H04W74/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L175	2730	H04W72/1284.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L176	2244	H04W72/1278.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L177	4073	H04W72/12.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L178	2362	H04W72/1231.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L179	1483	H04W72/1226.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L180	1552	H04W72/121.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L181	1114	H04W72/1205.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L182	2959	H04W72/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L183	0	H04W7/0413.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L184	0	H04W7/0406.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L185	0	H04W1/1664.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L186	0	H04W1/1621.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L187	0	H04W1/1607.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L188	0	H04W1/16.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L189	0	H04W1/12.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L190	0	H04W1/00.cpc.	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

L191	4	L169 and L170	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L192	0	L169 and L171	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L193	0	L169 and L172	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L194	0	L169 and L173	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L195	0	L169 and L174	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L196	3	L169 and L175	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L197	0	L169 and L176	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L198	0	L169 and L177	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L199	3	L169 and L178	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L200	0	L169 and L179	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L201	5	L169 and L180	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L202	0	L169 and L181	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L203	0	L169 and L182	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L204	0	L169 and L183	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L205	0	L169 and L184	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L206	0	L169 and L185	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L207	0	L169 and L186	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L208	0	L169 and L187	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L209	0	L169 and L188	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26

L210	0	L169 and L189	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
L211	0	L169 and L190	US-PGPUB; USPAT	OR	OFF	2019/09/27 16:26
S168	5	("trigger frame" or "trigger packet").clm. and (fcs or "frame check" or "check frame").clm. and (pad or padding).clm.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:49
S169	1205	H04W74/085.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S170	432	H04W74/0841.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S171	5385	H04W74/0833.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S172	2601	H04W74/08.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S173	2331	H04W74/00.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S174	2250	H04W72/1284.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S175	1950	H04W72/1278.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S176	3539	H04W72/12.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S177	2121	H04W72/1231.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:50
S178	1339	H04W72/1226.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51
S179	1305	H04W72/121.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51
S180	953	H04W72/1205.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51
S181	2829	H04W72/00.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51
S182	0	H04W7/0413.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51
S183	0	H04W7/0406.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51
S184	0	H04W1/1664.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:51

S185	0	H04W1/1621.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S186	0	H04W1/1607.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S187	0	H04W1/16.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S188	0	H04W1/12.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S189	0	H04W1/00.cpc.	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S190	2	S168 and S169	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S191	0	S168 and S170	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S192	0	S168 and S171	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S193	0	S168 and S172	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S194	0	S168 and S173	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S195	1	S168 and S174	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S196	0	S168 and S175	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S197	0	S168 and S176	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S198	1	S168 and S177	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S199	0	S168 and S178	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S200	3	S168 and S179	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:52
S201	0	S168 and S180	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S202	0	S168 and S181	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S203	0	S168 and S182	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53

S204	0	S168 and S183	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S205	0	S168 and S184	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S206	0	S168 and S185	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S207	0	S168 and S186	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S208	0	S168 and S187	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S209	0	S168 and S188	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53
S210	0	S168 and S189	US-PGPUB; USPAT	OR	OFF	2018/12/13 15:53

9/ 27/ 2019 6:44:22 PM
C:\ Users\ gsharma\ Documents\ EAST\ Workspaces\ 15555075.wsp

Bibliographic Data

Application No: 16/377,829

Foreign Priority claimed: (●) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /GAUTAM SHARMA/ Examiner's Signature | Initials

Title: WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
04/08/2019	370	2467	QUS-0003
RULE			

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CONTINUING DATA

This application is a CON of 15555075 01/02/2018 PAT 10305638

15555075 is a 371 of PCT/KR2016/002199 03/04/2016

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF 10-2015-0030369 03/04/2015

KOREA, REPUBLIC OF 10-2015-0036754 03/17/2015

KOREA, REPUBLIC OF 10-2015-0066670 05/13/2015

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/377,829	04/08/2019	Woojin AHN	QUS-0003

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PUBLICATION NOTICE

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Title:WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

Publication No.US-2019-0238272-A1
Publication Date:08/01/2019

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.

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In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/377,829

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	16 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 460 =	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
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1720

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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
16/377,829	04/08/2019	2414	1720	QUS-0003	16	2

CONFIRMATION NO. 4240

34610
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

FILING RECEIPT

OC000000107613842

Date Mailed: 04/24/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Woojin AHN, Seoul, KOREA, REPUBLIC OF;
Yongho KIM, Incheon, KOREA, REPUBLIC OF;
Jinsam KWAK, Gyeonggi-do, KOREA, REPUBLIC OF;
Juhyung SON, Gyeonggi-do, KOREA, REPUBLIC OF;

Applicant(s)

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

Power of Attorney: The patent practitioners associated with Customer Number 34610

Domestic Priority data as claimed by applicant

This application is a CON of 15/555,075 01/02/2018
which is a 371 of PCT/KR2016/002199 03/04/2016

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
REPUBLIC OF KOREA 10-2015-0030369 03/04/2015 No Access Code Provided
REPUBLIC OF KOREA 10-2015-0036754 03/17/2015 No Access Code Provided
REPUBLIC OF KOREA 10-2015-0066670 05/13/2015 No Access Code Provided

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: 04/23/2019
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/377,829**
Projected Publication Date: 08/01/2019
Non-Publication Request: No
Early Publication Request: No
Title

WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

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 AssetsControl, 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).

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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.

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/377,829	Filing Date 04/08/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/08/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/SHERRY A DAVIS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
QUS-0003	Continuation of U.S. Patent Application Serial No. 15/555,075
APPLICANT(S)	
Woojin AHN; Yongho KIM; Jinsam KWAK; and Juhyung SON	
FILING DATE	GROUP
	To Be Assigned

U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	*PATENT NO.	*ISSUE DATE	*INVENTOR NAME	CLASS	SUBCLASS	FILING DATE

U.S. PATENT APPLICATION PUBLICATIONS

EXAMINER'S INITIALS	*APPLICATION PUBLICATION NO.	*PUBLICATION DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE
	2017/0373813	12/2017	ASTERJADHI, Alfred			
	2016/0227437	08/2016	BLANKSBY, Andrew			
	2006/0034317	02/2006	HONG, Jin-woo			
	2012/0314697	12/2012	NOH, Yu Jin			
	2017/0250784	08/2017	SAKAI, Eisuke			
	2013/0301569	11/2013	WANG et al.			
	2013/0286959	10/2013	LOU et al.			

U.S. PATENT APPLICATIONS

EXAMINER'S INITIALS	*APPLICATION NO.	*FILING DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE

FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	Translation Yes	Translation No
	2011/102575	08/2011	WIPO			X	
	2014/171788	10/2014	WIPO			X	

OTHER ART (Including Author, Title, Date, Pertinent Pages, Publisher, Place of Publication, Etc.)

	International Search Report for PCT/KR2016/002199 mailed on July 8, 2016 and its English translation from WIPO
	Written Opinion of the International Searching Authority for PCT/KR2016/002199 mailed on July 8, 2016 and its English machine translation by Google Translate
	AHN, Woo Jin et al., "UL-OFMA Procedure in IEEE 802.11ax", IEEE 802.11-15/0091rl, 13 January 2015, slides 3-10
	U.S. Office Action dated July 2, 2018 issued in Application No. 15/555,075

EXAMINER	DATE CONSIDERED

EXAMINER: Initial if reference has been 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.
\\ked2\Documents\2453\2453-003\774498.docx

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

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

Application No./Patent No.: Continuation of U.S. Application No. 15/555,075 Filed/Issue Date: August 31, 2017

Titled: WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD., a corporation

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

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

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

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

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

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

   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 046584, Frame 0320, 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

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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.**

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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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

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

4. From: _____ To: _____

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

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

5. From: _____ To: _____

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

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

6. From: _____ To: _____

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

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

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

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

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

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

/Daniel Y.J. Kim/	April 8, 2019
Signature	Date
Daniel Y.J. Kim	36,186
Printed or Typed Name	Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. 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.

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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 34610

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 34610

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: SK Telecom Co., Ltd.
SK T-Tower, 65, Eulji-ro, Jung-gu
Seoul, 04539, Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	Date
Name Byun Goo SHIN	Telephone
Title Director of IPR	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/80 (07-17)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 34610

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 34610

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.
5Fl., 216 Hwangsaeul-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 13595, Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature		Date	Mar 5, 2019
Name	JIN SAM KWAK	Telephone	+82-31-112-0523
Title	CEO		

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 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.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Filer:	Daniel Y.J. Kim/Sarah Garrett
Attorney Docket Number:	QUS-0003

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1720**

Electronic Acknowledgement Receipt	
EFS ID:	35658484
Application Number:	16377829
International Application Number:	
Confirmation Number:	4240
Title of Invention:	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION
First Named Inventor/Applicant Name:	Woojin AHN
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Sarah Garrett
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	QUS-0003
Receipt Date:	08-APR-2019
Filing Date:	
Time Stamp:	15:33:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1720
RAM confirmation Number	040919INTEFSW15344600
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	Transmittal of New Application	Transmittal.pdf	120288 f66fb9d7e15bd9c98afad09580d8580de11a7e9e	no	2
Warnings:					
Information:					
2	Authorization for Extension of Time all replies	Authorization.pdf	95410 f329a1f8624467f77fcbf1767a3674e4e5848d9c	no	1
Warnings:					
Information:					
3	Application Data Sheet	ADS.pdf	1822982 1abb4f8d84cffcafaf9665f3d5db08667b485918	no	10
Warnings:					
Information:					
4		PreliminaryAmedment.pdf	159432 1f28891083c58f31e68f0e28a961358bb7ba9dfb	yes	7

Multipart Description/PDF files in .zip description

Document Description	Start	End
Preliminary Amendment	1	1
Specification	2	2
Claims	3	6
Applicant Arguments/Remarks Made in an Amendment	7	7

Warnings:

Information:

5		Application.pdf	1755753 5544fd13b22a0b541b8ae3d07c4fd124b0c84a98	yes	44
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Specification		1	40	
	Claims		41	43	
	Abstract		44	44	
Warnings:					
Information:					
6	Drawings-only black and white line drawings	Drawings.pdf	946124 99c5766285754ae5803c3e6eaefd07efb2eabe4b	no	21
Warnings:					
Information:					
7	Oath or Declaration filed	Declaration.pdf	129617 fc80f252a7c73509422bfa13867f844055221e80	no	3
Warnings:					
Information:					
8	Transmittal Letter	IDS.pdf	149995 5edabee718c17c64198063e0c4c0582f60add4da	no	2
Warnings:					
Information:					
9	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	173613 e2b33b0b66bbe27e7b7997e7c97b7fbd33e11ba4	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
10	Assignee showing of ownership per 37 CFR 3.73	373.pdf	118794 037e3269c5f810e823c14e02c5330cfa34226774	no	3

Warnings:					
Information:					
11	Power of Attorney	SKTPOA.pdf	83548 6229e87751d8b209d7070cdcf47066927ebe9a9c	no	2
Warnings:					
Information:					
12	Power of Attorney	WilusPOA.pdf	684549 7d48ef1c76c74381ba7eaa352fc9c44f306b9b44	no	1
Warnings:					
Information:					
13	Fee Worksheet (SB06)	fee-info.pdf	34783 8035356f26b390d649b6c76828fe3b9b09ff080e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	6274888		

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.

UTILITY PATENT APPLICATION
TRANSMITTAL UNDER 37 C.F.R. §1.53(b)

U.S. Patent and Trademark Office
Customer Service Window, **MAIL STOP PATENT APPLICATION**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Docket No.: **QUS-0003**

Sir:
Transmitted herewith for filing is the patent application of
INVENTOR OR APPLICATION IDENTIFIER: **Woojin AHN; Yongho KIM; Jinsam KWAK; and Juhyung SON**
FOR: **WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION**
Enclosed are:

1. ☒ 44 pages of specification, claims, abstract

2. ☒ 21 sheets of FORMAL drawings.

3. ☒ 3 pages of Declaration (copy from a prior application).
   ☒ Incorporation By Reference-The entire disclosure of the prior application is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
   ☒ This is a ☒ Continuation or ☐ Divisional of prior application No. **15/555,075**, filed on August 31, 2017, entitled **WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION**

4. ☒ Application Data Sheet.

5. ☒ An Information Disclosure Statement and PTO 1449 Form are submitted herewith.

6. The filing fee is calculated on the basis of the claims as filed herewith:

CLAIMS AS FILED					
For	**No. Filed**		**No. Extra**	**Rate**	**Fee**
Total Claims	**16**	**- 20**	**0**	X $100.00	**$0.00**
Independent Claims	**2**	**- 3**	**0**	X $460.00	**$0.00**
Multiple Dependent Claims (If applicable)				X $820.00	**$0.00**
APPLICATION SIZE FEE					
Number of Pages	X .75 =	0 - 100=	/50 =	*$400.00	**$0.00**
				BASIC FILING FEE	**$300.00**
				UTILITY SEARCH FEE	**$660.00**
				UTILITY EXAMINATION FEE	**$760.00**
				TOTAL FILING FEE	**$1,720.00**

7. ☒ Preliminary Amendment is enclosed.

8. ☐ Applicant claims Small Entity status.

9. ☒ Please charge my Credit Card.

10. ☐ Please charge my Deposit Account No. 16-0607 in the amount of $_____

11. ☒ The Commissioner is hereby authorized to charge fees under 37 C.F.R. §1.16 and §1.17 which may be required, including any extension of time fees to maintain the pendency of the parent application No. **15/555,075** or credit any overpayment to Deposit Account No. 16-0607.

12. ☒ Authorization under 37 C.F.R. §1.136(a)(3).

13. ☒ Priority is claimed. A copy of the foreign priority document was electronically retrieved in prior application No. **15/555,075** on **August 31, 2017**.

14. ☒ The prior application is assigned of record to **WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC. & SK TELECOM CO., LTD.** at Reel **046584**, Frame **0320**.

15. ☒ The power of attorney in the prior application is to:

KED & ASSOCIATES, LLP (Customer No. 34610)

16. ☒ Also enclosed:
Power of Attorney (PTO/AIA/80)
Statement Under 37 C.F.R. §3.73(c) (PTO/AIA/96)

17. ☐ Two (2) return postcards.
☐ Stamp & Return with Courier.
☐ Prepaid Postcard-Stamped Filing Date & Returned with Unofficial Serial Number.

Respectfully submitted,
KED & ASSOCIATES, LLP

/Daniel Y.J. Kim/

Daniel Y.J. Kim
Registration No. 36,186

Correspondence Address Below:
P.O. Box 8638
Reston, VA 20195
(703) 766-3777
DYK/seg
Please direct all correspondence to Customer Number 34610
\\ked2\Documents\2453\2453-003\774496.docx

Docket No.: **QUS-0003** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Customer No.: **34610**

Woojin AHN; Yongho KIM; Jinsam KWAK; and Juhyung SON

Serial No.: **Continuation of U.S. Patent Application Serial No. 15/555,075 filed August 31, 2017**

For: **WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION**

AUTHORIZATION TO TREAT A REPLY AS INCORPORATING AN EXTENSION OF TIME UNDER 37 C.F.R. §1.136(a)(3)

U.S. Patent and Trademark Office
Customer Service Window, **MAIL STOP APPLICATIONS**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

The U.S. Patent and Trademark Office is hereby authorized to treat any concurrent or future reply that requires a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time under 37 C.F.R. §1.136(a)(3). The U.S. Patent and Trademark Office is hereby authorized to charge all required extension of time fees to our Deposit Account No. 16-0607, if such fees are not otherwise provided for in such reply.

Respectfully submitted,
KED & ASSOCIATES, LLP

/Daniel Y. J. Kim/

Daniel Y. J. Kim
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
703 766-3777 DYK/seg
Please direct all correspondence to Customer Number 34610
Q:\Documents\2453-003\774493

PTO/AIA/14 (02-18)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	QUS-0003
	Application Number	
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

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
	Woojin		AHN	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Seoul	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	18-1, Seooreung-ro 13-gil Eunpyeong-gu
Address 2	
City	Seoul
State/Province	
Postal Code	03410
Country [i]	KR

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yongho		KIM	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Incheon	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	1404-804, 192 Guwol-ro Namdong-gu
Address 2	
City	Incheon
State/Province	
Postal Code	21561
Country [i]	KR

Inventor 3 Remove

Legal Name

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	QUS-0003
	Application Number	
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jinsam		KWAK	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Gyeonggi-do	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	1113-1704, 11 Naesonjungang-ro Uiwang-si		
Address 2			
City	Gyeonggi-do	State/Province	
Postal Code	16021	Country [i]	KR

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Juhyung		SON	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Gyeonggi-do	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	1114-302, 11 Naesonjungang-ro Uiwang-si		
Address 2			
City	Gyeonggi-do	State/Province	
Postal Code	16021	Country [i]	KR

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

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

Customer Number	34610		
Email Address	ked-docket@ked-iplaw.com	Add Email	Remove Email

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	QUS-0003
	Application Number	
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

Application Information:

Title of the Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION		
Attorney Docket Number	QUS-0003	**Small Entity Status Claimed** ☐	
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	21	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	34610		

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	QUS-0003
	Application Number	
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15555075	2018-01-02
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15555075	a 371 of international	PCT/KR2016/002199	2016-03-04

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)
10-2015-0030369	KR	2015-03-04	
			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
10-2015-0036754	KR	2015-03-17	
			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
10-2015-0066670	KR	2015-05-13	

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

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	QUS-0003
	Application Number	
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

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.

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	QUS-0003
	Application Number	
Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

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).

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Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

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. ☒

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Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION	

Applicant 2 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:

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Phone Number		Fax Number	
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Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

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Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

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Address 1			
Address 2			
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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	/Daniel Y.J. Kim/			Date (YYYY-MM-DD)	2019-04-08
First Name	Daniel Y.J.	Last Name	Kim	Registration Number	36186

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This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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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.

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Docket No.: **QUS-0003** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Confirmation No.: **To Be Assigned**
Woojin AHN; Yongho KIM; Jinsam KWAK; and Juhyung SON	Group Art Unit: **To Be Assigned**
Serial No.: **Continuation of U.S. Patent Application Serial No. 15/555,075 filed August 31, 2017**	Examiner: **To Be Assigned**
	Customer No.: **34610**

For: **WIRELESS COMMUNICATION METHOD AND WIRELESS COMMUNICATION TERMINAL**

PRELIMINARY AMENDMENT

U.S. Patent and Trademark Office
Customer Service Window, **MAIL STOP AMENDMENT**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

Prior to initial examination on the merits, please amend the above-identified application as follows:

Amendments to the Specification are reflected in this paper.

Amendments to the Claims are reflected in the listing of claims.

Remarks/Arguments begin after the listing of the claims.

AMENDMENTS TO THE SPECIFICATION

Please add the following new paragraph after the title:

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

This application is a continuation of U.S. Patent Application Serial No. 15/555,075, filed January 2, 2018, which is a U.S. National Stage Application under 35 U.S.C. §371 of PCT Application No. PCT/KR2016/002199, filed March 4, 2016, which claims priority to Korean Patent Application No's. 10-2015-0030369, filed March 4, 2015, 10-2015-0036754, filed March 17, 2015 and 10-2015-0066670, filed May 13, 2015, whose entire disclosures are hereby incorporated by reference.

AMENDMENTS TO THE CLAIMS

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

Listing of Claims:

1-12. (Canceled)

13. (New) A wireless communication terminal, the terminal comprising:

a transceiver; and

a processor,

wherein the processor is configured to:

receive, through the transceiver, a trigger frame indicating uplink transmission of one or more terminals, and

perform, through the transceiver, an uplink transmission in response to the trigger frame,

wherein the processor is further configured to identify a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame.

14. (New) The wireless communication terminal of claim 13, wherein a duration of the padding is set based on a time needed for the one or more terminals to process the

trigger frame.

15. (New) The wireless communication terminal of claim 13, wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame.

16. (New) The wireless communication terminal of claim 13, wherein the predetermined AID field information indicates a start of the padding.

17. (New) The wireless communication terminal of claim 16, wherein the predetermined AID field information is duplicated bit information in an AID field.

18. (New) The wireless communication terminal of claim 13, wherein the padding is applied by using duplicated information.

19. (New) The wireless communication terminal of claim 18, wherein the padding is applied by duplicating the predetermined AID field information.

20. (New) The wireless communication terminal of claim 13, wherein the processor is further configured to:

generate an uplink packet to perform the uplink transmission, and

perform the uplink transmission in response to the trigger frame by using the generated uplink packet,

wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated time.

21. (New) A wireless communication method of a wireless communication terminal, comprising:

receiving a trigger frame indicating uplink transmission of one or more terminals;

identifying a padding applied in the trigger frame by a predetermined association ID (AID) field information contained in the trigger frame; and

performing an uplink transmission in response to the trigger frame.

22. (New) The wireless communication method of claim 21, wherein a duration of the padding is set based on a time needed for the one or more terminals to process the trigger frame.

23. (New) The wireless communication method of claim 21, wherein the padding is contained before a frame check sequence (FCS) field of the trigger frame.

24. (New) The wireless communication method of claim 21, wherein the predetermined AID field information indicates a start of the padding.

25. (New) The wireless communication method of claim 24, wherein the predetermined AID field information is duplicated bit information in an AID field.

26. (New) The wireless communication method of claim 21, wherein the padding is applied by using duplicated information.

27. (New) The wireless communication method of claim 26, wherein the padding is applied by duplicating the predetermined AID field information.

28. (New) The wireless communication method of claim 21, wherein the method further comprising:

generating an uplink packet to perform the uplink transmission, and

performing the uplink transmission in response to the trigger frame by using the generated uplink packet,

wherein a padding is applied to the uplink packet to terminate the uplink transmission at a designated time.

REMARKS

Claims 13-28 are pending. By this Amendment, the specification has been amended to include the prior application information, and claims 1-12 have been canceled without prejudice or disclaimer, and new claims 13-28 have been added. Prompt examination and allowance in due course are respectfully solicited.

CONCLUSION

Should the Examiner have any questions regarding the above-identified application, the Examiner is invited to contact the undersigned attorney, **Daniel Y.J. Kim,** at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. §1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

/Daniel Y.J. Kim/

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[DESCRIPTION]

[Invention Title]

WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

[Technical Field]

The present invention relates to a wireless communication terminal and a wireless communication method for a simultaneous multi-user transmission, and more particularly, to a wireless communication terminal and a wireless communication method for efficiently managing simultaneous data transmissions of a plurality of terminals.

[Background Art]

In recent years, with supply expansion of mobile apparatuses, a wireless LAN technology that can provide a rapid wireless Internet service to the mobile apparatuses has been significantly spotlighted. The wireless LAN technology allows mobile apparatuses including a smart phone, a smart pad, a laptop computer, a portable multimedia player, an embedded apparatus, and the like to wirelessly access the Internet in home or a company or a specific service providing area based on a wireless communication technology in a short range.

Institute of Electrical and Electronics Engineers (IEEE) 802.11 has commercialized or developed various technological standards since an initial wireless LAN technology is supported using frequencies of 2.4 GHz. First, the IEEE 802.11b supports a communication speed of a maximum of 11 Mbps while using frequencies of a 2.4 GHz band. IEEE 802.11a which is commercialized after the IEEE 802.11b uses frequencies of not the 2.4 GHz band but a 5 GHz band to reduce an influence by

interference as compared with the frequencies of the 2.4 GHz band which are significantly congested and improves the communication speed up to a maximum of 54 Mbps by using an OFDM technology. However, the IEEE 802.11a has a disadvantage in that a communication distance is shorter than the IEEE 802.11b. In addition, IEEE 802.11g uses the frequencies of the 2.4 GHz band similarly to the IEEE 802.11b to implement the communication speed of a maximum of 54 Mbps and satisfies backward compatibility to significantly come into the spotlight and further, is superior to the IEEE 802.11a in terms of the communication distance.

Moreover, as a technology standard established to overcome a limitation of the communication speed which is pointed out as a weak point in a wireless LAN, IEEE 802.11n has been provided. The IEEE 802.11n aims at increasing the speed and reliability of a network and extending an operating distance of a wireless network. In more detail, the IEEE 802.11n supports a high throughput (HT) in which a data processing speed is a maximum of 540 Mbps or more and further, is based on a multiple inputs and multiple outputs (MIMO) technology in which multiple antennas are used at both sides of a transmitting unit and a receiving unit in order to minimize a transmission error and optimize a data speed. Further, the standard can use a coding scheme that transmits multiple copies which overlap with each other in order to increase data reliability.

As the supply of the wireless LAN is activated and further, applications using the wireless LAN are diversified, the need for new wireless LAN systems for supporting a higher throughput (very high throughput (VHT)) than the data processing speed supported by the IEEE 802.11n has come into the spotlight. Among them, IEEE 802.11ac supports a wide bandwidth (80 to 160 MHz) in the 5 GHz frequencies. The IEEE 802.11ac standard is defined only in the 5 GHz band, but initial 11ac chipsets will

support even operations in the 2.4 GHz band for the backward compatibility with the existing 2.4 GHz band products. Theoretically, according to the standard, wireless LAN speeds of multiple stations are enabled up to a minimum of 1 Gbps and a maximum single link speed is enabled up to a minimum of 500 Mbps. This is achieved by extending concepts of a wireless interface accepted by 802.11n, such as a wider wireless frequency bandwidth (a maximum of 160 MHz), more MIMO spatial streams (a maximum of 8), multi-user MIMO, and high-density modulation (a maximum of 256 QAM). Further, as a scheme that transmits data by using a 60 GHz band instead of the existing 2.4 GHz/5 GHz, IEEE 802.11ad has been provided. The IEEE 802.11ad is a transmission standard that provides a speed of a maximum of 7 Gbps by using a beamforming technology and is suitable for high bit rate moving picture streaming such as massive data or non-compression HD video. However, since it is difficult for the 60 GHz frequency band to pass through an obstacle, it is disadvantageous in that the 60 GHz frequency band can be used only among devices in a short-distance space.

Meanwhile, in recent years, as next-generation wireless LAN standards after the 802.11ac and 802.11ad, discussion for providing a high-efficiency and high-performance wireless LAN communication technology in a high-density environment is continuously performed. That is, in a next-generation wireless LAN environment, communication having high frequency efficiency needs to be provided indoors/outdoors under the presence of high-density stations and access points (APs) and various technologies for implementing the communication are required.

[Disclosure]

[Technical Problem]

The present invention has an object to provide high-efficiency/high-performance wireless LAN communication in a high-density environment as described

above.

In addition, the present invention has an object to reduce the possibility of collision of data transmission of a plurality of terminals in a dense user environment and to provide a stable data communication environment.

Also, the present invention has an object to provide a method by which a plurality of terminals can efficiently perform simultaneous multi-user transmission.

[Technical Solution]

In order to achieve the objects, the present invention provides a wireless communication method and a wireless communication terminal as below.

First, an exemplary embodiment of the present invention provides a base wireless communication terminal, including: a transceiver configured to transmit and receive a wireless signal; and a processor configured to control an operation of the base wireless communication terminal, wherein the processor transmits a trigger frame triggering a multi-user uplink transmission of a plurality of terminals, receives multi-user uplink data through resources allocated to the plurality of terminals, and transmits a block ACK through the resources in response to the received multi-user uplink data, wherein the transmission of the block ACK in each resource is terminated at the same time.

According to an embodiment, the processor may perform padding on the block ACK transmitted through at least one resource to match termination points of block ACK transmissions in each resource.

According to another embodiment, the processor may insert duplicated ACK information into the block ACK transmitted through at least one resource to match termination points of block ACK transmissions in each resource.

In addition, a predetermined padding may be performed before a frame check

sequence (FCS) field of the trigger frame.

In this case, the transmission of the trigger frame may be terminated at the same time in each resource through which the trigger frame is transmitted.

In addition, the resource may be a channel or a sub-channel.

According to an embodiment, a transmission packet of the multi-user uplink data may include a legacy preamble and a non-legacy preamble, and the legacy preamble may be received as common information on a 20 MHz channel basis.

In addition, the non-legacy preamble may include HE-SIG-A and remaining fields, and the HE-SIG-A may be received as common information on a 20 MHz channel basis, and the remaining fields of the non-legacy preambles may be received as individual information for each resource allocated to each terminal.

In this case, the remaining fields of the non-legacy preamble may include HE-STF and HE-LTF.

According to an embodiment, the multi-user uplink data transmission in each resource may be terminated at the same time.

In this case, the uplink data transmitted through at least one resource may be padded to terminate the multi-user uplink data transmission at the same time.

In addition, an exemplary embodiment of the present invention provides a wireless communication method of a base wireless communication terminal, including: transmitting a trigger frame triggering a multi-user uplink transmission of a plurality of terminals; receiving multi-user uplink data through resources allocated to the plurality of terminals; and transmitting a block ACK through the resources in response to the received multi-user uplink data; wherein the transmission of the block ACK in each resource is terminated at the same time.

[Advantageous Effects]

According to an embodiment of the present invention, efficient multi-user uplink transmission scheduling is possible in a contention-based channel access system.

Also, according to the embodiment of the present invention, it is possible to reduce unnecessary channel occupancy and increase total spectral efficiency of the network in a multi-user uplink transmission process.

In addition, according to the embodiment of the present invention, it is possible to prevent malfunction of the wireless LAN network by aligning the lengths of block ACKs transmitted through a plurality of channels, and at the same time, it is possible to secure transmission time of a control frame of an AP.

According to the embodiment of the present invention, it is possible to increase the total resource utilization rate in the contention-based channel access system and improve the performance of the wireless LAN system.

[Description of Drawings]

FIG. 1 illustrates a wireless LAN system according to an embodiment of the present invention.

FIG. 2 illustrates a wireless LAN system according to another embodiment of the present invention.

FIG. 3 is a block diagram illustrating a configuration of a station according to an embodiment of the present invention.

FIG. 4 is a block diagram illustrating a configuration of an access point according to an embodiment of the present invention.

FIG. 5 schematically illustrates a process in which a STA and an AP set a link.

FIG. 6 illustrates a carrier sense multiple access (CSMA)/collision avoidance (CA) method used in wireless LAN communication.

FIG. 7 illustrates a method for performing a distributed coordination function

(DCF) using a request to send (RTS) frame and a clear to send (CTS) frame.

FIG. 8 illustrates a wireless LAN network according to an embodiment of the present invention.

FIG. 9 illustrates a sequence of processes in which a multi-user uplink transmission is performed according to an embodiment of the present invention.

FIG. 10 illustrates an ACK transmission method for a multi-user uplink transmission according to an embodiment of the present invention.

FIG. 11 illustrates a NAV setting method for a multi-user uplink transmission according to an embodiment of the present invention.

FIG. 12 illustrates a frequency masking method according to the frequency bandwidth in use.

FIG. 13 illustrates a guard band setting method according to an embodiment of the present invention.

FIG. 14 illustrates a method of transmitting a legacy preamble of a non-legacy terminal in a process of a multi-user uplink data transmission.

FIG. 15 illustrates a method of configuring a non-legacy preamble in a process of a multi-user data transmission.

FIG. 16 illustrates a method for performing a multi-user uplink transmission according to an embodiment of the present invention.

FIG. 17 illustrates a structure of a multiplexed group ACK according to an embodiment of the present invention.

FIG. 18 illustrates a method of transmitting a multiplexed group ACK according to an embodiment of the present invention.

FIG. 19 illustrates a length alignment method of block ACKs according to an embodiment of the present invention.

FIG. 20 illustrates a method of frame length alignment by padding in a multi-user simultaneous transmission according to an embodiment of the present invention.

FIG. 21 illustrates a method of transmitting a multiplexed block ACK when a plurality of channels are used for a multi-user uplink transmission.

[Best Mode]

Terms used in the specification adopt general terms which are currently widely used by considering functions in the present invention, but the terms may be changed depending on an intention of those skilled in the art, customs, and emergence of new technology. Further, in a specific case, there is a term arbitrarily selected by an applicant and in this case, a meaning thereof will be described in a corresponding description part of the invention. Accordingly, it should be revealed that a term used in the specification should be analyzed based on not just a name of the term but a substantial meaning of the term and contents throughout the specification.

Throughout this specification and the claims that follow, when it is described that an element is "coupled" to another element, the element may be "directly coupled" to the other element or "electrically coupled" to the other element through a third element. Further, unless explicitly described to the contrary, the word "comprise" and variations such as "comprises" or "comprising", will be understood to imply the inclusion of stated elements but not the exclusion of any other elements. Moreover, limitations such as "or more" or "or less" based on a specific threshold may be appropriately substituted with "more than" or "less than", respectively.

This application claims priority to and the benefit of Korean Patent Application Nos. 10-2015-0030369, 10-2015-0036754 and 10-2015-0066670 filed in the Korean Intellectual Property Office and the embodiments and mentioned items described in the respective application, which forms the basis of the priority, shall be

included in the Detailed Description of the present application.

FIG. 1 is a diagram illustrating a wireless LAN system according to an embodiment of the present invention. The wireless LAN system includes one or more basic service sets (BSS) and the BSS represents a set of apparatuses which are successfully synchronized with each other to communicate with each other. In general, the BSS may be classified into an infrastructure BSS and an independent BSS (IBSS) and FIG. 1 illustrates the infrastructure BSS between them.

As illustrated in FIG. 1, the infrastructure BSS (BSS1 and BSS2) includes one or more stations STA1, STA2, STA3, STA4, and STA5, access points PCP/AP-1 and PCP/AP-2 which are stations providing a distribution service, and a distribution system (DS) connecting the multiple access points PCP/AP-1 and PCP/AP-2.

The station (STA) is a predetermined device including medium access control (MAC) following a regulation of an IEEE 802.11 standard and a physical layer interface for a wireless medium, and includes both a non-access point (non-AP) station and an access point (AP) in a broad sense. Further, in the present specification, a term 'terminal' may be used to refer to a non-AP STA, or an AP, or to both terms. A station for wireless communication includes a processor and a transceiver and according to the embodiment, may further include a user interface unit and a display unit. The processor may generate a frame to be transmitted through a wireless network or process a frame received through the wireless network and besides, perform various processing for controlling the station. In addition, the transceiver is functionally connected with the processor and transmits and receives frames through the wireless network for the station.

The access point (AP) is an entity that provides access to the distribution system (DS) via wireless medium for the station associated therewith. In the infrastructure BSS, communication among non-AP stations is, in principle, performed

via the AP, but when a direct link is configured, direct communication is enabled even among the non-AP stations. Meanwhile, in the present invention, the AP is used as a concept including a personal BSS coordination point (PCP) and may include concepts including a centralized controller, a base station (BS), a node-B, a base transceiver system (BTS), and a site controller in a broad sense. In the present invention, an AP may also be referred to as a base wireless communication terminal. The base wireless communication terminal may be used as a term which includes an AP, a base station, an eNB (i.e. eNodeB) and a transmission point (TP) in a broad sense. In addition, the base wireless communication terminal may include various types of wireless communication terminals that allocate medium resources and perform scheduling in communication with a plurality of wireless communication terminals.

A plurality of infrastructure BSSs may be connected with each other through the distribution system (DS). In this case, a plurality of BSSs connected through the distribution system is referred to as an extended service set (ESS).

FIG. 2 illustrates an independent BSS which is a wireless LAN system according to another embodiment of the present invention. In the embodiment of FIG. 2, duplicative description of parts, which are the same as or correspond to the embodiment of FIG. 1, will be omitted.

Since a BSS3 illustrated in FIG. 2 is the independent BSS and does not include the AP, all stations STA6 and STA7 are not connected with the AP. The independent BSS is not permitted to access the distribution system and forms a self-contained network. In the independent BSS, the respective stations STA6 and STA7 may be directly connected with each other.

FIG. 3 is a block diagram illustrating a configuration of a station 100 according to an embodiment of the present invention.

As illustrated in FIG. 3, the station 100 according to the embodiment of the present invention may include a processor 110, a transceiver 120, a user interface unit 140, a display unit 150, and a memory 160.

First, the transceiver 120 transmits and receives a wireless signal such as a wireless LAN packet, or the like and may be embedded in the station 100 or provided as an exterior. According to the embodiment, the transceiver 120 may include at least one transmit/receive module using different frequency bands. For example, the transceiver 120 may include transmit/receive modules having different frequency bands such as 2.4 GHz, 5 GHz, and 60 GHz. According to an embodiment, the station 100 may include a transmit/receive module using a frequency band of 6 GHz or more and a transmit/receive module using a frequency band of 6 GHz or less. The respective transmit/receive modules may perform wireless communication with the AP or an external station according to a wireless LAN standard of a frequency band supported by the corresponding transmit/receive module. The transceiver 120 may operate only one transmit/receive module at a time or simultaneously operate multiple transmit/receive modules together according to the performance and requirements of the station 100. When the station 100 includes a plurality of transmit/receive modules, each transmit/receive module may be implemented by independent elements or a plurality of modules may be integrated into one chip.

Next, the user interface unit 140 includes various types of input/output means provided in the station 100. That is, the user interface unit 140 may receive a user input by using various input means and the processor 110 may control the station 100 based on the received user input. Further, the user interface unit 140 may perform output based on a command of the processor 110 by using various output means.

Next, the display unit 150 outputs an image on a display screen. The display

unit 150 may output various display objects such as contents executed by the processor 110 or a user interface based on a control command of the processor 110, and the like. Further, the memory 160 stores a control program used in the station 100 and various resulting data. The control program may include an access program required for the station 100 to access the AP or the external station.

The processor 110 of the present invention may execute various commands or programs and process data in the station 100. Further, the processor 110 may control the respective units of the station 100 and control data transmission/reception among the units. According to the embodiment of the present invention, the processor 110 may execute the program for accessing the AP stored in the memory 160 and receive a communication configuration message transmitted by the AP. Further, the processor 110 may read information on a priority condition of the station 100 included in the communication configuration message and request the access to the AP based on the information on the priority condition of the station 100. The processor 110 of the present invention may represent a main control unit of the station 100 and according to the embodiment, the processor 110 may represent a control unit for individually controlling some component of the station 100, for example, the transceiver 120, and the like. The processor 110 controls various operations of wireless signal transmission/reception of the station 100 according to the embodiment of the present invention. A detailed embodiment thereof will be described below.

The station 100 illustrated in FIG. 3 is a block diagram according to an embodiment of the present invention, where separate blocks are illustrated as logically distinguished elements of the device. Accordingly, the elements of the device may be mounted in a single chip or multiple chips depending on design of the device. For example, the processor 110 and the transceiver 120 may be implemented while being

integrated into a single chip or implemented as a separate chip. Further, in the embodiment of the present invention, some components of the station 100, for example, the user interface unit 140 and the display unit 150 may be optionally provided in the station 100.

FIG. 4 is a block diagram illustrating a configuration of an AP 200 according to an embodiment of the present invention.

As illustrated in FIG. 4, the AP 200 according to the embodiment of the present invention may include a processor 210, a transceiver 220, and a memory 260. In FIG. 4, among the components of the AP 200, duplicative description of parts which are the same as or correspond to the components of the station 100 of FIG. 2 will be omitted.

Referring to FIG. 4, the AP 200 according to the present invention includes the transceiver 220 for operating the BSS in at least one frequency band. As described in the embodiment of FIG. 3, the transceiver 220 of the AP 200 may also include a plurality of transmit/receive modules using different frequency bands. That is, the AP 200 according to the embodiment of the present invention may include two or more transmit/receive modules among different frequency bands, for example, 2.4 GHz, 5 GHz, and 60 GHz together. Preferably, the AP 200 may include a transmit/receive module using a frequency band of 6 GHz or more and a transmit/receive module using a frequency band of 6 GHz or less. The respective transmit/receive modules may perform wireless communication with the station according to a wireless LAN standard of a frequency band supported by the corresponding transmit/receive module. The transceiver 220 may operate only one transmit/receive module at a time or simultaneously operate multiple transmit/receive modules together according to the performance and requirements of the AP 200.

Next, the memory 260 stores a control program used in the AP 200 and

various resulting data. The control program may include an access program for managing the access of the station. Further, the processor 210 may control the respective units of the AP 200 and control data transmission/reception among the units. According to the embodiment of the present invention, the processor 210 may execute the program for accessing the station stored in the memory 260 and transmit communication configuration messages for one or more stations. In this case, the communication configuration messages may include information about access priority conditions of the respective stations. Further, the processor 210 performs an access configuration according to an access request of the station. The processor 210 controls various operations such as wireless signal transmission/reception of the AP 200 according to the embodiment of the present invention. A detailed embodiment thereof will be described below.

FIG. 5 is a diagram schematically illustrating a process in which a STA sets a link with an AP.

Referring to FIG. 5, the link between the STA 100 and the AP 200 is set through three steps of scanning, authentication, and association in a broad way. First, the scanning step is a step in which the STA 100 obtains access information of BSS operated by the AP 200. A method for performing the scanning includes a passive scanning method in which the AP 200 obtains information by using a beacon message (S101) which is periodically transmitted and an active scanning method in which the STA 100 transmits a probe request to the AP (S103) and obtains access information by receiving a probe response from the AP (S105).

The STA 100 that successfully receives wireless access information in the scanning step performs the authentication step by transmitting an authentication request (S107a) and receiving an authentication response from the AP 200 (S107b). After the

authentication step is performed, the STA 100 performs the association step by transmitting an association request (S109a) and receiving an association response from the AP 200 (S109b). In this specification, an association basically means a wireless association, but the present invention is not limited thereto, and the association may include both the wireless association and a wired association in a broad sense.

Meanwhile, an 802.1X based authentication step (S111) and an IP address obtaining step (S113) through DHCP may be additionally performed. In FIG. 5, the authentication server 300 is a server that processes 802.1X based authentication with the STA 100 and may be present in physical association with the AP 200 or present as a separate server.

FIG. 6 is a diagram illustrating a carrier sense multiple access (CSMA)/collision avoidance (CA) method used in wireless LAN communication.

A terminal that performs a wireless LAN communication checks whether a channel is busy by performing carrier sensing before transmitting data. When a wireless signal having a predetermined strength or more is sensed, it is determined that the corresponding channel is busy and the terminal delays the access to the corresponding channel. Such a process is referred to as clear channel assessment (CCA) and a level to decide whether the corresponding signal is sensed is referred to as a CCA threshold. When a wireless signal having the CCA threshold or more, which is received by the terminal, indicates the corresponding terminal as a receiver, the terminal processes the received wireless signal. Meanwhile, when a wireless signal is not sensed in the corresponding channel or a wireless signal having a strength smaller than the CCA threshold is sensed, it is determined that the channel is idle.

When it is determined that the channel is idle, each terminal having data to be transmitted performs a backoff procedure after an interframe space (IFS) time

depending on a situation of each terminal, for instance, an arbitration IFS (AIFS), a PCF IFS (PIFS), or the like elapses. According to the embodiment, the AIFS may be used as a component which substitutes for the existing DCF IFS (DIFS). Each terminal stands by while decreasing slot time(s) as long as a random number assigned to the corresponding terminal during an interval of an idle state of the channel and a terminal that completely exhausts the slot time(s) attempts to access the corresponding channel. As such, an interval in which each terminal performs the backoff procedure is referred to as a contention window interval.

When a specific terminal successfully accesses the channel, the corresponding terminal may transmit data through the channel. However, when the terminal which attempts the access collides with another terminal, the terminals which collide with each other are assigned with new random numbers, respectively to perform the backoff procedure again. According to an embodiment, a random number newly assigned to each terminal may be decided within a range (2*CW) which is twice larger than a range (a contention window, CW) of a random number which the corresponding terminal is previously assigned. Meanwhile, each terminal attempts the access by performing the backoff procedure again in a next contention window interval and in this case, each terminal performs the backoff procedure from slot time(s) which remained in the previous contention window interval. By such a method, the respective terminals that perform the wireless LAN communication may avoid a mutual collision for a specific channel.

FIG. 7 is a diagram illustrating a method for performing a distributed coordination function using a request to send (RTS) frame and a clear to send (CTS) frame.

The AP and STAs in the BSS contend in order to obtain an authority for

transmitting data. When data transmission at the previous step is completed, each terminal having data to be transmitted performs a backoff procedure while decreasing a backoff counter (alternatively, a backoff timer) of a random number allocated to each terminal after an AFIS time. A transmitting terminal in which the backoff counter expires transmits the request to send (RTS) frame to notify that corresponding terminal has data to transmit. According to an exemplary embodiment of FIG. 7, STA1 which holds a lead in contention with minimum backoff may transmit the RTS frame after the backoff counter expires. The RTS frame includes information on a receiver address, a transmitter address, and duration. A receiving terminal (i.e., the AP in FIG. 7) that receives the RTS frame transmits the clear to send (CTS) frame after waiting for a short IFS (SIFS) time to notify that the data transmission is available to the transmitting terminal STA1. The CTS frame includes the information on a receiver address and duration. In this case, the receiver address of the CTS frame may be set identically to a transmitter address of the RTS frame corresponding thereto, that is, an address of the transmitting terminal STA1.

The transmitting terminal STA1 that receives the CTS frame transmits the data after a SIFS time. When the data transmission is completed, the receiving terminal AP transmits an acknowledgment (ACK) frame after a SIFS time to notify that the data transmission is completed. When the transmitting terminal receives the ACK frame within a predetermined time, the transmitting terminal regards that the data transmission is successful. However, when the transmitting terminal does not receive the ACK frame within the predetermined time, the transmitting terminal regards that the data transmission is failed. Meanwhile, adjacent terminals that receive at least one of the RTS frame and the CTS frame in the course of the transmission procedure set a network allocation vector (NAV) and do not perform data transmission until the set NAV is

terminated. In this case, the NAV of each terminal may be set based on a duration field of the received RTS frame or CTS frame.

In the course of the aforementioned data transmission procedure, when the RTS frame or CTS frame of the terminals is not normally transferred to a target terminal (i.e., a terminal of the receiver address) due to a situation such as interference or a collision, a subsequent process is suspended. The transmitting terminal STA1 that transmitted the RTS frame regards that the data transmission is unavailable and participates in a next contention by being allocated with a new random number. In this case, the newly allocated random number may be determined within a range (2*CW) twice larger than a previous predetermined random number range (a contention window, CW).

Multi-user uplink transmission

FIG. 8 illustrates a wireless LAN network according to an embodiment of the present invention. In FIG. 8, a BSS consists of an AP and a plurality of STAs (STA1, STA2, STA3 and STA4) associated therewith. The blocks shown with each terminal represents the channel state measured at the corresponding terminal. A shadow block indicates a busy channel, and a white block indicates an idle channel.

When using an orthogonal frequency division multiple access (OFDMA) or a multi-input multi-output (MIMO), one wireless communication terminal can simultaneously transmit data to a plurality of wireless communication terminals. Further, one wireless communication terminal can simultaneously receive data from a plurality of wireless communication terminals. For example, a multi-user downlink transmission in which an AP simultaneously transmits data to a plurality of STAs, and a multi-user uplink transmission in which a plurality of STAs simultaneously transmit data to the AP may be performed.

In order to perform the multi-user uplink transmission, the channel to be used and the transmission start time of each STA that performs uplink transmission should be adjusted. However, in a wireless LAN environment in which a plurality of BSSs are adjacent to each other, the measured channel states may be different from each other in the same BSS as shown in FIG 8. That is, depending on the influence of the adjacent external BSS of each terminal, channels to which each terminal can access may be different from each other. In addition, whether or not each STA has data for uplink transmission changes in real time. Therefore, in order to efficiently schedule the multi-user uplink transmission, state information of each STA needs to be transmitted to the AP.

According to an embodiment of the present invention, information for scheduling of a multi-user uplink transmission may be indicated through a predetermined field of a preamble of a packet and/or a predetermined field of a MAC header. For example, a STA may indicate information for multi-user uplink transmission scheduling through a predetermined field of a preamble or a MAC header of an uplink transmission packet, and may transmit the information to an AP. In this case, the information for multi-user uplink transmission scheduling includes at least one of buffer status information of each STA, channel state information measured by each STA. The buffer status information of the STA may indicate at least one of whether the STA has uplink data to be transmitted, the access class (AC) of the uplink data and the size (or the transmission time) of the uplink data.

FIG. 9 illustrates a sequence of processes in which a multi-user uplink transmission is performed. As described above, the multi-user uplink transmission process may be managed by the AP because a plurality of terminals simultaneously transmit data. Therefore, in order to allocate resources and prevent data collision, the

AP should obtain the buffer status information of each STA and deliver the accurate transmission time point information to each STA before the start of multi-user uplink transmission. The buffer status information of the STA may indicate at least one of whether the STA has uplink data to be transmitted, the access category (AC) of the uplink data, and the size (or the transmission time) of the uplink data. Such information delivery of each STA may be performed through an initialization step S210 and a scheduling step S220 for the multi-user uplink transmission.

According to an embodiment of the present invention, the scheduling step S220 for the multi-user uplink transmission is performed in advance to collect related information, and the initialization step S210 may be performed if a specific condition is satisfied. Alternatively, the initialization step S210 may be performed in advance according to the time condition, and then the scheduling step S220 may be performed next to collect the related information. The initializing step S210 and the scheduling step S220 include a process of exchanging information on channels available to the AP and the STA. According to an exemplary embodiment, the AP may transmit available channel information to a plurality of STAs in advance, and the plurality of STAs may feedback channel information available to the corresponding STA among the channels available to the AP. The specific operation method of the initializing step S210 and the scheduling step S220 in the embodiment of the present invention is not limited thereto. According to an embodiment, the initialization step S210 and the scheduling step S220 may be performed with an integrated operation.

When the initialization step S210 and the scheduling step S220 are performed, a multi-user uplink data transmission step S230 is performed. At least one STA assigned a channel or a sub-channel from the AP simultaneously transmits uplink data at the time point designated by the AP. The STA may perform uplink data transmission

through a 20 MHz channel basis or a wideband channel basis over the 20 MHz. In addition, the non-legacy STA may perform uplink data transmission through a sub-channel basis smaller than 20 MHz. In the embodiment of the present invention, a term resource may be used for comprehensively meaning a channel or a sub-channel allocated to the STAs. The AP receiving the uplink data from the STA transmits an ACK in response thereto (S240). If uplink data transmission is performed through a sub-channel basis, a plurality of STAs can transmit uplink data through one channel. In this case, the AP may transmit a group ACK through the corresponding channel to transmit an ACK for a plurality of STAs that transmitted the uplink data.

In case of being affected by a plurality of external BSSs in a dense BSS environment, the available channels of each terminal may be different from each other according to the geographical location of the wireless terminal. Therefore, the number of terminals capable of data transmission through each channel may be different from each other. In this case, as shown in FIG. 9, the air time during which actual uplink data transmission is performed may be different for each channel. However, if the AP cannot simultaneously perform data transmission and reception, the AP cannot transmit an ACK through another channel in which uplink data transmission has been completed while receiving uplink data through a channel in which the air time is long. Therefore, the STAs using the channel in which the air time is short may perform zero padding until the uplink data transmission of a channel having the longest air time is completed, to wait for ACK reception (S250). That is, the padding is performed on the uplink data transmitted through at least one channel, so that the multi-user uplink data transmission in each channel can be terminated at the same time.

However, when the zero padding is performed, STAs occupy the channel regardless of data transmission, thus the overall spectral efficiency is lowered. In

addition, terminals of other BSSs using the channel as a primary channel cannot perform communication during the zero padding period, and thus directly experience a decrease in performance. Therefore, there is a need for an ACK transmission method for further improving the data transmission efficiency of the terminals.

FIG. 10 illustrates an ACK transmission method for multi-user uplink transmission according to an embodiment of the present invention. When the multi-user uplink transmission is completed, the AP transmits a multiplexed group ACK in response thereto (S244). In this case, the AP may transmit the multiplexed group ACK through a first channel having the longest air time among the plurality of channels in which the multi-user uplink transmission is performed. According to an embodiment, the first channel having the longest air time may be the primary channel of the BSS.

The STAs in which a channel other than the first channel is assigned as the uplink data transmission channel set an ACK timer at the time when the uplink data transmission of the corresponding channel ends, and wait for ACK reception until the set ACK timer expires (S242). In this case, the other channel may be a channel other than the first channel having the longest air time, that is, a secondary channel of the corresponding BSS. The ACK timer of each channel indicates the time from when the uplink data transmission of the corresponding channel is completed to when the multiplexed group ACK is transmitted. For the setting of the ACK timer, each STA should obtain information on the transmission time point of the multiplexed group ACK. The transmission time point information of the multiplexed group ACK may be transmitted to each STA which is intended to perform uplink data transmission in the initialization step S210 and/or the scheduling step S220. According to an exemplary embodiment, the STA that the ACK timer is set may switch to a sleep mode until the corresponding timer expires to perform a power saving.

As described above, according to the embodiment of the present invention, each secondary channel can be returned immediately after the uplink data transmission is completed. Therefore, the terminals of the external BSS using the corresponding secondary channel as a primary channel may access the channel and transmit data at an earlier time point. Thus, the overall spectral efficiency of the network can be improved.

FIG. 11 illustrates a NAV setting method for a multi-user uplink transmission according to an embodiment of the present invention. In the embodiment of FIG. 11, the same or corresponding parts as those of the embodiment of FIG. 10 described above will be omitted.

According to an embodiment of the present invention, in order to protect the multi-user uplink transmission process, a NAV setting frame may be transmitted. First, the AP transmits the first NAV setting frame at the start time of the multi-user uplink transmission (S310). The actual transmission length of the multi-user uplink transmission may vary depending on the uplink transmission data length and the resource allocation result of the STAs. Thus, the duration field value of the first NAV setting frame may be set to durations of the initialization step and the scheduling step. The first NAV setting frame may be an RTS or CTS of a predetermined format. According to an embodiment, the first NAV setting frame may be one of a predefined multi-user RTS, RTS-to-self, CTS-to-self and CTS-to-group.

When the resource allocation of each STA is completed in the scheduling step, an air time in which uplink data transmission is performed for each channel is calculated. Accordingly, second NAV setting frames are transmitted for setting a NAV during a period in which the multi-user uplink transmission and the multiplexed group ACK transmission are performed (S320). The second NAV setting frame may be simultaneously transmitted by a plurality of STAs in which resource is allocated and

participate in the multi-user uplink data transmission. Alternatively, a plurality of STAs and an AP may simultaneously transmit the second NAV setting frame. According to an embodiment, the second NAV setting frame may be configured in a CTS frame format. In this case, second NAV setting frames simultaneously transmitted by a plurality of STAs and/or the AP may be set to the same waveform.

The NAVs of the neighboring terminals are set based on the first NAV setting frame and the second NAV setting frame transmitted as above (S330, S340). Since the second NAV setting frames having the same waveform are simultaneously transmitted on a 20 MHz channel basis, the neighboring terminals including legacy terminals can receive the second NAV setting frame and set a NAV. When the simultaneously transmitted second NAV setting frames have the same waveform for each channel, the second NAV setting frame may have duration information reflecting the air time of the corresponding channel. Accordingly, a terminal of an external BSS that has acquired the NAV information set on the specific channel can access the corresponding channel immediately after the NAV time has expired.

On the other hand, when the multiplexed group ACK is used as in the embodiment of FIG. 10, STAs that have transmitted uplink data through secondary channels receive the multiplexed group ACK through the primary channel. If the STAs set the NAV only for the secondary channel through which the uplink data is transmitted, terminals of the external BSS adjacent to the STA may regard the primary channel as idle and perform an access to the primary channel. In this case, STAs that have been transmitted the uplink data through the secondary channels may not be able to receive the multiplexed group ACK transmitted through the primary channel.

Therefore, according to the embodiment of the present invention, the STAs transmitting uplink data through the secondary channel transmit the second NAV setting

frame through the primary channel and the secondary channel. In this case, the primary channel through which the second NAV setting frame is transmitted is a primary channel of the BSS to which the corresponding STA belongs. In addition, the secondary channel through which the second NAV setting frame is transmitted is a secondary channel through which the STA transmits uplink data. Referring to FIG. 11, STA4 and STA5 transmitting uplink data through a secondary channel transmit a second NAV setting frame not only through the secondary channel but also through a primary channel (S320). As described above, the STAs additionally protect the primary channel through which the multiplexed group ACK is transmitted as well as the secondary channel through which the uplink data is transmitted. The duration field value of the second NAV setting frame transmitted through the primary channel is set to the time when the transmission of the multiplexed group ACK is completed. The duration field value of the second NAV setting frame transmitted through the secondary channel is set to the time when the uplink data transmission of the secondary channel is completed. On the other hand, STA1, STA2, and STA3 that transmit uplink data through the primary channel are not required to transmit an additional second NAV setting frame through channels other than the primary channel.

FIG. 12 illustrates a frequency masking method according to the frequency bandwidth in use. In the wireless LAN system, a frequency masking technique is used to minimize mutual interference when different terminals perform communications through adjacent channels. The frequency masking is implemented in a way of intentionally reducing transmission power at the boundary frequencies (i.e., the minimum frequency and the maximum frequency) of the currently used channel. Therefore, the shape of frequency masking is different depending on the bandwidth in which data transmission is performed. That is, the spectral mask 410 of a packet

transmitted on a 40 MHz channel has a different shape from the spectral mask 420 of a packet transmitted on two adjacent 20 MHz channels. In particular, each of the spectral masks 410 and 420 has a difference in the presence or absence of the guard band 430 at the central frequency portion of the 40 MHz channel.

FIG. 13 illustrates a guard band setting method according to an embodiment of the present invention.

FIG. 13 (a) represents a situation where data 440 is transmitted only through a channel of a second band after a specific time point from the transmission of data 440 through a channel of a first band is started. In the embodiment of the present invention, the second band has a narrower bandwidth than the first band. For example, the first band may represent a 40 MHz bandwidth, and the second band may represent a 20 MHz bandwidth. According to an embodiment of the present invention, the transmission bandwidth may be changed during the transmission of data 440 according to the scheduling of data transmission and the result of resource allocation. Even if the transmission bandwidth is changed in this manner, the spectral mask of the RF chain may be maintained in its original shape. That is, if the transmission band of the data is changed from the first band to the second band, data 440 in a form without the guard band 442 may be transmitted. In this case, when the terminal of the external BSS (i.e., OBSS) attempts to transmit on the idle band of the first band, interference may occur due to absence of the guard band 442 of data transmitted through the second band.

FIG. 13 (b) represents an embodiment in which data is transmitted by setting a guard band 450 between two adjacent basic band channels. According to an embodiment of the present invention, when multi-user data transmission is performed, data 440a and 440b allocated to each terminal may be transmitted through bands below the basic band. In this case, the multi-user data transmission includes a multi-user

uplink data transmission and a multi-user downlink data transmission. Further, the basic band may be a 20 MHz band, but the present invention is not limited thereto. In this manner, the guard band 450 in units of the basic band can be formed by setting a resource exceeding the basic band as not to be allocated to a single terminal.

According to another embodiment of the present invention, when a multi-user data transmission is performed, data allocation of a broadband exceeding the basic band may be allowed to each terminal. However, the terminal may perform nulling to the frequency components corresponding to the guard band 450 in the basic band unit among the wideband data, thereby preventing interference with the external BSS terminals.

According to another embodiment of the present invention, if the transmission band is changed from the first band to the second band during data transmission, the terminal may transmit the data by setting the guard band 450 on the basis of the changed second band. That is, if the transmission bandwidth is reduced during data transmission, the terminal sets a spectrum mask based on the reduced transmission bandwidth and transmits the data.

According to another embodiment of the present invention, a multi-user data transmission using a plurality of subbands in the first band may be performed. In this case, each subband has a narrower bandwidth than the first band. The plurality of subbands may be contiguous channels, or may be non-contiguous channels. In addition, each subband may be set to the same bandwidth, or may be set to a different bandwidth. According to an embodiment of the present invention, a terminal transmits multi-user data by setting a guard band 450 and a spectrum mask based on each subband through which data is transmitted.

FIGS. 14 and 15 illustrate a method of configuring a preamble of a non-legacy

packet according to an embodiment of the present invention. More specifically, FIG. 14 illustrates a method of transmitting a legacy preamble (L-preamble) of a non-legacy terminal in a process of a multi-user uplink data transmission. Further, FIG. 15 illustrates a method of configuring a non-legacy preamble in the process of a multi-user data transmission.

The legacy preamble is decodable at the legacy terminals and includes a legacy short training field (L-STF), a legacy long training field (L-LTF), and a legacy signal field (L-SIG). The non-legacy preamble is a field following the legacy preamble and can be recognized only by non-legacy terminals (e.g., an 802.11ax wireless LAN terminal). The non-legacy preamble may include an HE signal A field (HE-SIG-A), an HE signal B field (HE-SIG-B), an HE short training field (HE-STF), an HE long training field (HE-LTF), and the like.

The non-legacy wireless LAN packet includes a legacy preamble for legacy terminals and a non-legacy preamble for non-legacy terminals. The legacy preamble and the non-legacy preamble are inserted at the beginning of a non-legacy PHY Service Data Unit (PSDU). Non-legacy wireless LAN systems may support 256 FFT while legacy wireless LAN systems support 64 FFT. Thus, at least some of the non-legacy preamble may be composed of 256 FFT-based OFDM symbols. When a plurality of non-legacy STAs perform a multi-user uplink data transmission, each STA transmits at least some information of a non-legacy preamble through a sub-channel allocated to the STA. However, since the legacy preamble is transmitted on a 20 MHz channel basis, a method is required for the STAs assigned to resources on a sub-channel basis to transmit a legacy preamble in the corresponding channel.

According to an embodiment of the present invention, as shown in FIG. 14 (a), a representative STA selected from a plurality of STAs may transmit a legacy preamble

510 on behalf of the plurality of STAs assigned to the same 20 MHz channel. Various methods can be used to select the representative STA among a plurality of STAs. According to an embodiment, a STA having the highest received signal strength indication (RSSI) among a plurality of STAs assigned to the same 20 MHz channel may transmit a legacy preamble 510 for the multi-user uplink data transmission. According to another embodiment, a STA assigned to the first sub-channel among a plurality of sub-channels allocated within the same 20 MHz channel may transmit a legacy preamble 510 for the multi-user uplink data transmission.

The representative STA transmits the legacy preamble 510 in units of 20 MHz, and then transmits the non-legacy preamble 520 through the sub-channel allocated to the STA. The remaining STAs other than the representative STA transmit the non-legacy preamble 520 through the sub-channel allocated to the corresponding STA after the transmission of the legacy preamble 510 of the representative STA. The plurality of STAs transmit the non-legacy preamble 520 through allocated sub-channels at the same time.

According to another embodiment of the present invention, as shown in FIG. 14 (b), a plurality of STAs assigned to the same 20 MHz channel may simultaneously transmit the legacy preamble 510. In this case, the legacy preamble 510 transmitted by a plurality of STAs is set to the same waveform. Each STA transmits the legacy preamble 510 set in the same waveform in units of 20 MHz, and then transmits the non-legacy preamble 520 through a sub-channel allocated to the corresponding STA. To this end, the AP may transmit information corresponding to the legacy preamble 510 to each STA in the scheduling process. The AP receives the legacy preamble 510 from at least one STA as common information in units of 20 MHz.

FIG. 15 illustrates a method of configuring a non-legacy preamble according

to an embodiment of the present invention. In the embodiment of FIG. 15, the same or corresponding parts as those of the embodiment of FIG. 14 described above will be omitted.

FIG. 15 (a) illustrates an embodiment for constructing a non-legacy preamble. Some fields of the non-legacy preamble, for example, the HE-SIG-A 522 may be composed of 64 FFT-based OFDM symbols same as the legacy preamble 510. According to an embodiment of the present invention, the HE-SIG-A 522 of the non-legacy preamble may be transmitted on a 20 MHz channel basis in common. STAs that perform the multi-user uplink data transmission transmit the legacy preamble 510 and the HE-SIG-A 522 having the same information on a 20 MHz channel basis. That is, the AP receives HE-SIG-A 522 from at least one STA as common information on a 20 MHz channel basis. Also, the STAs transmit the remaining field 524 of the non-legacy preamble through the sub-channel allocated to the corresponding STA. That is, the AP receives the remaining field 524 of the non-legacy preamble as individual information for each sub-channel allocated to each STA. In this case, the remaining fields 524 of the non-legacy preamble include HE-STF and HE-LTF.

FIG. 15 (b) illustrates another embodiment constituting the non-legacy preamble. According to another embodiment of the present invention, the HE-SIG-A 522 of the non-legacy preamble may be transmitted on a sub-channel basis. STAs that perform the multi-user uplink data transmission transmit a legacy preamble 510 having the same information on a 20 MHz channel basis. Also, the STAs may transmit the non-legacy preambles 522 and 524 through a sub-channel allocated to the corresponding STA. The STA having assigned a plurality of sub-channels as resources may repeatedly transmit the same HE-SIG-A 522 through each assigned sub-channel.

Meanwhile, although FIG. 15 illustrates a method of configuring a non-legacy

preamble in a situation of the multi-user uplink data transmission, the method can be applied to the multi-user downlink data transmission as well. The HE-SIG-A 522 of the non-legacy preamble includes information necessary to interpret the non-legacy packet. For example, the HE-SIG-A 522 may include an indicator indicating whether the packet is an uplink packet or a downlink packet. According to the embodiment of the present invention, HE-SIG-A may be duplicated in units of 20 MHz when data is transmitted through a wideband channel.

FIG. 16 illustrates a method for performing a multi-user uplink transmission according to an embodiment of the present invention. In the embodiment of FIG. 16, the same or corresponding parts to those of the embodiments of FIGS. 9 and 10 described above will be omitted.

The multi-user uplink transmission in a non-legacy wireless LAN system may be initiated by a trigger frame. That is, the initialization step (S210) of FIG. 9 may be performed by a transmission of the trigger frame of the AP. STAs that perform the multi-user uplink transmission simultaneously transmit uplink data a predetermined IFS after the transmission of the trigger frame. The trigger frame indicates the start point of the multi-user uplink transmission and may indicate information on the channel or sub-channel allocated to each uplink transmission STA. STAs in which a channel or a sub-channel has been allocated from the AP simultaneously transmit uplink data at the time point designated by the AP. When the multi-user uplink transmission is completed, the AP transmits a multiplexed group ACK in response thereto.

According to an embodiment of the present invention, the trigger frame may include information for NAV setting of the multi-user uplink data transmission process. When the trigger frame conforms to the legacy frame format, a NAV of legacy terminals can be set based on the duration field value of the MAC header of the trigger

frame. According to a further embodiment of the present invention, in order to set a NAV for hidden nodes adjacent to uplink transmission STAs, the AP may increase the coverage of the trigger frame to be more than the transmission range of a normal frame. For example, an AP may transmit the trigger frame with increased power than a normal frame. Alternatively, the AP may apply a robust MCS (Modulation and Coding Scheme) to the trigger frame as compared to a normal frame.

FIG. 17 illustrates a structure of a multiplexed group ACK according to an embodiment of the present invention. According to an embodiment of the present invention, the multiplexed group ACK may have a frame format of a block ACK (BA).

The multiplexed group ACK includes a BA Control field and a BA Information field and may indicate block ACK information for a plurality of STAs through at least one of the fields. The block ACK information field is set to a variable length and may include a Per TID information field, a Block ACK Starting Sequence Control field, and a Block ACK Bitmap field. The Per TID information field includes a reserved field (B0 to B11) and a TID Value field (B12 to B15).

According to an embodiment of the present invention, ACK information for a plurality of STAs may be represented by using a reserved field of the Per TID information field. More specifically, the reserved field includes AID information of a recipient STA and an indicator indicating whether or not the ACK is a block ACK. For example, the reserved field may be composed of 12 bits (i.e., B0 to B11). A particular bit, for example, B11, may indicate whether the frame is a block ACK or a normal ACK. In addition, some remaining bits of the reserved field, for example, 11 bits of B0 to B11, may indicate AID information of the recipient STA of the corresponding frame.

The block ACK information field having the above-described configuration may be repeated for each Traffic ID (TID). Since the block ACK information field has a

variable length, AIDs for all STAs participating in the multi-user uplink transmission may be inserted into the block ACK information field through the reserved field. For example, the block ACK information field is allocated for each STA, and may be repeated by the number of recipient STAs. Thus, an AID, a Block ACK Starting Sequence Control field, and a Block ACK Bitmap field for each STA may be included in the block ACK information field. On the other hand, when the indicator B11 of the reserved field indicates a normal ACK, the Block ACK Starting Sequence Control field and the Block ACK Bitmap field may be omitted from the block ACK information field.

According to an embodiment of the present invention, information indicating a BA for a multiple STAs (e.g., a Multi-STA BA) may be included in a block ACK control field. More specifically, the block ACK control field includes a Multi-TID field B1, a Compressed Bitmap field B2 and a reserved field B3 to B11, and whether the frame is a Multi-STA BA is indicated through at least one of the fields. For example, a specific bit among the reserved field B3 to B11 may be used as a bit indicating the Multi-STA BA.

FIG. 18 illustrates a method of transmitting a multiplexed group ACK according to an embodiment of the present invention. In the embodiment of the present invention, the multiplexed group ACK includes a Multi-STA BA for a plurality of STAs as described above.

As in the above-described embodiment, uplink data for each channel in the multi-user uplink transmission may be terminated at the same time. In this case, the AP transmits a multiplexed group ACK on each channel through which the multi-user uplink data is transmitted to notify the completion of the transmission. However, if the number of STAs assigned to each channel is different as shown in FIG. 18, at least some information of the multiplexed group ACKs transmitted on each channel may have

different lengths. As described above with reference to FIG. 17, the block ACK information field of the multiplexed group ACK has a variable length, and the length of the field may be longer as the number of assigned STAs increases. Depending on whether the indicator of the reserved field indicates a block ACK, some fields such as a Block ACK Starting Sequence Control field and a Block ACK Bitmap field may be omitted. However, according to the embodiment of the present invention, the L-SIG and the HE-SIG-A may be duplicated as common information in units of 20MHz when data is transmitted through a wideband channel. Therefore, the multiplexed group ACKs transmitted on each channel should have the same length based on the value of a PPDU length field included in the L-SIG.

FIG. 19 illustrates a length alignment method of block ACKs according to an embodiment of the present invention. In an embodiment of the present invention, the block ACK includes a multiplexed group ACK and a Multi-STA BA. In the embodiment of FIG. 19, the same or corresponding parts as those of the embodiment of FIG. 17 described above will be omitted.

The AP transmits a block ACK in response to the multi-user uplink data. The AP may transmit the block ACK to a plurality of STAs using a multi-user downlink transmission. According to an embodiment of the present invention, the AP may transmit a block ACK for a corresponding STA on a channel through which multi-user uplink data is transmitted.

In this case, the amount of ACK information of the block ACK transmitted on each channel may be different. Referring to FIG. 19, ACK information of STA1, STA2, STA3 and STA4 is included in the block ACK transmitted on the first channel, and ACK information of STA5 and STA6 is included in the block ACK transmitted on the second channel. In addition, ACK information of STA7 is included in the block ACK

transmitted on the third channel, and ACK information of STA8 and STA9 is included in the block ACK transmitted on the fourth channel.

According to an embodiment of the present invention, the transmission of the block ACK may be terminated at the same time for each channel. That is, the AP may set the lengths of block ACKs transmitted on a plurality of channels to be the same.

According to an embodiment of the present invention, as shown in FIG. 19 (a), the AP may perform padding on a block ACK transmitted through at least one channel to match the termination point of the block ACK transmissions in each channel. That is, the AP may perform padding on the block ACKs of the second channel to the fourth channel in reference to the length of the block ACK of the first channel having the largest amount of ACK information. According to an embodiment, the padding of the block ACK may be implemented with zero padding. However, the present invention is not limited thereto and the padding may also be implemented with one padding.

According to another embodiment of the present invention, as shown in FIG. 19 (b), the AP may insert duplicated ACK information into a block ACK transmitted through at least one channel to match the termination point of the block ACK transmissions in each channel. That is, the AP may insert duplicated ACK information into the block ACKs of the second channel to the fourth channel in reference to the length of the block ACK of the first channel having the largest amount of ACK information. In this case, the duplicated ACK information includes at least one of a Per TID information field, a Block ACK Starting Sequence Control field, and a Block ACK Bitmap field for each STA.

If the indicator B11 of the reserved field indicates a block ACK, the Per TID information field, the Block ACK Starting Sequence Control field and the Block ACK Bitmap field for at least one STA may be inserted in duplicate into the block ACK

transmitted on the second to fourth channels. However, if the indicator B11 of the reserved field indicates a normal ACK, the Block ACK Start Sequence Control field and the Block ACK Bitmap field may be omitted from the block ACK information field. Therefore, the Per TID information field for at least one STA may be inserted in duplicate into the block ACK transmitted through the second to fourth channels. As described above, the Per TID information field of the block ACK information field includes AID information of the recipient STA.

FIG. 20 illustrates a method of frame length alignment by padding in a multi-user simultaneous transmission according to an embodiment of the present invention.

According to an embodiment of the present invention, a trigger frame that triggers the multi-user simultaneous transmission may be also be padded. In the multi-user uplink data transmission and the multi-user downlink data transmission, a different number of STAs may be assigned to each channel. The trigger frame may include AID information of the STA assigned to each channel, and the amount of information of the transmitted trigger frame may be different for each channel.

According to an embodiment of the present invention, a predetermined padding may be performed before a Frame Check Sequence (FCS) field of the trigger frame. Thus, the transmission of the trigger frame may be terminated at the same time in each channel through which the trigger frame is transmitted. Also, through the padding of the trigger frame, the STAs can acquire additional processing time to participate in the multi-user simultaneous transmission in response to the trigger frame. Meanwhile, according to another embodiment of the present invention, the duplicated AID information may be inserted before the FCS field of the trigger frame.

As described above, when different numbers of STAs are assigned to each channel in the multi-user simultaneous transmission process, the amount of information

of the block ACK transmitted in response to the multi-user data may be different for each channel. According to an embodiment of the present invention, padding may be performed on a block ACK of another channel in reference to a length of a block ACK of a channel to which a largest number of STAs are allocated. In this case, the padding may be performed before the FCS field of the block ACK.

FIG. 21 illustrates a method of transmitting a multiplexed block ACK when a plurality of channels are used for a multi-user uplink transmission. In the present invention, the multiplexed block ACK (M-BA) may indicate the above-described multiplexed group ACK.

As described above, the AP may transmit a multiplexed block ACK for a corresponding STA on a channel through which multi-user uplink data is transmitted. Therefore, the length of the multiplexed block ACK varies depending on the number of STAs assigned to the corresponding channel, the reception state of the multi-user uplink data, and the like. Therefore, at the time when the AP transmits the trigger frame, the actual length of the multiplexed block ACK cannot be predicted.

According to the embodiment of the present invention, the AP may set the TXOP value of the trigger frame by predicting the maximum time required for a multi-user uplink data transmission. The maximum time may be set to a time required for transmitting an M-BA using the block ACK option to all STAs on the channel through which the largest number of STAs are allocated. Therefore, when the actual multi-user uplink data transmission is completed, the length of the actual M-BA may be different for each channel depending on the uplink data reception result.

If M-BAs of different lengths are transmitted for each channel, access of other terminals may be allowed an AIFS time after the transmission completion of M-BA on some channels. When the M-BA on the primary channel is set to be the shortest as in

the embodiment of FIG. 21, other terminals may perform access to the primary channel. However, since the AP cannot switch its state until the M-BA transmissions on other channels are completed, the transmission attempts of other terminals may be ignored or the competition of an access attempt of the AP may be disadvantageous.

Therefore, according to the embodiment of the present invention, the AP may set the lengths of multiplexed block ACKs transmitted through a plurality of channels to be the same. To this end, the AP may perform padding on the multiplexed block ACKs transmitted through at least one channel to match the termination points of the multiplexed block ACK transmissions in each channel. According to an embodiment, the padding scheme of IEEE 802.11ac may be used for the padding of multiplexed block ACKs.

Meanwhile, the transmission of the multiplexed block ACK may be terminated before the TXOP set in the trigger frame. According to an embodiment, the AP may return the remaining TXOP after the transmission of the multiplexed block ACK is completed. According to another embodiment, the AP may perform additional operations such as a control frame transmission during the remaining TXOP after the transmission of the multiplexed block ACK is completed.

Although the present invention is described by using the wireless LAN communication as an example, the present invention is not limited thereto and the present invention may be similarly applied even to other communication systems such as cellular communication, and the like. Further, the method, the apparatus, and the system of the present invention are described in association with the specific embodiments, but some or all of the components and operations of the present invention may be implemented by using a computer system having universal hardware architecture.

The detailed described embodiments of the present invention may be implemented by various means. For example, the embodiments of the present invention may be implemented by a hardware, a firmware, a software, or a combination thereof.

In case of the hardware implementation, the method according to the embodiments of the present invention may be implemented by one or more of Application Specific Integrated Circuits (ASICSs), Digital Signal Processors (DSPs), Digital Signal Processing Devices (DSPDs), Programmable Logic Devices (PLDs), Field Programmable Gate Arrays (FPGAs), processors, controllers, micro-controllers, micro-processors, and the like.

In case of the firmware implementation or the software implementation, the method according to the embodiments of the present invention may be implemented by a module, a procedure, a function, or the like which performs the operations described above. Software codes may be stored in a memory and operated by a processor. The processor may be equipped with the memory internally or externally and the memory may exchange data with the processor by various publicly known means.

The description of the present invention is used for exemplification and those skilled in the art will be able to understand that the present invention can be easily modified to other detailed forms without changing the technical idea or an essential feature thereof. Thus, it is to be appreciated that the embodiments described above are intended to be illustrative in every sense, and not restrictive. For example, each component described as a single type may be implemented to be distributed and similarly, components described to be distributed may also be implemented in an associated form.

The scope of the present invention is represented by the claims to be described below rather than the detailed description, and it is to be interpreted that the

meaning and scope of the claims and all the changes or modified forms derived from the equivalents thereof come within the scope of the present invention.

[Mode for Invention]

As above, related features have been described in the best mode.

[Industrial Applicability]

Various exemplary embodiments of the present invention have been described with reference to an IEEE 802.11 system, but the present invention is not limited thereto and the present invention can be applied to various types of mobile communication apparatus, mobile communication system, and the like.

[CLAIMS]

1. A base wireless communication terminal, the terminal comprising:

a transceiver configured to transmit and receive a wireless signal; and

a processor configured to control an operation of the base wireless communication terminal,

wherein the processor is configured to:

transmit a trigger frame triggering a multi-user uplink transmission of a plurality of terminals, receive multi-user uplink data through resources allocated to the plurality of terminals, and transmit a block ACK through the resources in response to the received multi-user uplink data,

wherein the transmission of the block ACK in each resource is terminated at the same time.

2. The base wireless communication terminal of claim 1, wherein the processor performs padding on the block ACK transmitted through at least one resource to match termination points of block ACK transmissions in each resource.

3. The base wireless communication terminal of claim 1, wherein the processor inserts duplicated ACK information into the block ACK transmitted through at least one resource to match termination points of block ACK transmissions in each resource.

4. The base wireless communication terminal of claim 1, wherein a predetermined padding is performed before a frame check sequence (FCS) field of the trigger frame.

5. The base wireless communication terminal of claim 4, wherein the transmission of the trigger frame is terminated at the same time in each resource through which the trigger frame is transmitted.

6. The base wireless communication terminal of claim 1, wherein the resource is a channel or a sub-channel.

7. The base wireless communication terminal of claim 1,

wherein a transmission packet of the multi-user uplink data includes a legacy preamble and a non-legacy preamble, and

wherein the legacy preamble is received as common information on a 20 MHz channel basis.

8. The base wireless communication terminal of claim 7,

wherein the non-legacy preamble includes HE-SIG-A and remaining fields, and

wherein the HE-SIG-A is received as common information on a 20 MHz channel basis, and the remaining fields of the non-legacy preambles are received as individual information for each resource allocated to each terminal.

9. The base wireless communication terminal of claim 8,

wherein the remaining fields of the non-legacy preamble include HE-STF and HE-LTF.

10. The base wireless communication terminal of claim 1,

wherein the multi-user uplink data transmission in each resource is terminated at the same time.

11. The base wireless communication terminal of claim 10,

wherein the uplink data transmitted through at least one resource is padded to terminate the multi-user uplink data transmission at the same time.

12. A wireless communication method of a base wireless communication terminal, the method comprising:

transmitting a trigger frame triggering a multi-user uplink transmission of a plurality of terminals;

receiving multi-user uplink data through resources allocated to the plurality of terminals; and

transmitting a block ACK through the resources in response to the received multi-user uplink data;

wherein the transmission of the block ACK in each resource is terminated at the same time.

[ABSTRACT]

The present invention relates to a wireless communication terminal and a wireless communication method for efficiently managing simultaneous data transmissions of a plurality of terminals.

To this end, provided are a base wireless communication terminal including: a transceiver configured to transmit and receive a wireless signal; and a processor configured to control an operation of the base wireless communication terminal, wherein the processor is configured to: transmit a trigger frame triggering a multi-user uplink transmission of a plurality of terminals, receive multi-user uplink data through resources allocated to the plurality of terminals, and transmit a block ACK through the resources in response to the received multi-user uplink data, wherein the transmission of the block ACK in each resource is terminated at the same time, and a wireless communication method using the same.

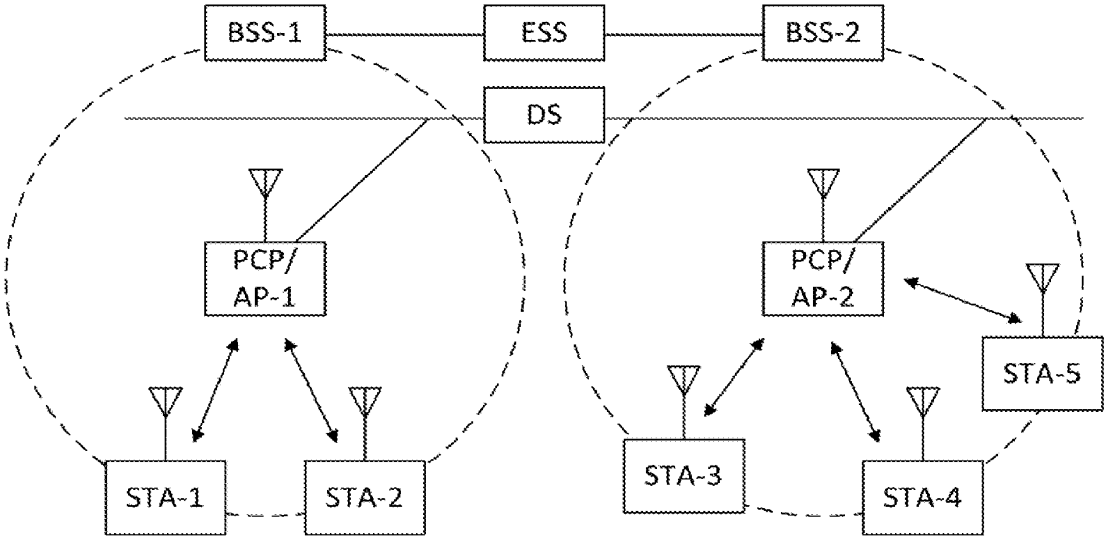


FIG. 1

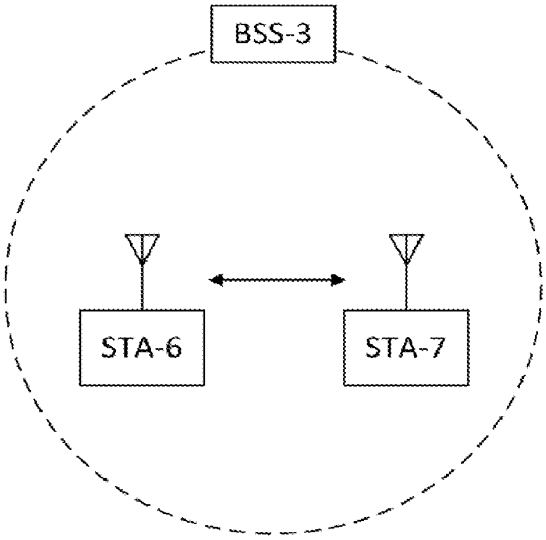


FIG. 2

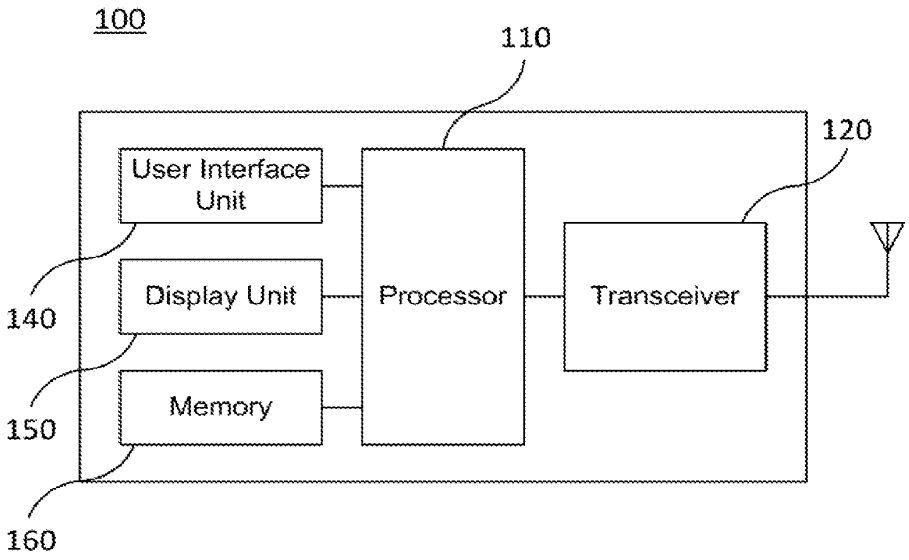

100
110
120
User Interface Unit
Display Unit
Memory
Processor
Transceiver
140
150
160

FIG. 3

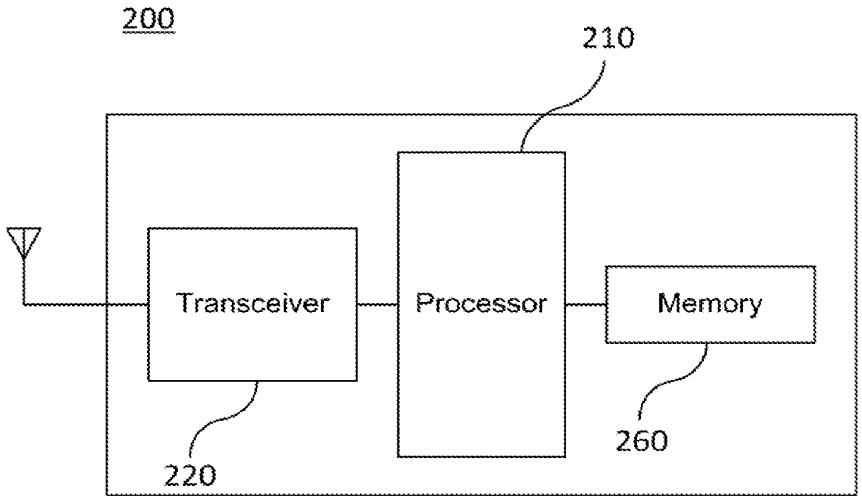


FIG. 4

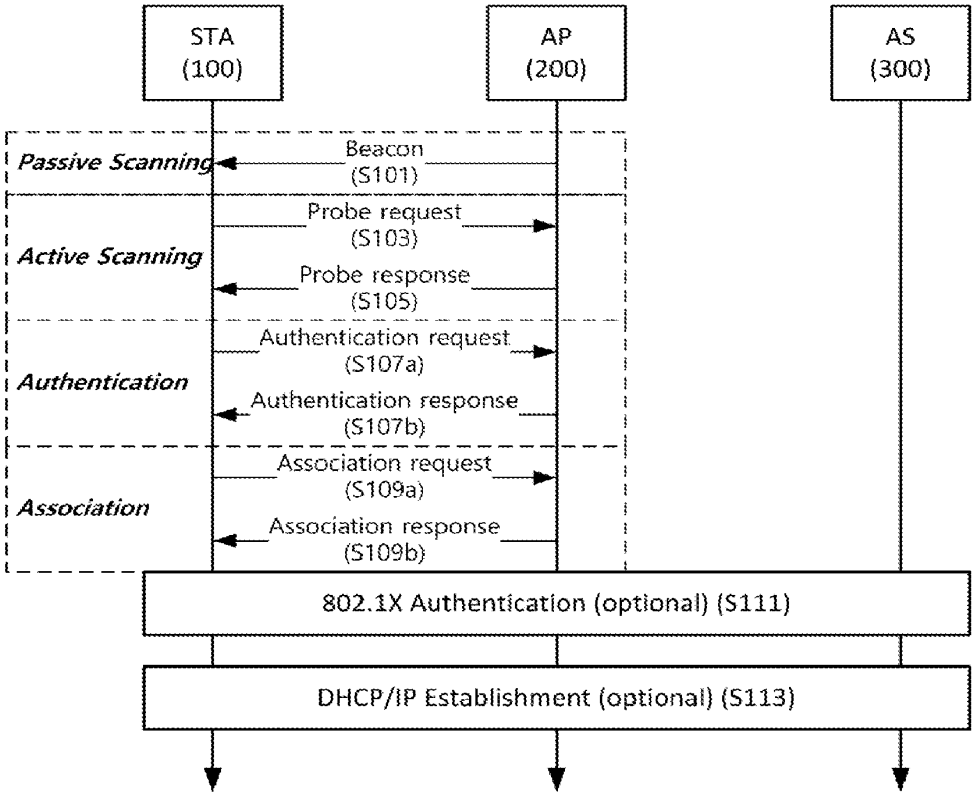

STA
(100)
AP
(200)
AS
(300)
Passive Scanning
Beacon
(S101)
Active Scanning
Probe request
(S103)
Probe response
(S105)
Authentication
Authentication request
(S107a)
Authentication response
(S107b)
Association
Association request
(S109a)
Association response
(S109b)
802.1X Authentication (optional) (S111)
DHCP/IP Establishment (optional) (S113)

FIG. 5

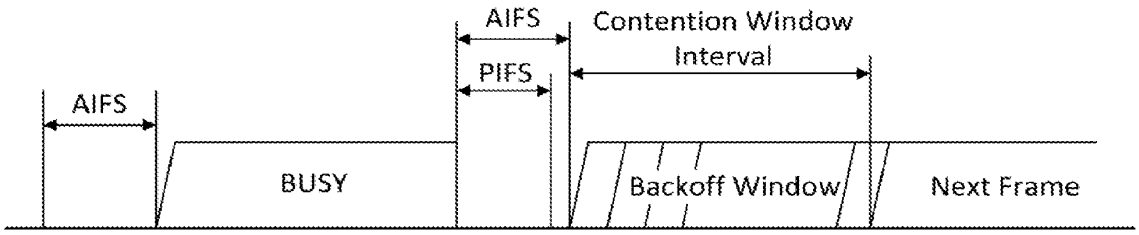

AIFS
AIFS
PIFS
Contention Window
Interval
BUSY
Backoff Window
Next Frame

FIG. 6

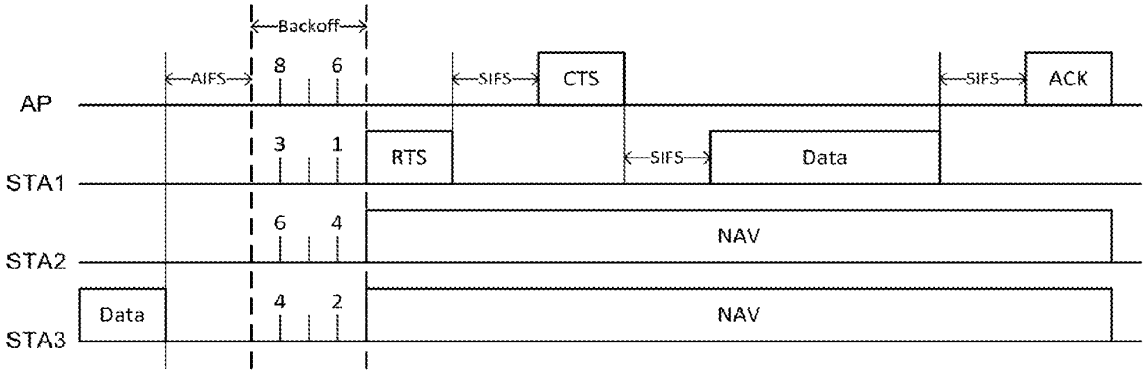

Backoff
AIFS
8
6
SIFS
CTS
SIFS
ACK
AP
3
1
RTS
SIFS
Data
STA1
6
4
NAV
STA2
Data
4
2
NAV
STA3

FIG. 7

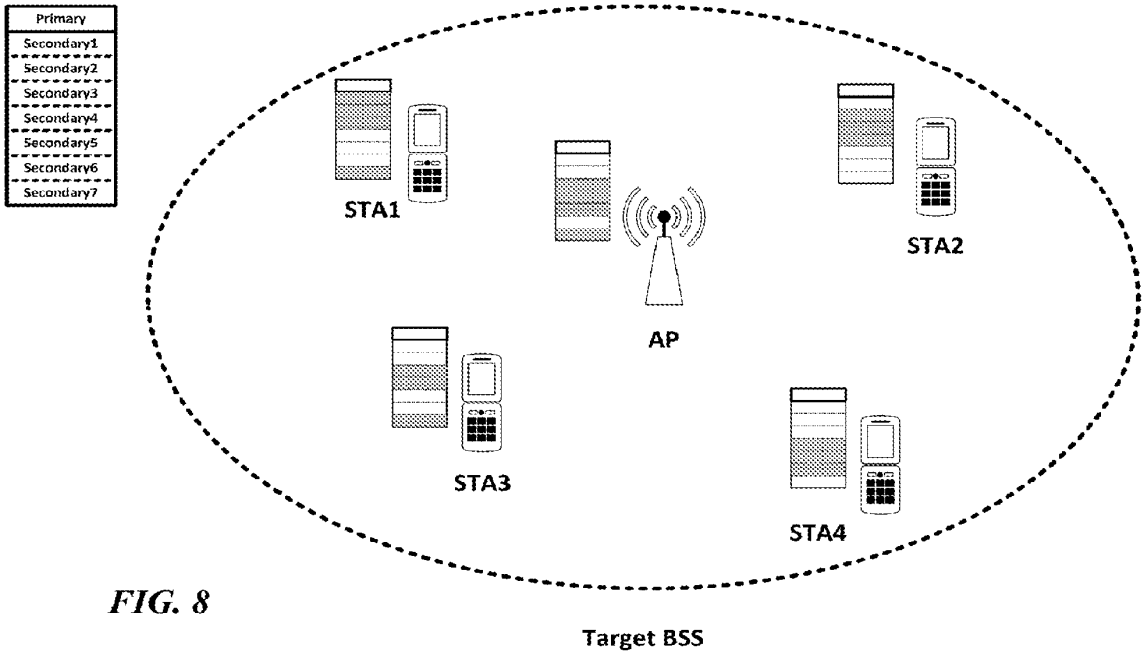

Primary
Secondary1
Secondary2
Secondary3
Secondary4
Secondary5
Secondary6
Secondary7
STA1
AP
STA2
STA3
STA4
Target BSS

FIG. 8

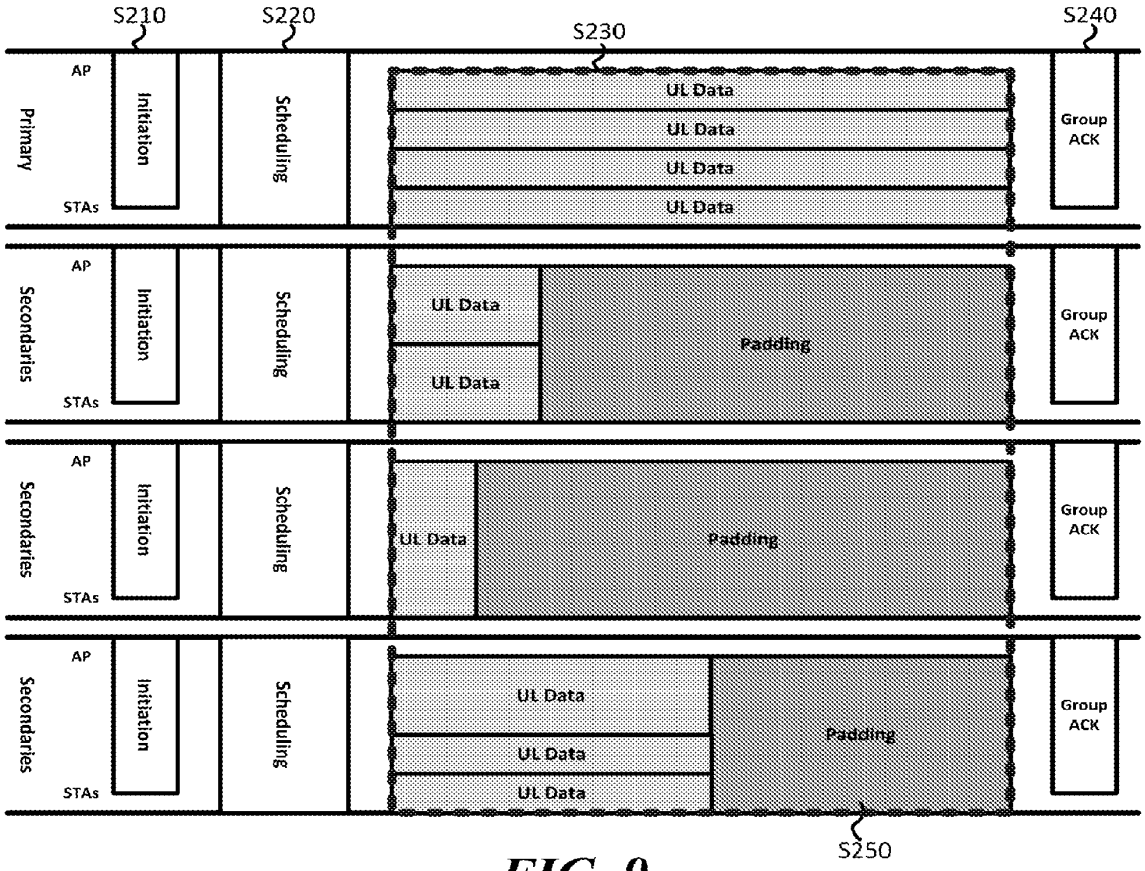

S210
S220
S230
S240
Primary
Secondaries
Secondaries
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
Padding
Group ACK
S250

FIG. 9

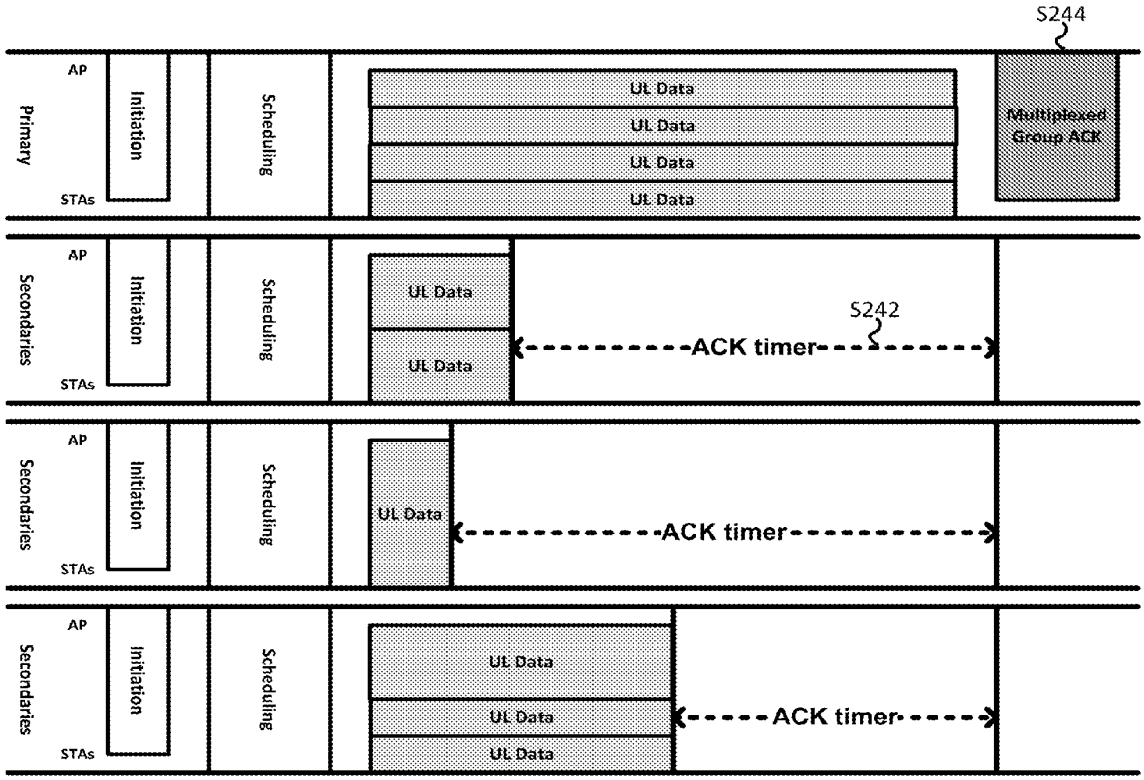

S244
Primary
AP
STAs
Initiation
Scheduling
UL Data
UL Data
UL Data
UL Data
Multiplexed Group ACK
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
UL Data
S242
ACK timer
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
ACK timer
Secondaries
AP
STAs
Initiation
Scheduling
UL Data
UL Data
UL Data
ACK timer

FIG. 10

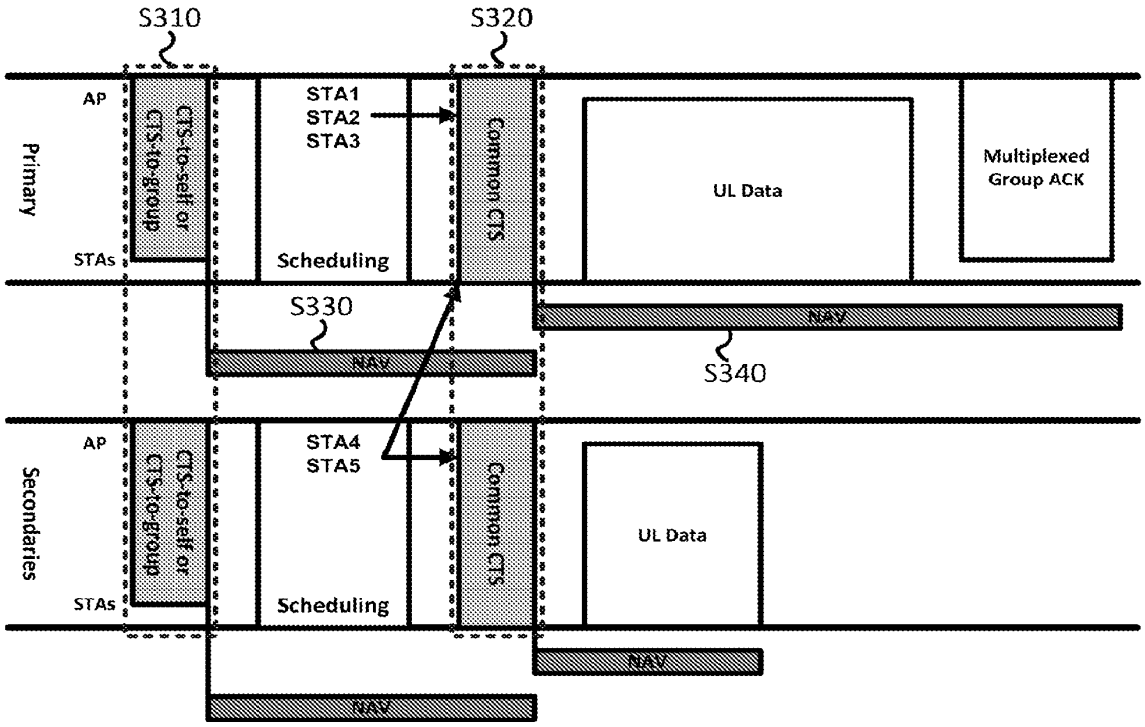

S310
S320
AP
Primary
STAs
CTS-to-self or CTS-to-group
STA1
STA2
STA3
Scheduling
Common CTS
UL Data
Multiplexed Group ACK
S330
NAV
S340
AP
Secondaries
STAs
CTS-to-self or CTS-to-group
STA4
STA5
Scheduling
Common CTS
UL Data
NAV
NAV

FIG. 11

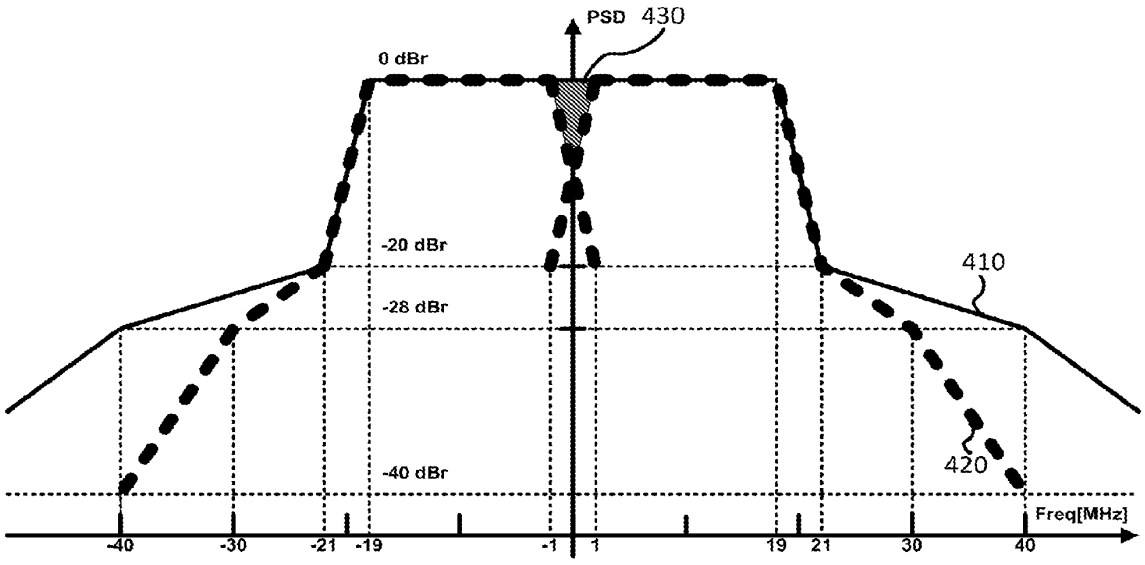

PSD
430
0 dBr
-20 dBr
-28 dBr
-40 dBr
410
420
Freq[MHz]
-40
-30
-21
-19
-1
1
19
21
30
40

FIG. 12

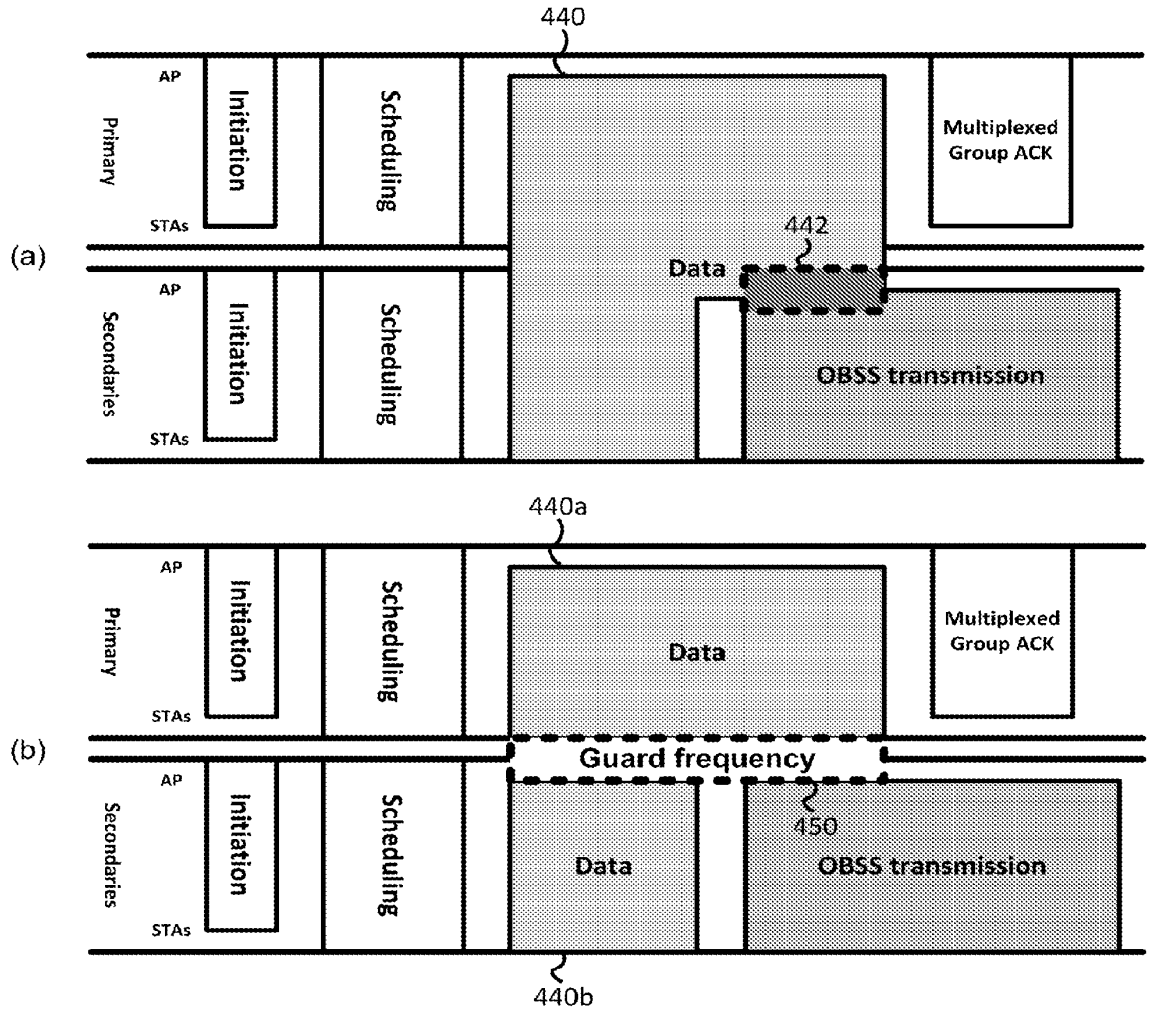

(a)
440
AP
Primary
STAs
Initiation
Scheduling
Multiplexed Group ACK
442
Data
AP
Secondaries
STAs
Initiation
Scheduling
OBSS transmission
(b)
440a
AP
Primary
STAs
Initiation
Scheduling
Data
Multiplexed Group ACK
Guard frequency
AP
Secondaries
STAs
Initiation
Scheduling
450
Data
OBSS transmission
440b

FIG. 13

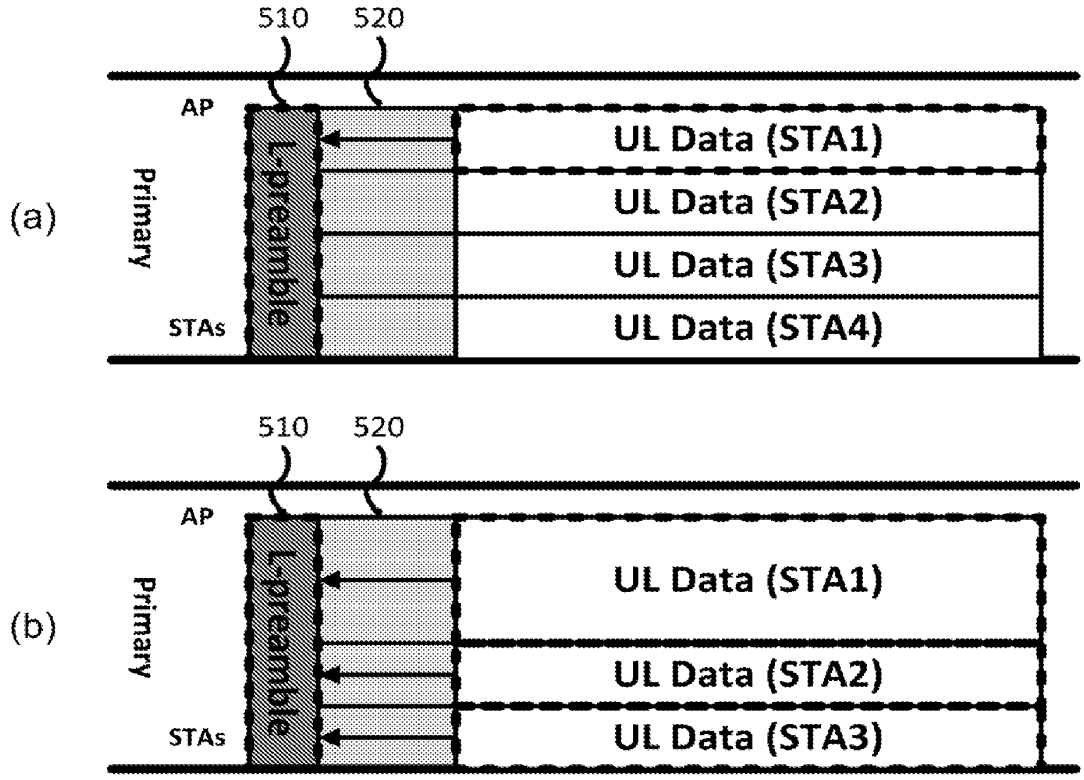

510
520
AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
UL Data (STA4)
(a)
510
520
AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
(b)

FIG. 14

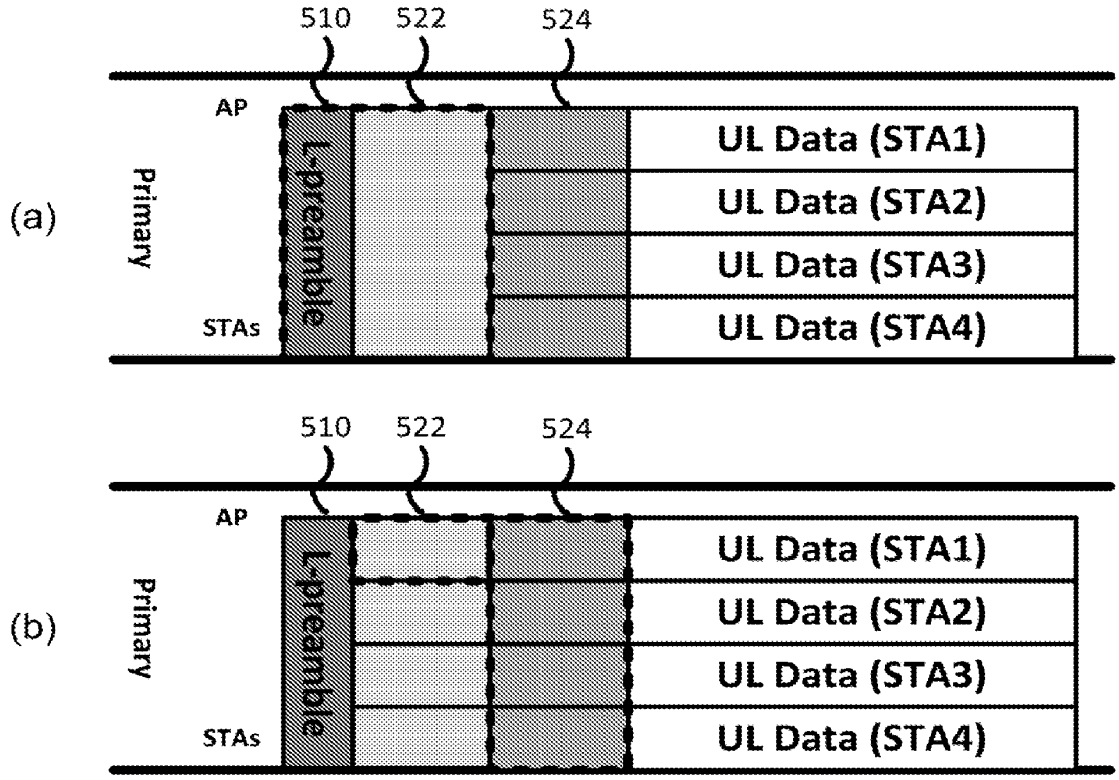

(a)
510
522
524
AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
UL Data (STA4)
(b)
510
522
524
AP
Primary
STAs
L-preamble
UL Data (STA1)
UL Data (STA2)
UL Data (STA3)
UL Data (STA4)

FIG. 15

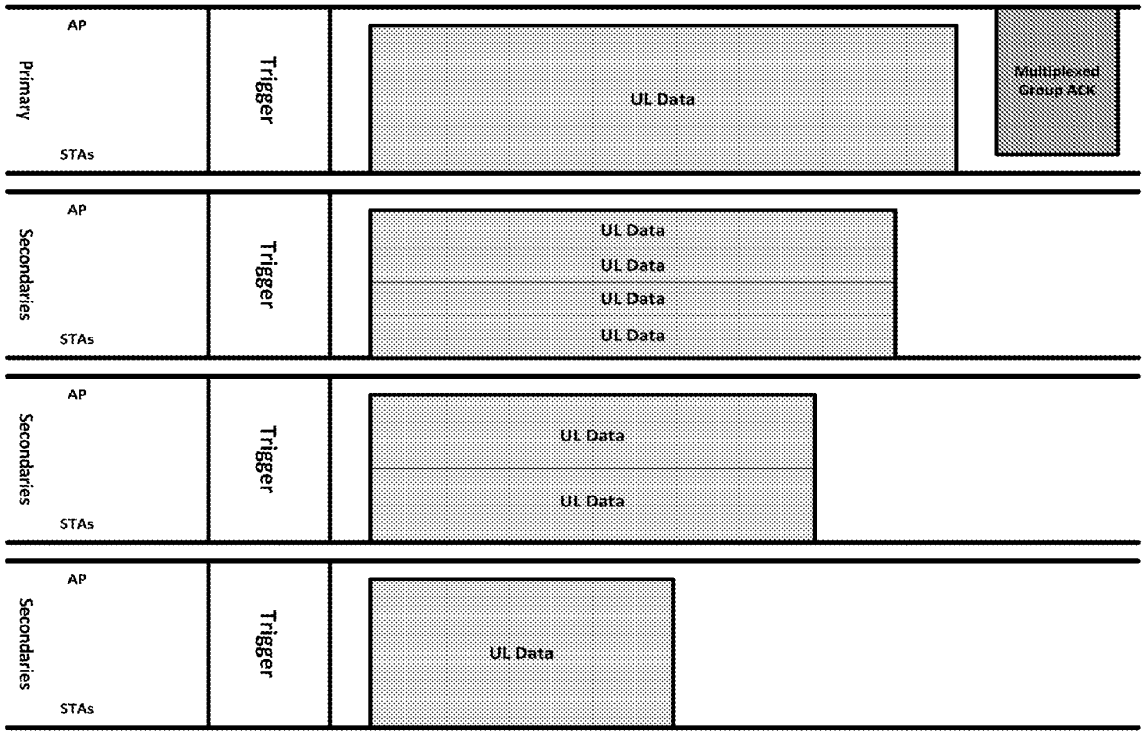

AP
Primary
STAs
Trigger
UL Data
Multiplexed Group ACK
AP
Secondaries
STAs
Trigger
UL Data
UL Data
UL Data
UL Data
AP
Secondaries
STAs
Trigger
UL Data
UL Data
AP
Secondaries
STAs
Trigger
UL Data

FIG. 16

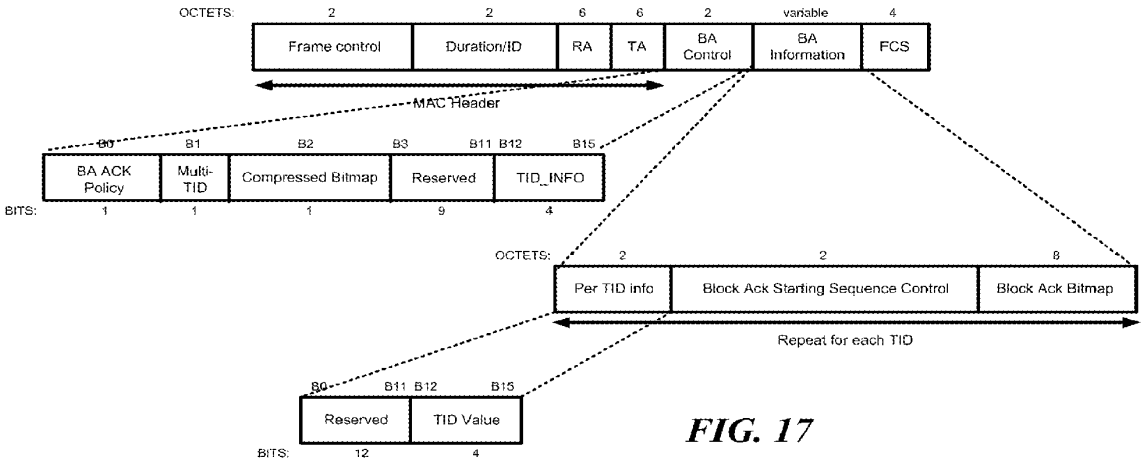

OCTETS:
2
2
6
6
2
variable
4
Frame control
Duration/ID
RA
TA
BA Control
BA Information
FCS
MAC Header
B0
B1
B2
B3
B11
B12
B15
BA ACK Policy
Multi-TID
Compressed Bitmap
Reserved
TID_INFO
BITS:
1
1
1
9
4
OCTETS:
2
2
8
Per TID info
Block Ack Starting Sequence Control
Block Ack Bitmap
Repeat for each TID
B0
B11
B12
B15
Reserved
TID Value
BITS:
12
4

FIG. 17

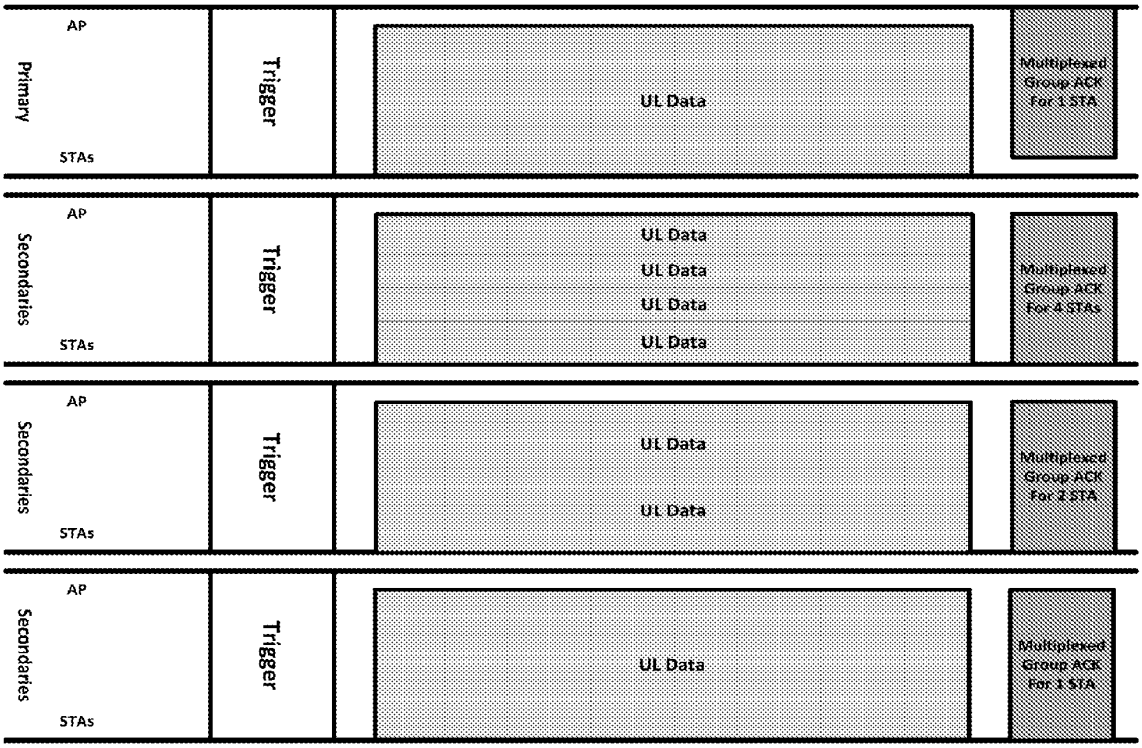

AP
Primary
STAs
Trigger
UL Data
Multiplexed Group ACK For 1 STA
AP
Secondaries
STAs
Trigger
UL Data
UL Data
UL Data
UL Data
Multiplexed Group ACK For 4 STAs
AP
Secondaries
STAs
Trigger
UL Data
UL Data
Multiplexed Group ACK For 2 STA
AP
Secondaries
STAs
Trigger
UL Data
Multiplexed Group ACK For 1 STA

FIG. 18

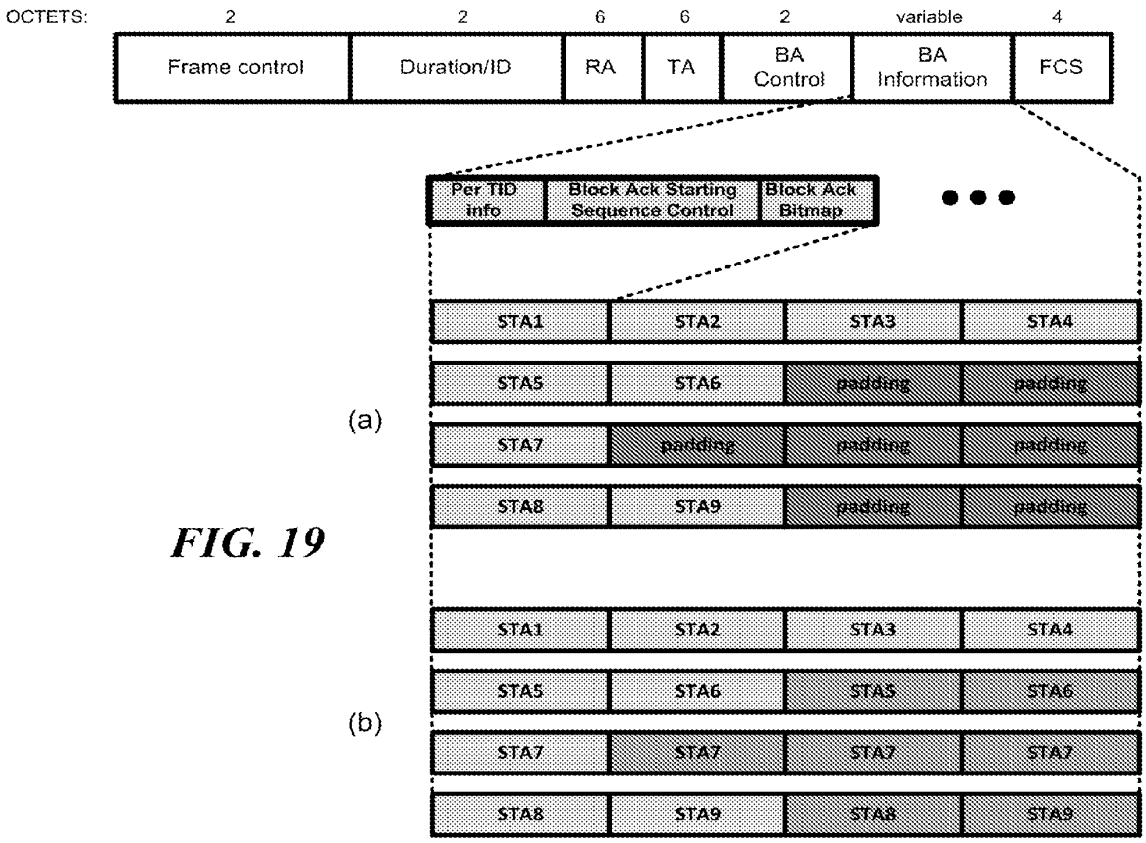

OCTETS:
2
2
6
6
2
variable
4
Frame control
Duration/ID
RA
TA
BA Control
BA Information
FCS
Per TID info
Block Ack Starting Sequence Control
Block Ack Bitmap
STA1
STA2
STA3
STA4
STA5
STA6
padding
padding
STA7
padding
padding
padding
STA8
STA9
padding
padding
(a)
STA1
STA2
STA3
STA4
STA5
STA6
STA5
STA6
STA7
STA7
STA7
STA7
STA8
STA9
STA8
STA9
(b)

FIG. 19

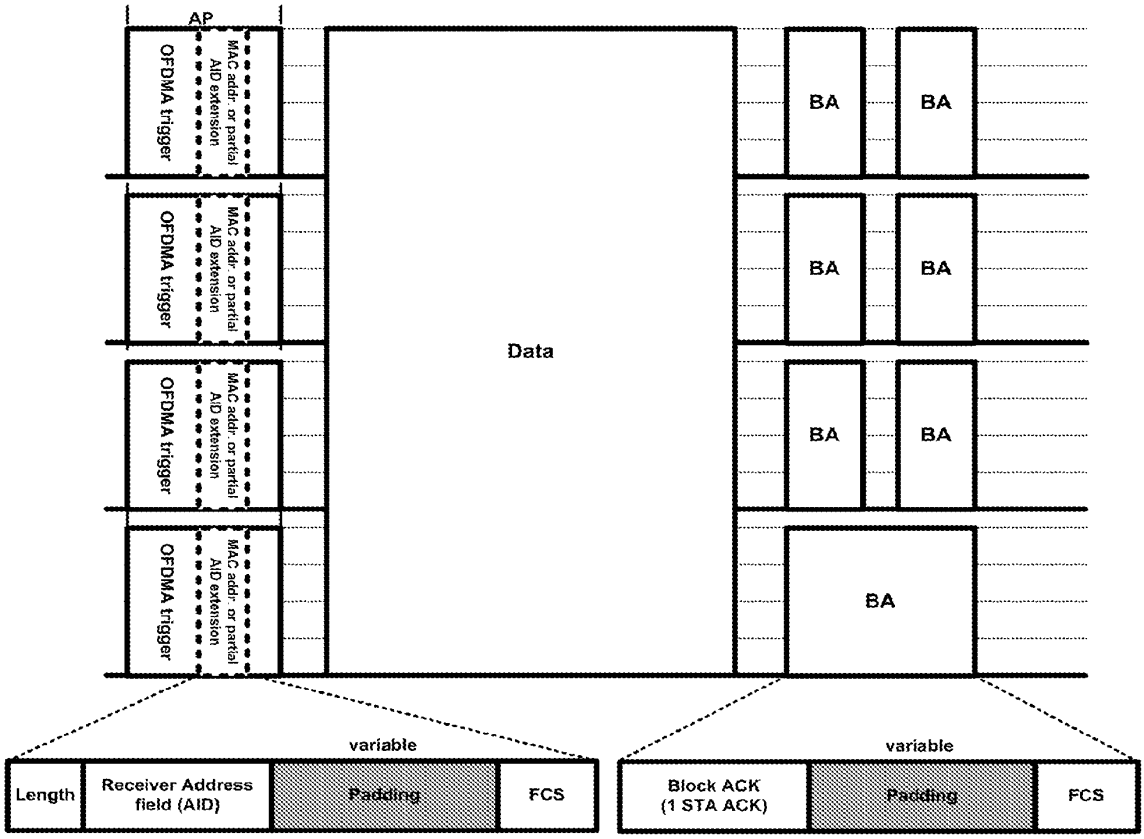

AP
OFDMA trigger
MAC addr. or partial AID extension
Data
BA
variable
Length
Receiver Address field (AID)
Padding
FCS
Block ACK (1 STA ACK)

FIG. 20

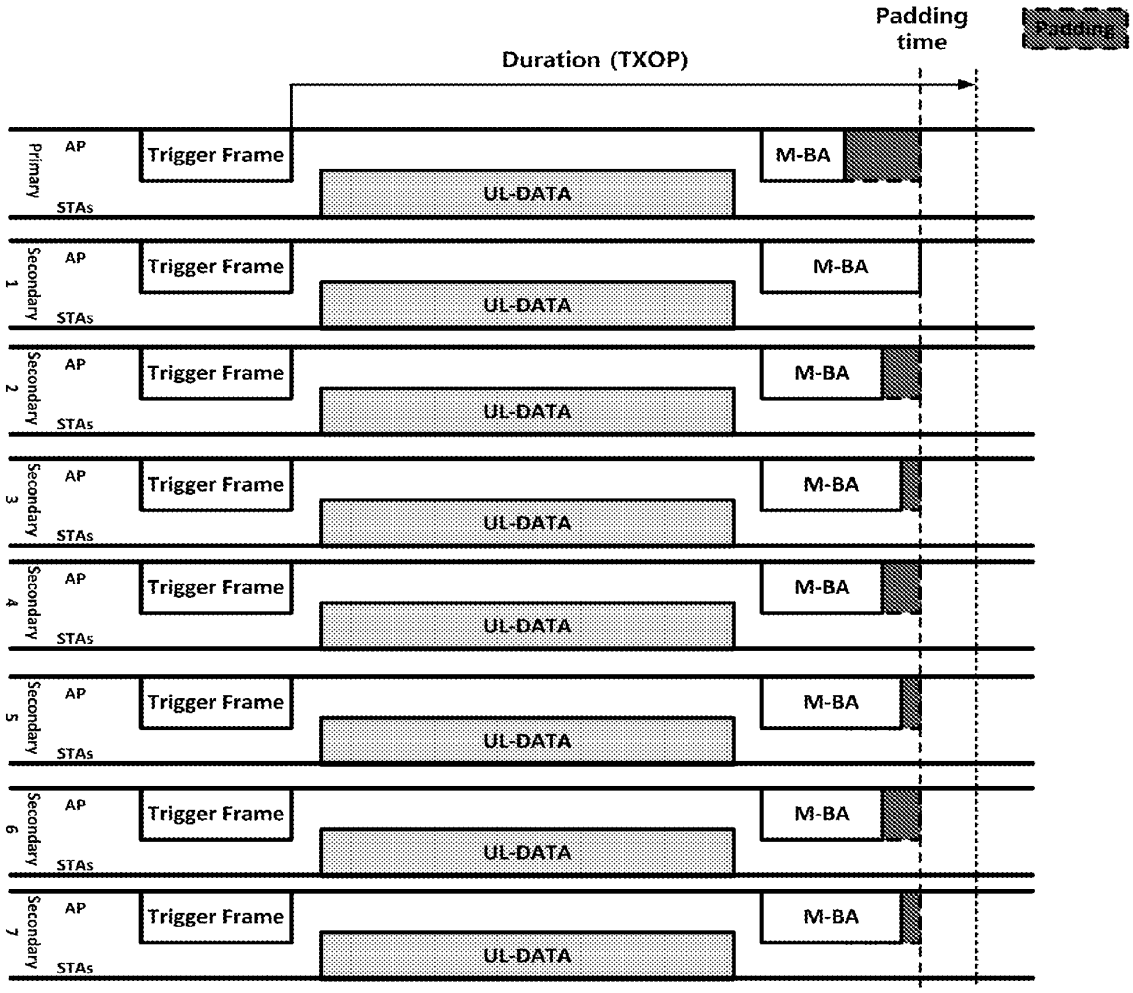

Padding time
Padding
Duration (TXOP)
Primary
Secondary 1
Secondary 2
Secondary 3
Secondary 4
Secondary 5
Secondary 6
Secondary 7
AP
STAs
Trigger Frame
UL-DATA
M-BA

FIG. 21

NOTE: 37 CFR 1.63(c) states, "A person may not execute an oath or declaration unless the person has reviewed and understands the contents of the application, including the claims and is aware of the duty to disclose to the Office all information known to be material to patentability as defined in § 1.56."

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION

As the below named inventor, I hereby declare that:

This declaration is directed to:

- ☐ The attached application, or
- ☒ United States application or PCT international application number PCT/KR2016/002199 filed on March 4, 2016.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR (1)

Inventor: Woojin AHN Date (Optional): Aug. 29. 2017

Signature: 

LEGAL NAME OF INVENTOR (2)

Inventor: Yongho KIM Date (Optional): _____

Signature: _____

WILP_160024-US

NOTE: 37 CFR 1.63(c) states, "A person may not execute an oath or declaration unless the person has reviewed and understands the contents of the application, including the claims and is aware of the duty to disclose to the Office all information known to be material to patentability as defined in § 1.56."

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

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The above-identified application was made or authorized to be made by me.

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LEGAL NAME OF INVENTOR (1)

Inventor: Woojin AHN Date (Optional): _____

Signature: _____

LEGAL NAME OF INVENTOR (2)

Inventor: Yongho KIM Date (Optional): 8/30/2017

Signature: Yongho Kim

LEGAL NAME OF INVENTOR (3)

Inventor: Jinsam KWAK Date (Optional): Aug 28, 2017

Signature:

LEGAL NAME OF INVENTOR (4)

Inventor: Juhyung SON Date (Optional): Aug 28 2017

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.

Docket No.: **QUS-0003** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Confirmation No.: **To Be Assigned**
Woojin AHN; Yongho KIM; Jinsam KWAK; and Juhyung SON	Group Art Unit: **To Be Assigned**
Serial No.: **Continuation of U.S. Patent Application Serial No. 15/555,075 filed August 31, 2017**	Examiner: **To Be Assigned**
	Customer No.: **34610**

For: **WIRELESS COMMUNICATION TERMINAL AND WIRELESS COMMUNICATION METHOD FOR MULTI-USER CONCURRENT TRANSMISSION**

INFORMATION DISCLOSURE STATEMENT

U.S. Patent and Trademark Office
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

Pursuant to 37 C.F.R.§ 1.56, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO-1449. One copy of each non-U.S. reference is attached. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the reference(s) be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the indicated date. Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered. This statement should not be construed as a representation that a search has been made, that information cited in the statement is considered to be and/or is material to patentability, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith. It is further understood that the Examiner will consider information that was cited or submitted to the U.S. Patent and Trademark Office in a prior application relied on under 35 U.S.C. §120. 1138 OG 37, 38 (May 19, 1992).

☒ 1. This Information Disclosure Statement is being filed (i) within three months of the U.S. filing date of a U.S. application other than a CPA continued prosecution application under §1.53(d) OR (ii) within three months of the date of entry of the national stage as set forth in §1.491 in an international application OR (iii) before the mailing date of a first Office Action on the merits OR (iv) before the mailing of a first Office Action after the filing of a Request for continued examination under §1.114. No certification or fee is required. 37 C.F.R. §1.97(b).

☐ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application. 37 C.F.R. §1.97(c).

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1). No fee is required.

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2). No fee is required.

☐ c. Please charge our Credit Card in the amount of $240.00.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information.

☐ 3. This Information Disclosure Statement is being filed after the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application, but on or before payment of the Issue Fee. Please charge our Credit Card in the amount of $240.00.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information. 37 C.F.R. §1.97(d).

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1).

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2).

☒ 4. Copies of the references were cited by or submitted to the Office in parent application No. **15/555,075**, filed August 31, 2017, which is relied upon for an earlier filing date under 35 U.S.C. §120. Thus, copies of these references are not attached. 37 C.F.R. §1.98(d).

☒ 5. To the extent necessary, a petition for an extension of time under 37 C.F.R. §1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

/Daniel Y.J. Kim/

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