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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/860,962	11/19/2019	10484976	SLA3700	7593

50735 7590 10/30/2019
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101

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):

Kai Ying, Vancouver, WA;
Sharp Kabushiki Kaisha, Sakai City, JAPAN;
Toshizo Nogami, Vancouver, WA;
FG Innovation Company Limited, Hong Kong, CHINA;
Tatsushi Aiba, Vancouver, WA;
John Michael Kowalski, Vancouver, WA;
Zhanping Yin, Vancouver, WA;
Jia Sheng, Vancouver, WA;

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Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/860,962	01/03/2018	Kai Ying	SLA3700	7593
50735	7590	10/10/2019		
AUSTIN RAPP 170 SOUTH MAIN STREET SUITE 735 SALT LAKE CITY, UT 84101			EXAMINER QURESHI, AFSAR M	
			ART UNIT	PAPER NUMBER
			2472	
			NOTIFICATION DATE	DELIVERY MODE
			10/10/2019	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):

usptocorrespondence@austin-rapp.com

Response to Rule 312 Communication	Application No.	Applicant(s)	
	15/860,962	Ying et al.	
	Examiner	Art Unit	AIA (FITF) Status
	AFSAR M QURESHI	2472	Yes

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

1. ☒ The amendment filed on 25 September 2019 under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

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

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

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472	10/4/2019
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LIE: Please enter amendment.
Thanks.
/AQ/
10/4/2019

Appl. No. 15/860,962
Amdt. dated September 25, 2019
Reply to Notice of Allowance of June 25, 2019

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/860,962	Confirmation No.: 7593
Applicant	:	Sharp Kabushiki Kaisha et al.	
First Named Inventor	:	Zhanping Yin	
Filed	:	January 3, 2018	
Art Unit	:	2472	
Examiner	:	Afsar M. Qureshi	
Docket No.	:	SLA3700	
Customer No.	:	50735	

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

AMENDMENT UNDER 37 C.F.R. § 1.312

Sir:

Under the provisions of 37 C.F.R. § 1.312, Applicant respectfully requests that the above-identified application be amended as follows:

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

Remarks begin on page 8 of this paper.

Attorney Docket No.: SLA3700
Customer No.: 50735

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)

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.

50735 7590 06/25/2019
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101

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.
15/860,962	01/03/2018	Kai Ying	SLA3700	7593

TITLE OF INVENTION: SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

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	09/25/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
QURESHI, AFSAR M	2472	370-310000

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,

1 Austin Rapp

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2

3

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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)

Sharp Kabushiki Kaisha
FG Innovation Company Limited

Osaka, Japan
Hong Kong, China

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. 601987

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 /Wesley L. Austin/

Date September 25, 2019

Typed or printed name Wesley L. Austin

Registration No. 42,273

Electronic Patent Application Fee Transmittal

Application Number:	15860962			
Filing Date:	03-Jan-2018			
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS			
First Named Inventor/Applicant Name:	Kai Ying			
Filer:	Wesley L. Austin/Jessamy Newton			
Attorney Docket Number:	SLA3700			
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:	37276199
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Jessamy Newton
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	25-SEP-2019
Filing Date:	03-JAN-2018
Time Stamp:	17:18:13
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	E201990H19486822
Deposit Account	
Authorized User	

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

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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)	17190US_IssueFeeTransmittal_3292-2-305.pdf	201275	no	1
			6a00415e1894608f6855a1e8191143fba53d0a67		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30658	no	2
			c63abe8504a55e18f882562f99600668285dc599f		

Warnings:

Information:

Total Files Size (in bytes):			231933
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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.

Appl. No. 15/860,962
Amdt. dated September 25, 2019
Reply to Notice of Allowance of June 25, 2019

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/860,962	Confirmation No.:	7593
Applicant	:	Sharp Kabushiki Kaisha et al.		
First Named Inventor	:	Zhanping Yin		
Filed	:	January 3, 2018		
Art Unit	:	2472		
Examiner	:	Afsar M. Qureshi		
Docket No.	:	SLA3700		
Customer No.	:	50735		

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

AMENDMENT UNDER 37 C.F.R. § 1.312

Sir:

Under the provisions of 37 C.F.R. § 1.312, Applicant respectfully requests that the above-identified application be amended as follows:

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

Remarks begin on page 8 of this paper.

Attorney Docket No.: SLA3700
Customer No.: 50735

Amendments to the Claims:

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

Listing of Claims:

1. (Currently Amended) A user equipment (UE) that communicates with a base station apparatus, comprising:
receiving circuitry configured to receive a radio resource control (RRC) message comprising first information used for configuring a periodicity,
the receiving circuitry configured to receive a RRC message comprising second information used for configuring a numerology,
the receiving circuitry configured to detect in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and
transmitting circuitry configured to transmit confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,
the transmitting circuitry configured to perform, based on a detection of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein

the transmitting circuitry is configured to transmit confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and
the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),
the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and
the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

2. (Currently Amended) A base station apparatus that communicates with a user equipment (UE), comprising:
transmitting circuitry configured to transmit a radio resource control (RRC) message comprising first information used for configuring a periodicity,
the transmitting circuitry configured to transmit a RRC message comprising second information used for configuring a numerology,
the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and

receiving circuitry configured to receive confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein the receiving circuitry is configured to receive confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID), the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

3. (Currently Amended) A communication method of a user equipment that communicates with a base station apparatus, comprising:
receiving a radio resource control (RRC) message comprising first information used for configuring a periodicity;
receiving a RRC message comprising second information used for configuring a numerology;

detecting in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;

transmitting confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI;

performing, based on a detection of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology;

transmitting confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, wherein the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),

the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and

the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

4. (Currently Amended) A communication method of a base station apparatus that communicates with a user equipment (UE), comprising:
- transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity;
 - transmitting a RRC message comprising second information used for configuring a numerology;
 - transmitting in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for the uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;
 - receiving confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI;
 - receiving, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology;
 - receiving confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, wherein the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),

the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

Appl. No. 15/860,962
Amdt. dated September 25, 2019
Reply to Notice of Allowance of June 25, 2019

REMARKS

In a Notice of Allowance dated June 25, 2019, all pending claims were allowed. By this paper, claims 1-4 have been amended. Support for the amendments is provided by at least paragraph [0072] of Applicant's specification. Applicant respectfully requests that this claim amendment be entered under 37 C.F.R. § 1.312.

Respectfully submitted,

/Wesley L. Austin/

Wesley L. Austin
Reg. No. 42,273
Attorney for Applicant

Date: September 25, 2019

AUSTIN RAPP
170 South Main Street, Suite 735
Salt Lake City, Utah 84101
Telephone: (801) 537-1700

Electronic Acknowledgement Receipt

EFS ID:	37271211
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Jessamy Newton
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	25-SEP-2019
Filing Date:	03-JAN-2018
Time Stamp:	13:59:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		17190-US_ResponseTo25Jun2019AllowanceNotice_3292-2-305.pdf	48617	yes	8
			0b8d30f98053d62804dfb708c7a64307cf4678b5		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment after Notice of Allowance (Rule 312)	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	8

Warnings:

Information:

Total Files Size (in bytes):	48617
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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.



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

50735 7590 06/25/2019
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101

EXAMINER	
QURESHI, AFSAR M	
ART UNIT	PAPER NUMBER

2472

DATE MAILED: 06/25/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/860,962	01/03/2018	Kai Ying	SLA3700	7593

TITLE OF INVENTION: SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

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	09/25/2019

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)

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.

50735 7590 06/25/2019
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101

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.
15/860.962	01/03/2018	Kai Ying	SLA3700	7593

TITLE OF INVENTION: SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

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	09/25/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
QURESHI, AFSAR M	2472	370-310000

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,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/860,962	01/03/2018	Kai Ying	SLA3700	7593
50735	7590	06/25/2019	EXAMINER	
AUSTIN RAPP 170 SOUTH MAIN STREET SUITE 735 SALT LAKE CITY, UT 84101			QURESHI, AFSAR M	
			ART UNIT	PAPER NUMBER
			2472	

DATE MAILED: 06/25/2019

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

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

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

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

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

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

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

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. 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) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/860,962	Applicant(s) Ying et al.	
	Examiner AFSAR M QURESHI	Art Unit 2472	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 Amendments rcvd. on 6/5/2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3. ☒ The allowed claim(s) is/are 1-4. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

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

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

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

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

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

* Certified copies not received: _____.

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

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

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

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

Attachment(s)

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

/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472	6/19/2019
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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.

Response to Amendment

2. This Office Action is responsive to Amendments received on 06/05/2019.
Claims 1-4 have been amended.
Claims 1-4 are pending in the instant application.

Allowable Subject Matter

3. Claims 1-4 are allowed over the closest prior art.
The following is a statement of reasons for the indication of allowable subject matter:

As argued by the Applicant, the amended features are not disclosed by the cited prior art references taken alone or in combination. The combination of cited Documents (CATT: "Feedback for SPS PDCCH Command", 3GPP Draft; R2-156256, Vol. Ran WG2, no. Anaheim, USA; XP051005752, and OUCHI et al., US 10,080,228) fail to disclose the novel features of transmitting RRC message in DCI format with CRC scrambled by a first RNTI, the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent C-RNTI, and, receiving confirmation information identified by a MAC PDU subheader with a logical channel identifier (LCID), as claimed herein.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AFSAR M QURESHI whose telephone number is (571)272-3178. The examiner can normally be reached on M-F 8 am - 4 pm.

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 Kizou can be reached on 571 272 3088. 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.

/AFSAR M QURESHI/
Primary Examiner, Art Unit 2472
6/19/2019

Search Notes 	Application/Control No. 15/860,962	Applicant(s)/Patent Under Reexamination Ying et al.
	Examiner AFSAR M QURESHI	Art Unit 2472

CPC - Searched*		
Symbol	Date	Examiner
H04L 5/0053, 0098, 0055	02/27/2019	AQ
H04W 72/0413, 042; 48/12; 4/70	02/28/2019	AQ
H04J 2211/006	02/28/2019	AQ
updated search	06/19/2019	AQ

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

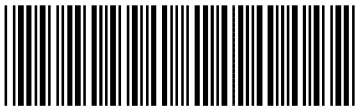
US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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, WEST, DERWENT, IEEE, IP.Com, INSPEC, PgPubs., USPAT, EPO, JPO, IBM, NPL, Text, GOOGLE	02/28/2019	AQ
updated search (112, 101)	06/19/2019	AQ

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04L	5/0053, 0098, 0055	06/19/2019	AQ
H04W	72/0413, 042; 48/12; 4/70	06/19/2019	AQ
H04J	2211/006	06/19/2019	AQ

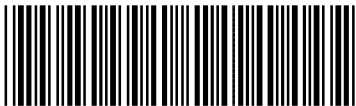
/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472	6/19/2019
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Issue Classification 	Application/Control No. 15/860,962	Applicant(s)/Patent Under Reexamination Ying et al.	
	Examiner AFSAR M QURESHI	Art Unit 2472	

CPC						
Symbol					Type	Version
H04W	/	72	/	0413	F	2013-01-01
H04W	/	72	/	042	I	2013-01-01
H04W	/	4	/	70	I	2018-02-01
H04W	/	48	/	12	I	2013-01-01
H04L	/	5	/	0053	I	2013-01-01
H04L	/	5	/	0098	I	2013-01-01
H04J	/	2211	/	006	A	2013-01-01
H04L	/	5	/	0055	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Set
	/		/		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	4	
/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472	19 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification 	Application/Control No. 15/860,962	Applicant(s)/Patent Under Reexamination Ying et al.	
	Examiner AFSAR M QURESHI	Art Unit 2472	

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04W72/04	/	72	/ 04
H04W4/70	/	4	/ 70
H04W48/12	/	48	/ 12
H04L5/00	/	5	/ 00
CPCONLY	/	NLY	/

NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE (Assistant Examiner) (Date)		Total Claims Allowed: 4	
/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472 (Primary Examiner) (Date)		19 June 2019 O.G. Print Claim(s)	1 O.G. Print Figure

Issue Classification 	Application/Control No. 15/860,962	Applicant(s)/Patent Under Reexamination Ying et al.
	Examiner AFSAR M QURESHI	Art Unit 2472

☒ 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														
	2														
	3														
	4														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 4	
/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472 (Primary Examiner) _____ (Date) 19 June 2019		O.G. Print Claim(s) 1	O.G. Print Figure 1

EAST Search History

EAST Search History (I nterference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1929	("uplink ultra-reliable low latency communications" or URLLC)	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:07
L2	54	1 and ((MAC and LCID) and (resource and periodicity))	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:10
L3	54	2 AND ((H04W72/042 OR H04W76/27 OR H04W72/0413 OR H04W74/0833 OR H04W72/14 OR H04W72/0453 OR H04W72/046 OR H04W72/1284 OR H04W88/08 OR H04W28/0278 OR H04W74/008 OR H04W76/28 OR H04W76/11 OR H04W16/28 OR H04W24/08 OR H04W52/146 OR H04W72/04 OR H04W72/1242 OR H04W72/1268 OR H04W72/1289 OR H04W74/0866 OR H04W16/32 OR H04W28/20 OR H04W48/10 OR H04W48/20 OR H04W52/228 OR H04W52/325 OR H04W68/005 OR H04W68/02 OR H04W72/0406 OR H04W72/044 OR H04W72/048 OR H04W72/06 OR H04W72/12 OR H04W72/1278 OR H04W76/10 OR H04W76/38 OR H04W80/02 OR H04W84/02 OR H04W88/02 OR H04W24/02 OR H04W24/10 OR H04W28/18 OR H04W36/0055 OR H04W36/02 OR H04W56/001 OR H04W68/025 OR H04W68/04 OR H04W74/0841 OR H04W74/085 OR H04W76/14 OR H04W88/10 OR H04W16/14 OR H04W24/04 OR H04W28/06 OR H04W36/0072 OR H04W36/0083 OR H04W36/08 OR H04W36/30 OR H04W48/12 OR H04W4/70 OR H04W52/0206 OR H04W52/0212 OR H04W52/18 OR H04W52/34 OR H04W52/38 OR H04W60/00 OR H04W68/00 OR H04W72/02 OR H04W72/0446 OR H04W72/085 OR H04W72/087 OR H04W72/10 OR H04W72/1257 OR H04W72/1294 OR H04W76/00 OR H04W76/12 OR H04W76/15 OR H04W76/18 OR H04W80/08 OR H04W84/045 OR H04W8/005 OR H04W8/18 OR H04W8/22 OR H04W8/24).CPC.)	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:10
L4	34	2 AND ((H04L5/0053 OR H04L5/0098 OR H04L5/001 OR H04L5/0048 OR H04L27/2607 OR H04L5/00 OR H04L5/0007 OR H04L5/0023 OR H04L5/0055 OR H04L27/2666 OR H04L5/0044 OR H04L5/005 OR H04L5/0057 OR H04L5/0092 OR H04L1/0026 OR H04L1/16 OR H04L1/1812 OR H04L27/2613 OR H04L41/0654 OR H04L5/0064 OR H04L5/0091 OR H04L5/0094 OR H04L1/00 OR H04L1/0071	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:10

		OR H04L1/1607 OR H04L1/1819 OR H04L1/1896 OR H04L27/2601 OR H04L27/2608 OR H04L27/2692 OR H04L47/30 OR H04L47/34 OR H04L5/0032 OR H04L5/0046 OR H04L69/04 OR H04L69/22).CPC.)				
L5	11	2 AND ((H04B7/0617 OR H04B7/0626 OR H04B7/0695 OR H04B17/309 OR H04B7/043 OR H04B7/088 OR H04B7/2603 OR H04B17/17 OR H04B7/0408).CPC.)	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:11
L6	5	2 AND ((H04J11/0076 OR H04J11/0073 OR H04J11/00 OR H04J11/0069 OR H04J13/0062 OR H04J2211/006).CPC.)	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:11
L7	54	2 AND ((H04W72/042 OR H04W76/27 OR H04W72/0413 OR H04W74/0833 OR H04W72/14 OR H04W72/0453 OR H04W72/046 OR H04W72/1284 OR H04W88/08 OR H04W28/0278 OR H04W74/008 OR H04W76/28 OR H04W76/11 OR H04W16/28 OR H04W24/08 OR H04W52/146 OR H04W72/04 OR H04W72/1242 OR H04W72/1268 OR H04W72/1289 OR H04W74/0866 OR H04W16/32 OR H04W28/20 OR H04W48/10 OR H04W48/20 OR H04W52/228 OR H04W52/325 OR H04W68/005 OR H04W68/02 OR H04W72/0406 OR H04W72/044 OR H04W72/048 OR H04W72/06 OR H04W72/12 OR H04W72/1278 OR H04W76/10 OR H04W76/38 OR H04W80/02 OR H04W84/02 OR H04W88/02 OR H04W24/02 OR H04W24/10 OR H04W28/18 OR H04W36/0055 OR H04W36/02 OR H04W56/001 OR H04W68/025 OR H04W68/04 OR H04W74/0841 OR H04W74/085 OR H04W76/14 OR H04W88/10 OR H04W16/14 OR H04W24/04 OR H04W28/06 OR H04W36/0072 OR H04W36/0083 OR H04W36/08 OR H04W36/30 OR H04W48/12 OR H04W4/70 OR H04W52/0206 OR H04W52/0212 OR H04W52/18 OR H04W52/34 OR H04W52/38 OR H04W60/00 OR H04W68/00 OR H04W72/02 OR H04W72/0446 OR H04W72/085 OR H04W72/087 OR H04W72/10 OR H04W72/1257 OR H04W72/1294 OR H04W76/00 OR H04W76/12 OR H04W76/15 OR H04W76/18 OR H04W80/08 OR H04W84/045 OR H04W8/005 OR H04W8/18 OR H04W8/22 OR H04W8/24 OR H04L5/0053 OR H04L5/0098 OR H04L5/001 OR H04L5/0048 OR H04L27/2607 OR H04L5/00 OR H04L5/0007 OR H04L5/0023 OR H04L5/0055 OR H04L27/2666 OR H04L5/0044 OR H04L5/005 OR H04L5/0057 OR H04L5/0092 OR H04L1/0026 OR H04L1/16 OR H04L1/1812 OR H04L27/2613 OR H04L41/0654 OR H04L5/0064 OR H04L5/0091 OR H04L5/0094 OR H04L1/00 OR H04L1/0071 OR H04L1/1607 OR H04L1/1819 OR H04L1/1896 OR H04L27/2601 OR H04L27/2608 OR H04L27/2692 OR H04L47/30 OR H04L47/34 OR H04L5/0032 OR H04L5/0046 OR H04L69/04 OR H04L69/22 OR	US-PGPUB; USPAT	ADJ	OFF	2019/06/19 08:11

		H04B7/0617 OR H04B7/0626 OR H04B7/0695 OR H04B17/309 OR H04B7/043 OR H04B7/088 OR H04B7/2603 OR H04B17/17 OR H04B7/0408 OR H04J11/0076 OR H04J11/0073 OR H04J11/00 OR H04J11/0069 OR H04J13/0062 OR H04J2211/006).CPC.)				
L8	0	3 and ((RRC message) same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:14
L9	0	4 and ((RRC message) same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:14
L10	0	5 and ((RRC message) same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:14
L11	0	6 and ((RRC message) same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:14
L12	0	7 and ((RRC message) same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:14
L13	0	7 and ((DCI and C-RNTI) same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:15
L14	0	7 and (periodicity same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:17
L15	10	(periodicity same numerology).clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:18
L16	7	15 and H04W72/\$.cpc.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:18
L17	4	15 and H04W72/0413,042.cpc.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:18
L18	4	15 and H04L5/0053,0098,0055.cpc.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:19
L19	0	17 and (DCI and C-RNTI) .clm.	US- PGPUB; USPAT	ADJ	OFF	2019/06/19 08:20

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/860,962	Filing Date 01/03/2018	☐ To be Mailed
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ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)	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), (l), 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 \$80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 = *		x \$420 =	
☐ 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)	RATE (\$)	ADDITIONAL FEE (\$)
AMENDMENT	06/05/2019		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	
	Total (37 CFR 1.16(i))	* 4	Minus	** 20	= 0	x \$100 = 0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 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
AMENDMENT			CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	
	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".						/GAIL D WOOTEN/
*** 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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Appl. No. 15/860,962
Amdt. dated June 5, 2019
Reply to Office Action of March 5, 2019

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	15/860,962	Confirmation No.:	7593
Applicant	:	Sharp Kabushiki Kaisha		
First Named Inventor	:	Kai Ying		
Filed	:	January 3, 2018		
Art Unit	:	2472		
Examiner	:	Afsar M. Qureshi		
Docket No.	:	SLA3700		
Customer No.	:	50735		

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

AMENDMENT

Sir:

In response to the Office Action dated March 5, 2019, please amend the above-identified application as follows:

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

Remarks/Arguments begin on page 9 of this paper.

Attorney Docket No.: SLA3700
Customer No.: 50735

Electronic Acknowledgement Receipt

EFS ID:	36214437
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Jessamy Newton
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	05-JUN-2019
Filing Date:	03-JAN-2018
Time Stamp:	17:31:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SLA3700_ResponseTo05Mar2019OfficeAction_3292-2-305.pdf	121492 70ab1aa1b19c30ddbc1b5ca4c7f7d485d08a39a3	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Applicant Arguments/Remarks Made in an Amendment	9	11
	Claims	2	8
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1

Warnings:

Information:

Total Files Size (in bytes):	121492
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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.

REMARKS/ARGUMENTS

In the Office Action dated March 5, 2019 (hereinafter, "Office Action"), claims 1–4 were rejected under 35 U.S.C. § 103. By this paper, claims 1-4 are being amended.

Applicant respectfully responds to the Office Action.

I. Claims 1–4 Rejected Under 35 U.S.C. § 103

Claims 1–4 stand rejected under 35 U.S.C. § 103 based on CATT: "Feedback for SPS PDCCH command" R2-156256 (hereinafter, "R2-156256") in view of U.S. Patent No. 10,080,228 to Ouchi et al. (hereinafter, "Ouchi"). Applicant respectfully requests reconsideration in view of the above claim amendments and the following remarks.

The factual inquiries that are relevant in the determination of obviousness are determining the scope and contents of the prior art, ascertaining the differences between the prior art and the claims in issue, resolving the level of ordinary skill in the art, and evaluating evidence of secondary considerations. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)). As the Board of Patent Appeals and Interferences has confirmed, "obviousness requires a suggestion of all limitations in a claim." *Ex parte Wada & Murphy*, No. 2007-3733 (B.P.A.I. Jan. 14, 2008) (citing *CFMT, Inc. v. Yieldup Int'l Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003)).

Claim 1 has been amended as shown above. This amendment is supported by at least paragraphs [0057], [0058], [0060], [0073], [0085], [0086] and [00103] of the originally-filed specification. The combination of R2-156256 and Ouchi does not teach or suggest this claimed subject matter.

Claim 1, as amended, recites claim subject matter that includes the following:

the receiving circuitry configured to detect in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission

on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and
transmitting circuitry configured to transmit confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,
the transmitting circuitry configured to perform, based on a detection of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein
the transmitting circuitry is configured to transmit confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and
the confirmation MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),
the confirmation MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and
the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

R2-156256 does not teach or suggest this subject matter. Rather, R2-156256 observes that the “UE does not skip the first available SPS occasion (i.e. UE send UL data or padding while no UL data in buffer in the occasion) after the PDCCH deactivation command is not enough for eNB to distinguish PDCCH reception from PDCCH missing.” (R2-156256, page 3.) It then goes on to propose that “RAN2 to consider introducing new MAC CE to acknowledge the reception of PDCCH activation/deactivation command for SPS while skip UL transmission with no data in buffer feature is active.” (*Id.*) However, this does not teach or suggest claim 1, as amended. Furthermore, Ouchi does not disclose claim 1, as amended.

For at least the foregoing reasons, Applicant respectfully submits that amended claim 1 is allowable.

Amended claim 2 recites corresponding features as claim 1. As discussed above, the combination of R2-156256 and Ouchi does not teach or suggest this claimed subject matter. Accordingly, Applicant respectfully submits that amended claim 2 is allowable.

Amended claim 3 recites corresponding features as claim 1. As discussed above, the combination of R2-156256 and Ouchi does not teach or suggest this claimed subject matter. Accordingly, Applicant respectfully submits that amended claim 3 is allowable.

Amended claim 4 recites corresponding features as claim 1. As discussed above, the combination of R2-156256 and Ouchi does not teach or suggest this claimed subject matter. Accordingly, Applicant respectfully submits that amended claim 4 is allowable.

CONCLUSION

In view of the foregoing, Applicant respectfully submits that all pending claims in the present application are in a condition for allowance, which is earnestly solicited. Should any issues remain unresolved, the Examiner is encouraged to telephone the undersigned at the number provided below.

Respectfully submitted,

/Wesley L. Austin/

Wesley L. Austin
Reg. No. 42,273
Attorney for Applicant

Date: June 5, 2019

AUSTIN RAPP
170 South Main Street, Suite 735
Salt Lake City, Utah 84101
Telephone: (801) 537-1700

Amendments to the Claims:

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

Listing of Claims:

1. (Currently Amended) A user equipment (UE) that communicates with a base station apparatus, comprising:
receiving circuitry configured to receive, ~~from a base station apparatus,~~ a radio resource control (RRC) message including comprising first information used for configuring a periodicity ~~for an uplink data transmission,~~
the receiving circuitry configured to receive a RRC message comprising second information used for configuring a numerology,
the receiving circuitry configured to ~~receive on~~ detect in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent C-RNTI, the first RNTI being from the base station apparatus,
~~second information~~ used for indicating an activation and a deactivation for [[the]] an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and
transmitting circuitry configured to transmit, ~~to the base station apparatus,~~ confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI for the second information,
the transmitting circuitry configured to perform, based on a detection of the DCI format comprising the third information on a physical uplink shared channel, ~~to the base station apparatus,~~ the uplink data transmission on the PUSCH based on the

periodicity and the numerology ~~first information and the second information,~~
wherein
~~the receiving circuitry is configured to receive on the physical downlink control channel,~~
~~from the base station apparatus, third information used for indicating a~~
~~deactivation for the uplink data transmission,~~
the transmitting circuitry is configured to transmit, ~~to the base station apparatus,~~
confirmation information MAC CE in a case that fourth information used for
indicating the deactivation for the uplink data transmission on the PUSCH is
comprised in the DCI format with the CRC scrambled by the first RNTI ~~for the~~
~~third information,~~ and
the confirmation MAC CE for the DCI format comprising the third information is
identified by a MAC protocol data unit (MAC PDU) subheader with the same
~~index of a~~ logical channel identifier (LCID),
the confirmation MAC CE for the DCI format comprising the fourth information is
identified by the MAC PDU subheader with the LCID, and
the same index of the LCID is used for identifying the confirmation information MAC
CE for the DCI format comprising the third information ~~second information and~~
the confirmation information MAC CE for the DCI format comprising the fourth
information ~~third information.~~

2. (Currently Amended) A base station apparatus that communicates with a user equipment
(UE), comprising:
transmitting circuitry configured to transmit, ~~to a user equipment,~~ a radio resource control
(RRC) message including comprising first information used for configuring a
periodicity ~~for an uplink data transmission,~~
the transmitting circuitry configured to transmit a RRC message comprising second
information used for configuring a numerology,

the transmitting circuitry configured to transmit ~~[[on]]~~ in a common search space of a physical downlink control channel, to the user equipment, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent C-RNTI, the first RNTI being second information used for indicating an activation and a deactivation for ~~[[the]]~~ an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and

receiving circuitry configured to receive, ~~from the user equipment,~~ confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI for the second information,

the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH on a physical uplink shared channel, from the user equipment, the uplink data transmission based on the periodicity and the numerology first information and the second information, wherein

~~the transmitting circuitry is configured to transmit on the physical downlink control channel, to the user equipment, third information used for indicating a deactivation for the uplink data transmission,~~

the receiving circuitry is configured to receive, ~~from the user equipment,~~ confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI for the third information, and

the confirmation MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with the same index of a logical channel identifier (LCID),
the confirmation MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and
the same index of the LCID is used for identifying the confirmation information MAC CE for the DCI format comprising the third information second information and the confirmation information MAC CE for the DCI format comprising the fourth information third information.

3. (Currently Amended) A communication method of a user equipment that communicates with a base station apparatus, comprising:
receiving, from a base station apparatus, a radio resource control (RRC) message including comprising first information used for configuring a periodicity for an uplink data transmission;
receiving a RRC message comprising second information used for configuring a numerology;
receiving on detecting in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent C-RNTI, the first RNTI being from the base station apparatus, second information used for indicating an activation and a deactivation for [[the]] an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;
transmitting, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is

comprised in the DCI format with the CRC scrambled by the first RNTI for the
second information;
performing, based on a detection of the DCI format comprising the third information on a
physical uplink shared channel, to the base station apparatus, the uplink data
transmission on the PUSCH based on the periodicity and the numerology first
information and the second information;
receiving on the physical downlink control channel, from the base station apparatus, third
information used for indicating a deactivation for the uplink data transmission;
and
transmitting, to the base station apparatus, confirmation information MAC CE in a case
that fourth information used for indicating the deactivation for the uplink data
transmission on the PUSCH is comprised in the DCI format with the CRC
scrambled by the first RNTI for the third information, wherein
the confirmation MAC CE for the DCI format comprising the third information is
identified by a MAC protocol data unit (MAC PDU) subheader with the same
index of a logical channel identifier (LCID),
the confirmation MAC CE for the DCI format comprising the fourth information is
identified by the MAC PDU subheader with the LCID, and
the same index of the LCID is used for identifying the confirmation information MAC
CE for the DCI format comprising the third information second information and
the confirmation information MAC CE for the DCI format comprising the fourth
information third information.

4. (Currently Amended) A communication method of a base station apparatus that
communicates with a user equipment (UE), comprising:
transmitting, to a user equipment, a radio resource control (RRC) message including
comprising first information used for configuring a periodicity for an uplink data
transmission;

transmitting a RRC message comprising second information used for configuring a numerology;

transmitting [[on]] in a common search space of a physical downlink control channel, to the user equipment, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent C-RNTI, the first RNTI being second information used for indicating an activation and a deactivation for the uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;

receiving, from the user equipment, confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI for the second information;

receiving, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH on a physical uplink shared channel, from the user equipment, the uplink data transmission based on the periodicity and the numerology first information and the second information;

transmitting on the physical downlink control channel, to the user equipment, third information used for indicating a deactivation for the uplink data transmission;
and

receiving, from the user equipment, confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI for the third information, wherein

the confirmation MAC CE for the DCI format comprising the third information is
identified by a MAC protocol data unit (MAC PDU) subheader with the same
index of a logical channel identifier (LCID),
the confirmation MAC CE for the DCI format comprising the fourth information is
identified by the MAC PDU subheader with the LCID, and
the same index of the LCID is used for identifying the confirmation information MAC
CE for the DCI format comprising the third information second information and
the confirmation information MAC CE for the DCI format comprising the fourth
information third information.



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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
15/860,962	01/03/2018	2472	2160	SLA3700	4	4

50735
AUSTIN RAPP
170 SOUTH MAIN STREET
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SALT LAKE CITY, UT 84101

CONFIRMATION NO. 7593
REPLACEMENT FILING RECEIPT



Date Mailed: 05/30/2019

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)

Kai Ying, Vancouver, WA;
Toshizo Nogami, Vancouver, WA;
Tatsushi Aiba, Vancouver, WA;
John Michael Kowalski, Vancouver, WA;
Zhanping Yin, Vancouver, WA;
Jia Sheng, Vancouver, WA;

Applicant(s)

Sharp Kabushiki Kaisha, Sakai City, JAPAN;
FG Innovation Company Limited, Hong Kong, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 50735

Domestic Priority data as claimed by applicant

This application is a CON of PCT/US2018/012039 01/02/2018
and claims benefit of 62/443,464 01/06/2017

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

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 01/25/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/860,962**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA
RELIABLE LOW LATENCY COMMUNICATIONS

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 37, Code of Federal Regulations, 5.11 & 5.15

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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.

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NOT GRANTED

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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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/860,962	01/03/2018	Kai Ying	SLA3700

CONFIRMATION NO. 7593

POA ACCEPTANCE LETTER

50735
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101



Date Mailed: 05/30/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/24/2019.

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

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

/fstephanos/

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

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

Application Number	15/860,962
Filing Date	01/03/2018
First Named Inventor	Kai Ying
Title	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
Art Unit	2472
Examiner Name	Afsar M. Qureshi
Attorney Docket Number	SLA3700

SIGNATURE of Applicant or Patent Practitioner

Signature	/Wesley L. Austin/	Date (Optional)	05/24/2019
Name	Wesley L. Austin	Registration Number	42273
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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



*Total of 2 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Doc Code: PA.
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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 BY APPLICANT

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

Application Number

Filing Date

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



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

50735

OR



I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

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



The address associated with the above-mentioned Customer Number

OR



The address associated with Customer Number:

OR



Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

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

FG Innovation Company Limited



Inventor or Joint Inventor (title not required below)



Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)



Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)



Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

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

Signature

Date (Optional)

Name

CHIE-MING CHOU

Title

CEO

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



Total of 3 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Kai Ying et al.Application No./Patent No.: 15/860,962Filed/Issue Date: 01/03/2018Titled: SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

FG Innovation Company Limited, 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 63%. 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 _____, Frame _____, or for which a copy thereof is attached.
- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Kai Ying et al. To: Sharp Laboratories of America, Inc.The document was recorded in the United States Patent and Trademark Office at
Reel 044666, Frame 0907, or for which a copy thereof is attached.2. From: Sharp Laboratories of America, Inc. To: Sharp Kabushiki KaishaThe document was recorded in the United States Patent and Trademark Office at
Reel 045982, Frame 0251, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

STATEMENT UNDER 37 CFR 3.73(c)

3. From: Sharp Kabushiki Kaisha To: Sharp Kabushiki Kaisha and FG Innovation Company Limited

The document was recorded in the United States Patent and Trademark Office at
Reel 049218, Frame 0383, 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.

/Wesley L. Austin/

05/24/2019

Signature

Date

Wesley L. Austin

42273

Printed or Typed Name

Title or Registration Number

Electronic Acknowledgement Receipt

EFS ID:	36111319
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Jessamy Newton
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	24-MAY-2019
Filing Date:	03-JAN-2018
Time Stamp:	15:13:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	SLA3700_RequestToChangeAp plicant_3292-2-305.pdf	21912	no	1
			534fa333a1d9899369b2f237d70f7e28ca61 8a9d		

Warnings:

Information:					
2	Application Data Sheet	SLA3700_SupplementalApplicationDataSheet_3292-2-305.pdf	183334	no	10
			ebc0baafc1ce24fd8f287a7a3cc310af2725a50b		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3	Power of Attorney	SLA3700_PowerOfAttorney_SharKabushikiKaisha_3292-2-305.pdf	250082	no	3
			fabe45936a9d5aa2204fcd03434d83175ec96f7e		
Warnings:					
Information:					
4	Power of Attorney	SLA3700_PowerOfAttorney_FGIInnovation_3292-2-305.pdf	320786	no	2
			42e86d1709b8b697afd9ae8ca3680ab438296adb		
Warnings:					
Information:					
5	Assignee showing of ownership per 37 CFR 3.73	SLA3700_StatementUnder37CFR3-73c_FGIInnovation_3292-2-305.pdf	73539	no	2
			461723c65c70e1ac8e7644e1241a57e5a262b22e		
Warnings:					
Information:					
Total Files Size (in bytes):			849653		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 15/860,962 Confirmation No.: 7593
Applicant : Sharp Laboratories of America, Inc.
First Named Inventor : Kai Ying
Filed : January 3, 2018
Art Unit : 2472
Examiner : Afsar M. Qureshi
Docket No. : SLA3700
Customer No. : 50735

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

REQUEST TO CHANGE APPLICANT

Sir:

Applicant hereby requests under 37 CFR 1.46(c) to change the Applicant from Sharp Laboratories of America, Inc. to Sharp Kabushiki Kaisha and FG Innovation Company Limited. A supplemental Application Data Sheet and Power of Attorney documents in support of this request are filed concurrently herewith.

Respectfully submitted,

/Wesley L. Austin/

Wesley L. Austin
Reg. No. 42,273
Attorney for Applicant

Date: May 24, 2019

AUSTIN RAPP
170 South Main Street, Suite 735
Salt Lake City, Utah 84101
Telephone: (801) 537-1700

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		
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	
	Kai		Ying		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Vancouver	State/Province	WA	Country of Residence	
				US	
Mailing Address of Inventor:					
Address 1	17412 SE 22nd St				
Address 2					
City	Vancouver	State/Province	WA		
Postal Code	98683	Country	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Toshizo		Nogami		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Vancouver	State/Province	WA	Country of Residence	
				US	
Mailing Address of Inventor:					
Address 1	620 SE 168th Avenue				
Address 2					
City	Vancouver	State/Province	WA		
Postal Code	98684	Country	US		
Inventor 3					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Tatsushi		Aiba		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		SLA3700	
		Application Number		15/860,962	
Title of Invention		SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS			

City	Vancouver	State/Province	WA	Country of Residence	US
------	-----------	----------------	----	----------------------	----

Mailing Address of Inventor:

Address 1	600 SE 177th Ave.				
Address 2	Apt. K109				
City	Vancouver	State/Province	WA		
Postal Code	98683	Country	US		

Remove

Inventor 4					
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	John	Michael	Kowalski		

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Vancouver	State/Province	WA	Country of Residence	US
------	-----------	----------------	----	----------------------	----

Mailing Address of Inventor:

Address 1	19116 NE 29th Drive				
Address 2					
City	Vancouver	State/Province	WA		
Postal Code	98684	Country	US		

Remove

Inventor 5					
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Zhanping		Yin		

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Vancouver	State/Province	WA	Country of Residence	US
------	-----------	----------------	----	----------------------	----

Mailing Address of Inventor:

Address 1	2104 SE 187th Avenue				
Address 2					
City	Vancouver	State/Province	WA		
Postal Code	98683	Country	US		

Remove

Inventor 6					
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jia		Sheng		

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Vancouver	State/Province	WA	Country of Residence	US
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700	
		Application Number	15/860,962	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS			
Mailing Address of Inventor:				
Address 1		16019 NE 14th Circle		
Address 2				
City	Vancouver	State/Province	WA	
Postal Code	98684	Country ¹	US	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.				

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	50735		
Email Address	uspto@austin-rapp.com	Add Email	Remove Email

Application Information:

Title of the Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		
Attorney Docket Number	SLA3700	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	21	Suggested Figure for Publication (if any)	20

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3700
	Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS	

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	50735		

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	PCTUS2018012039	2018-01-02
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62443464	2017-01-06
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove
			Access Code ^j (if applicable)

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3700
	Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS	

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

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3700
	Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

- ☒ Assignee
 ☐ Legal Representative under 35 U.S.C. 117
 ☐ Joint Inventor
- ☐ Person to whom the inventor is obligated to assign.
 ☐ Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name ~~Sharp Laboratories of America, Inc.~~ Sharp Kabushiki Kaisha

Mailing Address Information For Applicant:

Address 1	~~5750 NW Pacific Rim Boulevard~~	<u>1, Takumi-cho</u>
Address 2		
City	~~Gamas Sakai-ku, Sakai City, Osaka~~	State/Province ~~WA~~
Country	~~US~~ <u>JP</u>	Postal Code ~~98607~~ <u>590-8522</u>
Phone Number		Fax Number
Email Address		

Additional Applicant Data may be generated within this form by selecting the Add button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3700
	Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS	

Applicant 2

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

[Clear](#)

☒ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor
☐ Person to whom the inventor is obligated to assign.	☐ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name

FG Innovation Company Limited

Mailing Address Information For Applicant:

Address 1	Flat 2623, 26/F Tuen Mun Central Square		
Address 2	22 Hoi Wing Road, Tuen Mun		
City	New Territories, Hong Kong	State/Province	
Country	CN	Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	15/860,962
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		State/Province	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Wesley L. Austin/		Date (YYYY-MM-DD)	2019-05-24
First Name	Wesley L.	Last Name	Austin	Registration Number
42273				

Additional Signature may be generated within this form by selecting the Add button.

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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.

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:



Practitioners associated with Customer Number:

50735

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 assignments 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:



The address associated with Customer Number:

50735

OR

☐	Firm or Individual Name			
	Address			
	City	State	Zip	
	Country			
	Telephone	Email		

Assignee Name and Address: Sharp Kabushiki Kaisha
1 Takumi-cho, Sakai-ku
Sakai City, Osaka 590-8522, Japan

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	27, Dec. 2017
Name	Mototaka Taneya	Telephone	360 834-8754
Title	Managing Officer, BU President, Corporate Research & Development BU		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Kai Ying et al.Application No./Patent No.: 15/860,962Filed/Issue Date: 01/03/2018Titled: SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONSSharp Kabushiki Kaisha, 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 37%. 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 _____, Frame _____, or for which a copy thereof is attached.
- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Kai Ying et al. To: Sharp Laboratories of America, Inc.The document was recorded in the United States Patent and Trademark Office at
Reel 044666, Frame 0907, or for which a copy thereof is attached.2. From: Sharp Laboratories of America, Inc. To: Sharp Kabushiki KaishaThe document was recorded in the United States Patent and Trademark Office at
Reel 045982, Frame 0251, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

STATEMENT UNDER 37 CFR 3.73(c)

3. From: Sharp Kabushiki Kaisha To: Sharp Kabushiki Kaisha and FG Innovation Company Limited

The document was recorded in the United States Patent and Trademark Office at
Reel 049218, Frame 0383, 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.

/Wesley L. Austin/

05/24/2019

Signature

Date

Wesley L. Austin

42273

Printed or Typed Name

Title or Registration Number



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/860,962	01/03/2018	Kai Ying	SLA3700	7593
50735	7590	03/05/2019		
AUSTIN RAPP 170 SOUTH MAIN STREET SUITE 735 SALT LAKE CITY, UT 84101			EXAMINER QURESHI, AFSAR M	
			ART UNIT	PAPER NUMBER
			2472	
			NOTIFICATION DATE	DELIVERY MODE
			03/05/2019	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):

usptocorrespondence@austin-rapp.com

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. This Office Action is responsive to application filed on 01/03/2018.

Claims 1-4 are present in the application.

Claim Rejections - 35 USC § 103

3. 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.

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

5. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly

owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

6. Claims 1-4 are rejected under 35 U.S.C. 103 as being unpatentable over CATT: "Feedback for SPS PDCCH command", 3GPP DRAFT; **R2-156256**, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), vol. RAN WG2, no. Anaheim, USA; 20151116 - 20151120 16 November 2015 (2015-11-16), XP051005752 (hereinafter "**R2-156256**") in view of OUCHI et al. (US 10,080,228) ("Ouchi" hereinafter).

Claims 1-4. The document **R2-156256 [identified by the Applicant –**

PCT/US2018/012939] discloses "A user equipment, UE, comprising:

‘receiving circuitry configured to receive, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission’ (**see message 1 in Figure 1**, RRC including first information ‘semi-persistent scheduling’ (SPS) for configuring a periodicity),

‘the receiving circuitry configured to receive on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission’ (**see message 2 in Figure 1**, second information, which is activation); and

‘transmitting circuitry configured to transmit, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second

information (**see message 3 in Figure 1 and proposal "S2: introduce new MAC CE for PDCCH command" in section 2**),

'the transmitting circuitry configured to perform on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information' (**see message 4 in Figure 1**, PUSCH, UE transmits UL data on these SPS resource at SPS occasion), wherein

'the receiving circuitry is configured to receive on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission' (**see message 5 In Figure 1**, third information as SPS deactivation where eNB explicitly deactivates the SPS resource via PDCCH command),

'the transmitting circuitry is configured to transmit, to the base station apparatus, confirmation information MAC CE for the third information' (**see message 6 In Figure 1 and proposal "S2i Introduce new MAC CE for PDCCH command" in section 2**), and

'a MAC protocol data unit sub header with the same index of logical channel identifier, LCID, is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information (**see proposal "S2: Introduce new MAC CE for PDCCH command" in section 2**, disclosing introduction of a new LCID value for the new MAC CE used for confirming

reception of SPS PDCCH commands, including both SPS activation and SPS release commands)."

Document **R2-156256** does not explicitly disclose the receiving/transmitting circuitry in UE and eNB. However, UE and eNB or Base Stations are known to have the above capabilities (of receiving/transmitting) such as disclosed and claimed by Ouchi (see, for example, claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to be able to interpret both UE and eNB of **R2-156256** having the receiving circuitry and transmitting circuitry, performing functions as discussed above, which is a common knowledge disclosed by Ouchi .

Claims 2-4 contain a corresponding feature combination as claim 1 in terms of a similar (unconcise) method and apparatuses Therefore, same considerations as made in respect of independent claim 1 are also valid for claims 2-4.

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

Suzuki et al. (US 2016/0380742)

ISLAM et al. (US 2018/0083758)

Bhushan et al. (US 2016/0150532)

Chen et al. (US 2017/0215186)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AFSAR M QURESHI whose telephone number is (571)272-3178. The examiner can normally be reached on M-F 8 am - 4 pm.

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 Kizou can be reached on 571 272 3088. 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.

/AFSAR M QURESHI/
Primary Examiner, Art Unit 2472
2/27/2019

<i>Notice of References Cited</i>	Application/Control No. 15/860,962		Applicant(s)/Patent Under Reexamination Ying et al.	
	Examiner AFSAR M QURESHI		Art Unit 2472	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-10080228-B2	09-2018	Ouchi; Wataru	H04B1/713	1/1
*	B	US-20160380742-A1	12-2016	SUZUKI; Shoichi	H04L5/001	370/280
*	C	US-20160150532-A1	05-2016	Bhushan; Naga	H04L1/1812	370/336
*	D	US-20180083758-A1	03-2018	ISLAM; TOUFIQUL	H04L5/0083	1/1
*	E	US-20170215186-A1	07-2017	Chen; Wanshi	H04W72/0446	1/1
	F					
	G					
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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	CATT,"Feedback for SPS PDCCH command,"3GPP TSG RAN WG2 #92, Anaheim, USA, R2-156256, 20 Nov. 2015 , XP051005752, Retrieved from: URL: http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN2/Docs/
	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.

<i>Search Notes</i> 	Application/Control No. 15/860,962	Applicant(s)/Patent Under Reexamination Ying et al.
	Examiner AFSAR M QURESHI	Art Unit 2472

CPC - Searched*		
Symbol	Date	Examiner
H04L 5/0053, 0098, 0055	02/27/2019	AQ
H04W 72/0413, 042; 48/12; 4/70	02/28/2019	AQ
H04J 2211/006	02/28/2019	AQ

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, WEST, DERWENT, IEEE, IP.Com, INSPEC, PgPubs., USPAT, EPO, JPO, IBM, NPL, Text, GOOGLE	02/28/2019	AQ

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

/AFSAR M QURESHI/ Primary Examiner, Art Unit 2472	2/28/2019
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	186	(low latency communication).ti.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 20:57
S2	516	(low latency communication).ab.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 20:58
S3	61	S1 and (UE and ("base station" or BS or eNB or "node"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:00
S4	3868	((low latency communication) or URLLC)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:01
S5	1601	S4 and (UE and ("base station" or BS or eNB or "node"))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:01
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		H04L1/1851 OR H04L1/1874 OR H04L1/1883 OR H04L1/20 OR H04L1/203 OR H04L2025/03414 OR H04L25/03006 OR H04L25/03159 OR H04L25/03866 OR H04L27/26 OR H04L27/2607 OR H04L27/2611 OR H04L27/2627 OR H04L27/2676 OR H04L27/30 OR H04L41/08 OR H04L41/0803 OR H04L43/08 OR H04L47/2433 OR H04L49/9005 OR H04L49/9052 OR H04L5/0012 OR H04L5/0041 OR H04L5/006 OR H04L5/0076 OR H04L5/0091 OR H04L5/0098 OR H04L5/14 OR H04L5/143 OR H04L61/2069 OR H04L69/323).CPC.)				
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S9	54	S5 AND ((H04J11/0069 OR H04J13/0062 OR H04J11/0023 OR H04J11/0076 OR H04J1/06 OR H04J2011/0009).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:04
S10	40	S3 and S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:05
S11	4	S10 and (RRC and PDCCH and PUSCH and PDCCH)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:06
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S13	0	S11 and (MAC CE)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	OFF	2019/02/27 21:06

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S15	0	S10 and (MAC and LCID)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:07
S16	70	S6 and (MAC and LCID)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:07
S17	54	S16 and (MAC CE)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:07
S18	167	(Ying Kai).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:08
S20	1718	(Aiba Tatsushi).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:09
S21	1197	(Nogami Toshizo).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:09
S23	156	(Kowalski, John Michael).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:10
S24	442	(yin Zhanping).in.	US-PGPUB; USPAT; USOCR;	ADJ	OFF	2019/02/27 21:10

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S25	274	(Sheng Jia).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:11
S26	7737	(receiv\$3 same ("radio resource control" or RRC)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:12
S27	7	S26 and ((first information) same periodicity).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:13
S28	1	S27 and ((second information) same activat\$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:14
S29	4	S18 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:15
S30	7	S20 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:16
S31	4	S21 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:16
S32	3	S23 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:16
S33	2	S24 and S27	US-PGPUB;	ADJ	OFF	2019/02/27

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			21:16
S34	1	S25 and S27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:16
S35	7	S27 and transmit\$3.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 21:50
S36	1	S35 and LCID	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 22:04
S37	42	S3 and S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 22:25
S38	0	S37 and (MAC and LCID)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 22:26
S39	10	S37 and (receiv\$3 same ("radio resource control" or RRC))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 22:26
S40	0	S39 and S28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	OFF	2019/02/27 22:26
S41	0	S39 and ((second information) same activat\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	ADJ	OFF	2019/02/27 22:27

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Approved for use through 07/31/2016. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	15860962
Filing Date	2018-01-03
First Named Inventor	Kai Ying
Art Unit	2464
Examiner Name	Ricky Quoc Ngo
Attorney Docket Number	SLA3700

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.M.Q/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15860962
Filing Date	2018-01-03
First Named Inventor	Kai Ying
Art Unit	2464
Examiner Name	Ricky Quoc Ngo
Attorney Docket Number	SLA3700

1	International Search Report and Written Opinion issued for PCT Application No. PCT/US2018/012039 on 26 Mar 2018
2	CATT, "Feedback for SPS PDCCH command," 3GPP TSG RAN WG2 #92, Anaheim, USA, R2-156256, 20 Nov 2015
3	Nokia, Alcatel-Lucent Shanghai Bell, "Skipping empty BSR and feedback for SPS activation/deactivation," 3GPP TSG-RAN WG2 Meeting #93bis, Dubrovnik, Croatia, R2-162504, 15 Apr 2016

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/AFSAR M QURESHI/	Date Considered	02/27/2019
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.M.Q/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15860962
Filing Date	2018-01-03
First Named Inventor	Kai Ying
Art Unit	2464
Examiner Name	Ricky Quoc Ngo
Attorney Docket Number	SLA3700

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Wesley L. Austin/	Date (YYYY-MM-DD)	2018-05-14
Name/Print	Wesley L. Austin	Registration Number	42273

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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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Bibliographic Data

Application No: 15/860,962

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /AFSAR M QURESHI/

Examiner's Signature

Initials

Title:

SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/03/2018	370	2472	SLA3700
RULE			

APPLICANTS

Sharp Laboratories of America, Inc., Camas, WA,

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Zhanping Yin Vancouver, WA, UNITED STATES

Jia Sheng Vancouver, WA, UNITED STATES

CONTINUING DATA

This application is a CON of PCT/US2018/012039 01/02/2018

This application has PRO of 62443464 01/06/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

01/25/2018

STATE OR COUNTRY

UNITED STATES

ADDRESS

AUSTIN RAPP

170 SOUTH MAIN STREET

SUITE 735

SALT LAKE CITY, UT 84101

UNITED STATES

FILING FEE RECEIVED

\$2,160

Doc code: IDS

PTO/SB/08a (03-15)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2016. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Filing Date	
First Named Inventor	Kai Ying
Art Unit	
Examiner Name	
Attorney Docket Number	SLA3700

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Application Number	
Filing Date	
First Named Inventor	Kai Ying
Art Unit	
Examiner Name	
Attorney Docket Number	SLA3700

1	3GPP TR 38.913 v0.3.0, "Study on Scenarios and Requirements for Next Generation Access Technologies (Release 14)," Mar 2016
2	3GPP TR 22.862 v1.0.0, "Feasibility Study on New Services and Markets Technology Enablers Critical Communications; Stage 1 (Release 14)," Feb 2016
3	Huawei, HiSilicon, "Overview of URLLC support in NR", 3GPP TSG RAN WG1 meeting #86bis, Lisbon, Portugal, R1-1608843, 14 Oct 2016
4	"RAN1 Chairman's Notes," 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal 14 Oct 2016
5	3GPP TS 36.331, V14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 14) Sep 2016
6	3GPP TS 36.321, V14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC); Protocol specification (Release 14) Sep 2016
7	Huawei, HiSilicon, "Overview of UL URLLC Support in NR," 3GPP TSG-RAN WG1 Meeting #87, Reno, USA, R1-1611220, 18 Nov 2016
8	Nokia, Alcatel-Lucent Shanghai Bell, "Enhanced semi-persistent scheduling for 5G URLLC," 3GPP TSG RAN WG1 #87, Reno, USA, R1-1612251, 18 Nov 2016
9	LG Electronics, "Discussion on control and data transmission of URLLC", 3GPP TSG RAN WG1 Meeting #87, Reno, USA, R1-1611850, 18 Nov 2016
10	3GPP TS 36.213 V14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14), Sep 2016

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Application Number		
Filing Date		
First Named Inventor	Kai Ying	
Art Unit		
Examiner Name		
Attorney Docket Number	SLA3700	

EXAMINER SIGNATURE

Examiner Signature	/AFSAR M QURESHI/	Date Considered	02/27/2019
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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Wesley L. Austin/	Date (YYYY-MM-DD)	2018-01-03
Name/Print	Wesley L. Austin	Registration Number	42273

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/860,962	01/03/2018	Kai Ying	SLA3700

CONFIRMATION NO. 7593

PUBLICATION NOTICE



OC000000100931413

50735
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101

Title:SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA
RELIABLE LOW LATENCY COMMUNICATIONS

Publication No.US-2018-0199334-A1

Publication Date:07/12/2018

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15860962
	Filing Date		2018-01-03
	First Named Inventor	Kai Ying	
	Art Unit	2464	
	Examiner Name	Ricky Quoc Ngo	
	Attorney Docket Number	SLA3700	

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STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	15860962
Filing Date	2018-01-03
First Named Inventor	Kai Ying
Art Unit	2464
Examiner Name	Ricky Quoc Ngo
Attorney Docket Number	SLA3700

1	International Search Report and Written Opinion issued for PCT Application No. PCT/US2018/012039 on 26 Mar 2018
2	CATT, "Feedback for SPS PDCCH command," 3GPP TSG RAN WG2 #92, Anaheim, USA, R2-156256, 20 Nov 2015
3	Nokia, Alcatel-Lucent Shanghai Bell, "Skipping empty BSR and feedback for SPS activation/deactivation," 3GPP TSG-RAN WG2 Meeting #93bis, Dubrovnik, Croatia, R2-162504, 15 Apr 2016

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Signature	/Wesley L. Austin/	Date (YYYY-MM-DD)	2018-05-14
Name/Print	Wesley L. Austin	Registration Number	42273

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PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

To:

Austin, Wesley L.
Austin Rapp
170 South Main Street, Suite 735
Salt Lake City, UT 84101
ETATS-UNIS D'AMERIQUE

(PCT Rule 44.1)

Date of mailing
(day/month/year)

26 March 2018 (26-03-2018)

Applicant's or agent's file reference
SLA3700PCT

FOR FURTHER ACTION

See paragraphs 1 and 4 below

International application No.
PCT/US2018/012039

International filing date
(day/month/year)

2 January 2018 (02-01-2018)

Applicant

SHARP LABORATORIES OF AMERICA, INC

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

Filing of amendments and statement under Article 19:

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

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

How? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 - 9.011.

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

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

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

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

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

Within **22 months from the priority date**, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the PCT Applicant's Guide, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorized officer

ROLAFF, Jorg
Tel: +31 (0)70 340-3107

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SLA3730PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2018/012039	International filing date (day/month/year) 2 January 2018 (02-01-2018)	(Earliest) Priority Date (day/month/year) 6 January 2017 (06-01-2017)
Applicant SHARP LABORATORIES OF AMERICA, INC		

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

This international search report consists of a total of 3 sheets.

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

1. **Basis of the report**

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

☒ the international application in the language in which it was filed

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

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

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

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

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

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

☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows:

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

☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 39.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 20

☒ as suggested by the applicant

☐ as selected by this Authority, because the applicant failed to suggest a figure

☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/012039

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04L5/00

ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CATT: "Feedback for SPS PDCCH command", 3GPP DRAFT; R2-156256, 3RD GENERATION PARTNERSHIP PROJECT (3GPP) vol. RAN WG2, no. Anaheim, USA; 20151116 - 20151120 16 November 2015 (2015-11-16), XP051005752, Retrieved from the Internet: URL: http://www.3gpp.org/ftp/Meetings_3GPP_ SYNC/RAN2/Docs/ [retrieved on 2015-11-16] section 2; figure 1 ----- -/-	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

19 March 2018

Date of mailing of the international search report

26/03/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Tejera, Pedro

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/012039

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NOKIA ET AL: "Skipping empty BSR and feedback for SPS activation/deactivation", 3GPP DRAFT; R2-162504 SPS ACTIVATION DEACTIVATION CONFIRMATION V1.0, 3RD GENERATION PARTNERSHIP PROJECT (3GPP) vol. RAN WG2, no. Dubrovnik, Croatia; 20160411 - 20160415 2 April 2016 (2016-04-02), XP051082433, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_93bis/Docs/ [retrieved on 2016-04-02] Proposal 6; sections 2.2, 2.3 -----	1-4

Information on Search Strategy - Pilot phase (see OJ 2015, A86)

The type of information contained in this sheet may change during the pilot for improving the usefulness of this new service.

Application Number

PCT/US2018/012039

TITLE: SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

APPLICANT: SHARP LABORATORIES OF AMERICA, INC

IPC CLASSIFICATION: H04L5/00

EXAMINER: Tejera, Pedro

CONSULTED DATABASES: SEASTAR, ANSERA

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: H04L5/0096

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:

A protocol to schedule periodic data transmissions in LTE is presented feature configuration of periodicity through RRC, dynamic activation and deactivation through PDCCH and confirmation of reception of PDCCH activation/deactivation messages by means of a MAC CE message with a common logical channel identifier index in the header.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2018/012039

International filing date (day/month/year)
02.01.2018

Priority date (day/month/year)
06.01.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04L5/00

Applicant
SHARP LABORATORIES OF AMERICA, INC

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

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

2. FURTHER ACTION

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

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

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

Name and mailing address of the ISA:

 European Patent Office
P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040
Fax: +31 70 340 - 3016

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Tejera, Pedro

Telephone No. +31 70 340-0



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2018/012039

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*b/s*.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2018/012039

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

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	<u>1-4</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-4</u>
Industrial applicability (IA)	Yes: Claims	<u>1-4</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

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

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 CATT: "Feedback for SPS PDCCH command",
3GPP DRAFT; R2-156256, 3RD GENERATION PARTNERSHIP PROJECT (3GPP),
vol. RAN WG2, no. Anaheim, USA; 20151116 - 20151120 16 November 2015
(2015-11-16), XP051005752,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN2/Docs/
[retrieved on 2015-11-16]
- D2 NOKIA ET AL: "Skipping empty BSR and feedback for SPS activation/deactivation",
3GPP DRAFT; R2-162504 SPS ACTIVATION DEACTIVATION CONFIRMATION V1.0,
3RD GENERATION PARTNERSHIP PROJECT (3GPP),
vol. RAN WG2, no. Dubrovnik, Croatia; 20160411 - 20160415 2 April 2016
(2016-04-02), XP051082433,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_93bis/Docs/
[retrieved on 2016-04-02]

Preliminary Remark:

- 1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-4 is not new (Article 33(2) PCT).
- 2 The subject-matter of independent claims 1-4 is not new.
- 2.1 The subject-matter of independent apparatus claim 1 is not new in view of D1, which discloses (the references in parentheses applying to this document):
"A user equipment, UE, comprising:

receiving circuitry configured to receive, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission (see **message 1 in Figure 1**),

the receiving circuitry configured to receive on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission (see **message 2 in Figure 1**); and

transmitting circuitry configured to transmit, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information (see **message 3 in Figure 1 and proposal "S2: introduce new MAC CE for PDCCH command" in section 2**),

the transmitting circuitry configured to perform on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information (see **message 4 in Figure 1**), wherein

the receiving circuitry is configured to receive on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission (see **message 5 in Figure 1**),

the transmitting circuitry is configured to transmit, to the base station apparatus, confirmation information MAC CE for the third information (see **message 6 in Figure 1 and proposal "S2: introduce new MAC CE for PDCCH command" in section 2**), and

a MAC protocol data unit subheader with the same index of logical channel identifier, LCID, is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information (see **proposal "S2: introduce new MAC CE for PDCCH command" in section 2**, disclosing introduction of a new LCID value for the new MAC CE used for confirming reception of SPS PDCCH commands, including both SPS activation and SPS release commands)."

- 2.2 It is noted that there are other prior art documents in view of which the subject-matter of claim 1 is not novel. As an example document D2 (see **proposal 6 and sections 2.2 and 2.3**) can be cited.
- 2.3 The arguments provided in points 2.1, 2.2 for apparatus claim 1 apply, mutatis mutandis, to the other independent claims 2-4.

Re Item VII

Certain defects in the international application

- 3 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

- 4 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 5 Main technical features mentioned in the abstract and illustrated in drawings are not followed by reference signs. This is not in compliance with Rule 8(d) PCT.

Re item VIII

Certain observations on the international application

- 6 Incorporating contents of referenced documents as done in paragraph [0001] contravenes the required self-contained character of the description (see PCT Guidelines 4.26).

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO/ISA)

General information

For all international applications, the competent International Searching Authority (ISA) will establish an international search report (ISR) accompanied by a written opinion of the International Searching Authority (WO/ISA). The WO/ISA may be responded to by

- filing informal comments with the International Bureau of WIPO (IB) (where no demand for international preliminary examination (demand) is filed)
- filing amendments under Art. 19 PCT (this can be done whether or not a demand is filed)
- filing amendments under Art. 34 PCT and/or formal observations in response to objections raised in the WO/ISA (where a demand is actually filed)

This document explains these possibilities.

Filing informal comments

After receipt of the ISR and WO/ISA, the applicant may file informal comments on the WO/ISA, directly with the IB (see International Search and Preliminary Examination Guidelines 2.15). These will be communicated to the designated/elected Offices, together with the International Preliminary Report on Patentability (IPRP) at 30 months from the priority date.

Amending claims under Art. 19 PCT

The applicant may file amended claims under Art. 19 PCT, directly with the IB by the later of the following dates:

- 2 months from the date of mailing of the ISR and the WO/ISA
- 16 months from the priority date

However, any such amendment received by the IB after the expiration of the applicable time limit shall be considered to have been received on time by the IB, if it reaches it before the technical preparations for international publication have been completed (the 15th day prior to the date of publication, see PCT Applicant's Guide, International Phase, 9.013).

For further information, please see Rule 46 PCT as well as form PCT/ISA/220.

Please also note that, when filing amended claims under Art. 19 PCT, such amendments shall be accompanied by a letter identifying the amendments made and also the basis for the amendments in the application as originally filed (Rule 46.5(b) PCT). Where a demand is filed, failure to comply with this requirement may result in the amendments being ignored in the International Preliminary Examination Report (IPER), see Rule 70.2(c-bis) PCT.

**Filing a demand
for international
preliminary
examination**

In principle, the **WO/ISA** will be considered to be the written opinion of the International Preliminary Examining Authority (IPEA). Where the **WO/ISA** issued by the EPO as ISA gives a positive opinion on the international application and the invention to which it relates, filing a demand with the EPO as IPEA would normally be unnecessary, since a positive IPRP would anyway be established by the IB based on the **WO/ISA** (see also further below).

If the applicant wishes to file a demand (for example, to allow him to argue his case in international preliminary examination with regard to objections raised in a negative **WO/ISA** before the IPEA issues an IPER), this must be done before expiration of **3 months after the date of mailing of the ISR and WO/ISA or 22 months after priority date**, whichever expires later (Rule 54*bis* PCT). Amendments under Art. 34 PCT can be filed with the IPEA, normally at the same time as filing the demand (Rule 66.1(b) PCT) or within the time limit set for reply to any written opinion issued during international preliminary examination by the IPEA.

If a demand is filed at the EPO as IPEA and no comments/amendments have been received by the time the EPO starts drawing up the IPER (Rule 66.4*bis* PCT), the **WO/ISA** will be transformed by the IPEA into an IPER (also called the IPRP (Chapter II)) which would merely reflect the content of the **WO/ISA** (OJ 10/2011, 532). The demand can still be withdrawn (Art. 37 PCT).

Please also note that, when filing amendments under Art. 34 PCT, such amendments shall be accompanied by a letter which identifies the amendments made and also the basis for the amendments in the application as originally filed (Rule 66.8(a) PCT). Failure to comply with this requirement may result in the amendments being ignored in the IPER (IPRP (Chapter II)), see Rule 70.2(c-*bis*) PCT.

**Filing a request
for supplementary
international
search**

The applicant may, with the IB, file a request for **supplementary international search** under Rule 45*bis*.1 PCT. The present ISR and **WO/ISA** may also be taken into account in the execution of that supplementary international search, provided that these are available to the Authority charged with this task before it starts the supplementary search (Rule 45*bis*.5 PCT).

This kind of request **cannot be filed specifying the ISA** who did the international search.

More information on this topic can be found in the **PCT Applicant's Guide**, Chapter 8 (<http://www.wipo.int/pct/en/guide/ip08.html>).

**End of the
international
phase**

Where no demand is filed, at the end of the international phase, the IB will transform the **WO/ISA** into the IPRP (PCT Chapter I) (Rule 44*bis* PCT), which will then be transmitted together with possible informal comments to the designated Offices. Where a demand is filed, the **WO/ISA** is not transformed into an IPRP (Chapter I) by the IB, but rather the IPEA will establish an IPER, (the IPER is the same as the IPRP (PCT Chapter II), see Rule 70.15 PCT).

Bitte beachten Sie, dass angeführte Nichtpatentliteratur (wie z. B. wissenschaftliche oder technische Dokumente) je nach geltendem Recht dem Urheberrechtsschutz und/oder anderen Schutzarten für schriftliche Werke unterliegen könnte. Die Vervielfältigung urheberrechtlich geschützter Texte, ihre Verwendung in anderen elektronischen oder gedruckten Publikationen und ihre Weitergabe an Dritte ist ohne ausdrückliche Zustimmung des Rechtsinhabers nicht gestattet.

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Please be aware that cited works of non-patent literature such as scientific or technical documents or the like may be subject to copyright protection and/or any other protection of written works as appropriate based on applicable laws. Copyrighted texts may not be copied or used in other electronic or printed publications or re-distributed without the express permission of the copyright holder.

Electronic Acknowledgement Receipt

EFS ID:	32611184
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Jessamy Newton
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	14-MAY-2018
Filing Date:	03-JAN-2018
Time Stamp:	11:58:13
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	Information Disclosure Statement (IDS) Form (SB08)	SLA3700_SupplementalIDS_3292-2-305.pdf	1035038	no	4
			c94084a59fba513875402f23ff83141f2492fed8		

Warnings:

Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Non Patent Literature	PCTUS2018012039_PCTSearch Report.pdf	2811139 bf162b72bad6b664b4075d8c7c9a8908ddb0b472	no	14
Warnings:					
Information:					
3	Non Patent Literature	R2-156256.pdf	749675 667f1b8702900fe9ad85010bf095ce4000f879f5	no	3
Warnings:					
Information:					
4	Non Patent Literature	R2-162504.pdf	2005191 76ea02275ff41b0eaf9d05cf014f08308073b1b6	no	8
Warnings:					
Information:					
Total Files Size (in bytes):			6601043		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/860,962	01/03/2018	3646	2160	SLA3700	4	4

CONFIRMATION NO. 7593

FILING RECEIPT



0000000096940880

50735
AUSTIN RAPP
170 SOUTH MAIN STREET
SUITE 735
SALT LAKE CITY, UT 84101

Date Mailed: 01/29/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Kai Ying, Vancouver, WA;
Toshizo Nogami, Vancouver, WA;
Tatsushi Aiba, Vancouver, WA;
John Michael Kowalski, Vancouver, WA;
Zhanping Yin, Vancouver, WA;
Jia Sheng, Vancouver, WA;

Applicant(s)

Sharp Laboratories of America, Inc., Camas, WA;

Power of Attorney: The patent practitioners associated with Customer Number 50735

Domestic Priority data as claimed by applicant

This application is a CON of PCT/US2018/012039 01/02/2018
and claims benefit of 62/443,464 01/06/2017

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

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 01/25/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/860,962**

Projected Publication Date: 07/12/2018

Non-Publication Request: No

Early Publication Request: No

Title

SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA
RELIABLE LOW LATENCY COMMUNICATIONS

Preliminary Class

342

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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

GRANTED

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

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

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

NOT GRANTED

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

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
15/860,962

APPLICATION AS FILED - PART I

(Column 1)

(Column 2)

SMALL ENTITY

OR

OTHER THAN SMALL ENTITY

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A
TOTAL CLAIMS (37 CFR 1.16(i))	4 minus 20 =	*
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1
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))		

RATE(\$)	FEE(\$)
N/A	
N/A	
N/A	
TOTAL	

OR

RATE(\$)	FEE(\$)
N/A	300
N/A	660
N/A	760
x 100 =	0.00
x 460 =	460
	0.00
	0.00
TOTAL	2180

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

APPLICATION AS AMENDED - PART II

(Column 1)

(Column 2)

(Column 3)

SMALL ENTITY

OR

OTHER THAN SMALL ENTITY

AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(i))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

OR

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total (37 CFR 1.16(i))	*	Minus	**	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=
	Application Size Fee (37 CFR 1.16(s))				
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

OR

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
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.

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:



Practitioners associated with Customer Number:

50,735

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 assignments 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:



The address associated with Customer Number:

50,735

OR

☐	Firm or Individual Name			
	Address			
	City		State	Zip
	Country			
	Telephone		Email	

Assignee Name and Address: **Sharp Laboratories of America, Inc.**
5750 NW Pacific Rim Blvd.
Camas, WA 98607

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	/David C. Ripma/	Date	September 1, 2017
Name	David C. Ripma	Telephone	360-834-8754
Title	Patent Counsel of MiiCs IP, Inc. a subsidiary of SBPJ Co., Ltd. and Sharp Corporation		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Kai Ying et al.Application No./Patent No.: 15/860,962Filed/Issue Date: January 3, 2018Titled: Signaling, Procedures, User Equipment and Base Stations for Uplink Ultra Reliable Low Latency CommunicationsSharp Laboratories of America, Inc., 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 _____, Frame _____, or for which a copy thereof is attached.
- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

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

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

2. From: _____ To: _____

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

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

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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.

/David C. Ripma/

Signature

David C. Ripma

Printed or Typed Name

January 16, 2018

Date

Reg. No. 27,672

Title or Registration Number

ASSIGNMENT

WHEREAS, the undersigned Kai Ying, a resident of Vancouver, WA; Toshizo Nogami, a resident of Vancouver, WA; Tatsushi Aiba, a resident of Vancouver, WA; John M. Kowalski, a resident of Vancouver, WA; Zhanping Yin, a resident of Vancouver, WA; and Jia Sheng, a resident of Vancouver, WA, (hereinafter termed "Inventors") have invented certain new and useful improvements in:

Signaling, Procedures, User Equipment and Base Stations for Uplink Ultra Reliable Low Latency Communications

and have executed a declaration and oath for an application for a United States patent disclosing and identifying the invention:

☐ Declaration executed on _____

or

☒ Having been previously filed and assigned Serial Number 15/860,962 and filing date January 3, 2018; and

WHEREAS Sharp Laboratories of America, Inc., a corporation of the State of Washington, (hereinafter termed "Assignee"), having a place of business at 5750 NW Pacific Rim Boulevard, Camas, Washington 98607, wishes to acquire the entire right, title and interest in and to said application and the invention disclosed therein, and in and to all embodiments of the invention, heretofore conceived, made or discovered by said Inventors (all collectively hereinafter termed "said invention"), and in and to any and all patents, certificates of invention and other forms of protection thereon (hereinafter termed "patents") applied for or granted in the United States and/or other countries.

NOW THEREFORE, for good and valuable consideration acknowledged by said Inventors to have been received in full from said Assignee:

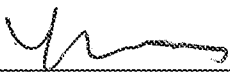
1. Said Inventors hereby sell, assign, transfer and convey unto said Assignee, the entire right, title and interest (a) in and to said application and said invention; (b) in and to all rights to apply in any and all countries of the world for patents, certificates of inventions or other government grants on said invention, including the right to apply for patents pursuant to the International Convention for the Protection of Industrial Property or pursuant to any other convention, treaty, agreement or understanding; (c) in and to any and all applications filed and any and all patents, certificates of inventions or other governmental grants granted on said invention in the United States or any other country, including each and every application filed and each and every patent granted on any application which is a division, substitution, or continuation of any of said applications; (d) in and to each and every reissue or extension of any of said patents; and (e) in and to each and every patent

claim resulting from a reexamination certificate for any and all of said patents.

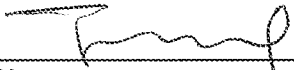
2. Said Inventors hereby covenant and agree to cooperate with said Assignee to enable said Assignee to enjoy to the fullest extent the right, title and interest herein conveyed in the United States and other countries. Such cooperation by said Inventors shall include prompt production of pertinent facts and documents, giving of testimony, executing of petitions, oaths, specifications, declarations or other papers, and other assistance all to the extent deemed necessary or desirable by said Assignee (a) for perfecting in said Assignee the right, title and interest herein conveyed; (b) for complying with any duty of disclosure; (c) for prosecuting any of said applications; (d) for filing and prosecuting substitute, divisional, continuing or additional applications covering said invention; (e) for filing and prosecuting applications for reissue of any of said patents; (f) for interference or other priority proceedings involving said invention; and (g) for legal proceedings involving said invention and any applications therefore and any patents granted thereon, including without limitation opposition proceedings, cancellation proceedings, priority contests, public use proceedings, reexamination proceedings, compulsory licensing proceedings, infringement actions and court actions; provided, however, that the expense incurred by said Inventors in providing such cooperation shall be paid for by said Assignee.
3. The terms and covenants of this Assignment shall inure to the benefit of said Assignee, its successors, assigns and other legal representatives, and shall be binding upon said Inventors, said Inventors' heirs, legal representatives and assigns.
4. Said Inventors hereby warrant and represent that said Inventors have not entered and will not enter into any assignment, contract, or understanding in conflict with this Assignment.

IN WITNESS WHEREOF, the said Inventors have executed this Assignment on the date given below:

(1)	<u>Kai Ying</u> Kai Ying (Signature)	<u>1/15/2018</u> (Date)
(2)	<u>Toshizo Nogami</u> Toshizo Nogami (Signature)	<u>1/15/2018</u> (Date)
(3)	<u>Tatsushi Aiba</u> Tatsushi Aiba (Signature)	<u>1/15/2018</u> (Date)
(4)	<u>John M. Kowalski</u> John M. Kowalski (Signature)	<u>15 Jan 18</u> (Date)

(5) 
Zhanping Yin (Signature)

1/9/2018
(Date)

(6) 
Jia Sheng (Signature)

1/15/2018
(Date)

Electronic Acknowledgement Receipt

EFS ID:	31549967
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Ashley Austin
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	19-JAN-2018
Filing Date:	
Time Stamp:	14:34:57
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	Oath or Declaration filed	SLA3700_Declaration_3292-2-305.pdf	350954	no	3
			789de293b145ec22d5b6ec3898355e7f4fb a5ab6		

Warnings:

Information:					
2	Power of Attorney	SLA3700_PowerOfAttorney_3292-2-305.pdf	728661	no	6
			f6dbae96dc365aedf8e4deadebb63bb7d5475741		
Warnings:					
Information:					
Total Files Size (in bytes):			1079615		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	PATENT APPLICATION
	)	
Inventors: Kai Ying et al.	)	Attorney Docket No.
	)	SLA3700
Serial No.: 15/860,962	)	
	)	
Filed: January 3, 2018	)	
	)	
Title: Signaling, Procedures, User Equipment	)	
and Base Stations for Uplink Ultra	)	
Reliable Low Latency Communications	)	

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

This declaration is directed to:

- ☐ The attached application; OR
- ☒ The United States Application or PCT International application number assigned the above-identified "Serial No."; filed on the above-identified "Filed" date.

The above-identified application was made or authorized to be made by me.

I believe 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.

Full name of sole
or first inventor:

Kai Ying

Residence:

Vancouver, WA

Post Office Address:

17412 SE 22nd St, Vancouver, WA 98683

Inventor's Signature: _____

Kai Ying

Date: _____

1/15/2018

Full name
of second inventor: Toshizo Nogami

Residence: Vancouver, WA

Post Office Address: 620 SE 168th Ave., Apt. 132, Vancouver, WA 98684

Inventor's Signature: Toshizo Nogami

Date: 1/15/2018

Full name
of third inventor: Tatsushi Aiba

Residence: Vancouver, WA

Post Office Address: 600 SE 177th Ave., Apt. K109, Vancouver, WA 98683

Inventor's Signature: Tatsushi Aiba

Date: Jan. 5, 2018

Full name
of fourth inventor: John M. Kowalski

Residence: Vancouver, WA

Post Office Address: 19116 NE 29th Drive, Vancouver, WA 98684

Inventor's Signature: John M. Kowalski

Date: 15 Jan 18

Full name
of fifth inventor: Zhanping Yin

Residence: Vancouver, WA

Post Office Address: 2104 SE 187th Avenue, Vancouver, WA 98683

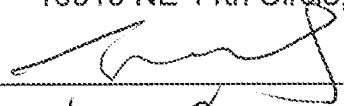
Inventor's Signature: Zhanping Yin

Date: 1/9/2018

Full name
of sixth inventor: Jia Sheng

Residence: Vancouver, WA

Post Office Address: 16019 NE 14th Circle, Vancouver, WA 98684

Inventor's Signature: 

Date: 1/15/2018

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Kai Ying	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	SLA3700	

U.S.PATENTS						Remove
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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Kai Ying	
Art Unit		
Examiner Name		
Attorney Docket Number	SLA3700	

1	3GPP TR 38.913 v0.3.0, "Study on Scenarios and Requirements for Next Generation Access Technologies (Release 14)," Mar 2016
2	3GPP TR 22.862 v1.0.0, "Feasibility Study on New Services and Markets Technology Enablers Critical Communications; Stage 1 (Release 14)," Feb 2016
3	Huawei, HiSilicon, "Overview of URLLC support in NR", 3GPP TSG RAN WG1 meeting #86bis, Lisbon, Portugal, R1-1608843, 14 Oct 2016
4	"RAN1 Chairman's Notes," 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal 14 Oct 2016
5	3GPP TS 36.331, V14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 14) Sep 2016
6	3GPP TS 36.321, V14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC); Protocol specification (Release 14) Sep 2016
7	Huawei, HiSilicon, "Overview of UL URLLC Support in NR," 3GPP TSG-RAN WG1 Meeting #87, Reno, USA, R1-1611220, 18 Nov 2016
8	Nokia, Alcatel-Lucent Shanghai Bell, "Enhanced semi-persistent scheduling for 5G URLLC," 3GPP TSG RAN WG1 #87, Reno, USA, R1-1612251, 18 Nov 2016
9	LG Electronics, "Discussion on control and data transmission of URLLC", 3GPP TSG RAN WG1 Meeting #87, Reno, USA, R1-1611850, 18 Nov 2016
10	3GPP TS 36.213 V14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14), Sep 2016

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Application Number	
Filing Date	
First Named Inventor	Kai Ying
Art Unit	
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Signature	/Wesley L. Austin/	Date (YYYY-MM-DD)	2018-01-03
Name/Print	Wesley L. Austin	Registration Number	42273

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Application Number:				
Filing Date:				
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS			
First Named Inventor/Applicant Name:	Kai Ying			
Filer:	Wesley L. Austin/Jessamy Newton			
Attorney Docket Number:	SLA3700			
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	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	420	420
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	1051	1	140	140

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2160

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EFS ID:	31390611
Application Number:	15860962
International Application Number:	
Confirmation Number:	7593
Title of Invention:	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS
First Named Inventor/Applicant Name:	Kai Ying
Customer Number:	50735
Filer:	Wesley L. Austin/Ashley Austin
Filer Authorized By:	Wesley L. Austin
Attorney Docket Number:	SLA3700
Receipt Date:	03-JAN-2018
Filing Date:	
Time Stamp:	13:51:57
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$2160
RAM confirmation Number	010318INTEFSW13531500
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1		SLA3700_Application_3292-2-305.pdf	282750	yes	67
			3c9c42ea2ff7f77cff30b3094d91bb13e7196e18		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	62	
	Claims		63	66	
	Abstract		67	67	
Warnings:					
Information:					
2	Drawings-only black and white line drawings	SLA3700_Drawings_3292-2-305.pdf	171337	no	21
			9abb4acce654b3cd4d72e520316fbbb21fbbbd49		
Warnings:					
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3	Non Patent Literature	3GPP_TR_22862.pdf	1350299	no	22
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4	Non Patent Literature	3GPP_TR_38913.pdf	443061	no	30
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Warnings:					
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5	Non Patent Literature	3GPP_TS_36213_v14-0-0.pdf	3461707	no	406
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6	Non Patent Literature	3GPP_TS_36321.pdf	1034864	no	96
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7	Non Patent Literature	3GPP_TS_36331.pdf	5014821	no	644
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Warnings:					
Information:					
8	Non Patent Literature	ChairmanNotes_RAN1_86bis_final.pdf	898496	no	113
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Information:					
9	Non Patent Literature	R1-1608843.pdf	503258	no	7
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10	Non Patent Literature	R1-1611220.pdf	904917	no	8
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11	Non Patent Literature	R1-1611850.pdf	76307	no	7
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Warnings:					
Information:					
12	Non Patent Literature	R1-1612251.pdf	607048	no	8
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Information:					

13	Application Data Sheet	SLA3700_ApplicationDataSheet_3292-2-305.pdf	1823057	no	10
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14	Information Disclosure Statement (IDS) Form (SB08)	SLA3700_InformationDisclosureStatement_3292-2-305.pdf	1035248	no	5
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SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS

RELATED APPLICATIONS

[0001] This application is related to and claims priority from U.S. Provisional Patent Application No. 62/443,464, entitled “SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS,” filed on January 6, 2017, which is hereby incorporated by reference herein, in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to communication systems. More specifically, the present disclosure relates to new signaling, procedures, user equipment (UE) and base stations for uplink ultra-reliable low latency communications (URLLC).

BACKGROUND

[0003] Wireless communication devices have become smaller and more powerful in order to meet consumer needs and to improve portability and convenience. Consumers have become dependent upon wireless communication devices and have come to expect reliable service, expanded areas of coverage and increased functionality. A wireless communication system may provide communication for a number of wireless communication devices, each of which may be serviced by a base station. A base station may be a device that communicates with wireless communication devices.

[0004] As wireless communication devices have advanced, improvements in communication capacity, speed, flexibility and/or efficiency have been sought. However,

improving communication capacity, speed, flexibility and/or efficiency may present certain problems.

[0005] For example, wireless communication devices may communicate with one or more devices using a communication structure. However, the communication structure used may only offer limited flexibility and/or efficiency. As illustrated by this discussion, systems and methods that improve communication flexibility and/or efficiency may be beneficial.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Figure 1 is a block diagram illustrating one implementation of one or more gNBs and one or more user equipments (UEs) in which systems and methods for ultra-reliable low latency communications (URLLC) operations may be implemented;

[0007] Figure 2 is a diagram illustrating one example of a resource grid for the downlink;

[0008] Figure 3 is a diagram illustrating one example of a resource grid for the uplink;

[0009] Figure 4 shows examples of several numerologies;

[0010] Figure 5 shows examples of subframe structures for the numerologies that are shown in Figure 4;

[0011] Figure 6 shows examples of slots and sub-slots;

[0012] Figure 7 shows examples of scheduling timelines;

[0013] Figure 8 shows examples of downlink (DL) control channel monitoring regions;

[0014] Figure 9 shows examples of DL control channel which consists of more than one control channel elements;

[0015] Figure 10 shows examples of uplink (UL) control channel structures;

[0016] Figure 11 illustrates examples of a first approach and a second approach for efficient uplink transmission signaling;

[0017] Figure 12 is a first example illustrating an initial transmission with additional transmission;

[0018] Figure 13 is a second example illustrating an initial transmission with additional transmission;

[0019] Figure 14 is an example illustrating a retransmission with additional transmission

[0020] Figure 15 is an example illustrating transmission without a scheduling request (SR);

[0021] Figure 16 illustrates various components that may be utilized in a UE;

[0022] Figure 17 illustrates various components that may be utilized in a gNB;

[0023] Figure 18 is a block diagram illustrating one implementation of a UE in which systems and methods for URLLC operations may be implemented;

[0024] Figure 19 is a block diagram illustrating one implementation of a gNB in which systems and methods for URLLC operations may be implemented;

[0025] Figure 20 is a flow diagram illustrating a communication method of a UE; and

[0026] Figure 21 is a flow diagram illustrating a communication method of a gNB.

DETAILED DESCRIPTION

[0027] A user equipment (UE) is described. The UE includes receiving circuitry configured to receive, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The receiving circuitry is configured to receive on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission. The UE also includes transmitting circuitry configured to transmit, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information. The transmitting circuitry is configured to perform on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information. The receiving circuitry is also configured to receive on the physical

downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission. The transmitting circuitry is also configured to transmit, to the base station apparatus, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

[0028] A base station apparatus is also described. The base station apparatus includes transmitting circuitry configured to transmit, to a user equipment, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The transmitting circuitry is configured to transmit on a physical downlink control channel, to the user equipment, second information used for indicating an activation for the uplink data transmission. The base station apparatus also includes receiving circuitry configured to receive, from the user equipment, confirmation information MAC CE for the second information. The receiving circuitry is configured to receive on a physical uplink shared channel, from the user equipment, the uplink data transmission based on the first information and the second information. The transmitting circuitry is also configured to transmit on the physical downlink control channel, to the user equipment, third information used for indicating a deactivation for the uplink data transmission. The receiving circuitry is also configured to receive, from the user equipment, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of LCID is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

[0029] A communication method of a user equipment is also described. The communication method includes receiving, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The communication method also includes receiving on a physical downlink control channel, from the base station apparatus, second information

used for indicating an activation for the uplink data transmission. The communication method further includes transmitting, to the base station apparatus, confirmation information MAC CE for the second information. The communication method additionally includes performing on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information. The communication method also includes receiving on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission. The communication method further includes transmitting, to the base station apparatus, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of LCID is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

[0030] A communication method of a base station apparatus is also described. The communication method includes transmitting, to a user equipment, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The communication method also includes transmitting on a physical downlink control channel, to the user equipment, second information used for indicating an activation for the uplink data transmission. The communication method further includes receiving, from the user equipment, confirmation information MAC CE for the second information. The communication method additionally includes receiving on a physical uplink shared channel, from the user equipment, the uplink data transmission based on the first information and the second information. The communication method also includes transmitting on the physical downlink control channel, to the user equipment, third information used for indicating a deactivation for the uplink data transmission. The communication method further includes receiving, from the user equipment, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of LCID is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

[0031] Another UE is also described that includes receiving circuitry configured to receive a Radio Resource Control (RRC) message including first information configuring a physical uplink control channel (PUCCH) resource and second information configuring one or more physical uplink shared channel (PUSCH) resources. The UE also includes transmitting circuitry configured to transmit on the PUCCH resource, a scheduling request. Also, the receiving circuitry is configured to receive on a physical downlink channel (PDCH) resource, third information indicating a positive acknowledgment for the scheduling request, an index of the PDCH resource being determined based on an index of the PUCCH resource, and the transmitting circuitry is configured to transmit on a PUSCH resource, uplink data based on a detection of the third information, the PUSCH resource being indicated, by the third information, among the one or more PUSCH resources.

[0032] The scheduling request may be used for indicating a buffer size in an uplink, and a number of bits for the scheduling request is more than one.

[0033] Another UE is described. The UE includes receiving circuitry configured to receive a RRC message including first information configuring more than one PUSCH resources. The UE also includes transmitting circuitry configured to perform on a first PUSCH resource among the more than one PUSCH resource, an initial transmission for uplink data. The receiving circuitry is configured to receive on a PDCH resource, second information indicating a grant of a retransmission for the uplink data, the second information being used for indicating a second PUSCH resource among the more than one PUSCH resources. The transmitting circuitry is configured to perform on the second PUSCH resource, the retransmission for the uplink data based on a detection of the second information.

[0034] The second information may be used for indicating a repetition of the retransmission for the uplink data. The retransmission for the uplink data may be repeated based on the second information. The second PUSCH resource may be configured only for the retransmission for the uplink data.

[0035] A base station apparatus is also described. The base station apparatus includes transmitting circuitry configured to transmit a RRC message including first information configuring a PUCCH resource and second information configuring one or more PUSCH resources. The base station apparatus also includes receiving circuitry configured to receive on the PUCCH resource, a scheduling request. The transmitting circuitry is configured to transmit on a PDCH resource, third information indicating a positive acknowledgment for the scheduling request, an index of the PDCH resource being determined based on an index of the PUCCH resource. The receiving circuitry is configured to receive on a PUSCH resource, uplink data based on the third information, the PUSCH resource being indicated, by the third information, among the one or more PUSCH resources.

[0036] Another base station apparatus is described. The base station apparatus includes transmitting circuitry configured to transmit a RRC message including first information configuring more than one PUSCH resources. The base station apparatus also includes receiving circuitry configured to receive on a first PUSCH resource among the more than one PUSCH resource, an initial transmission for uplink data. The transmitting circuitry is configured to transmit on a PDCH resource, second information indicating a grant of a retransmission for the uplink data, the second information being used for indicating a second PUSCH resource among the more than one PUSCH resources. The receiving circuitry is configured to receive on the second PUSCH resource, the retransmission for the uplink data based on a detection of the second information.

[0037] A method of a UE is also described. The method includes receiving a RRC message including first information configuring a PUCCH resource and second information configuring one or more PUSCH resources. The method also includes transmitting on the PUCCH resource, a scheduling request. The method further includes receiving on a PDCH resource, third information indicating a positive acknowledgment for the scheduling request, an index of the PDCH resource being determined based on an index of the PUCCH resource. The method additionally includes transmitting on a PUSCH resource, uplink data based on a detection of the third information, the PUSCH

resource being indicated, by the third information, among the one or more PUSCH resources.

[0038] Another method of a UE is described. The method includes receiving a RRC message including first information configuring more than one PUSCH resources. The method also includes performing on a first PUSCH resource among the more than one PUSCH resource, an initial transmission for uplink data. The method further includes receiving on a PDCH resource, second information indicating a grant of a retransmission for the uplink data, the second information being used for indicating a second PUSCH resource among the more than one PUSCH resources. The method additionally includes performing on the second PUSCH resource, the retransmission for the uplink data based on a detection of the second information.

[0039] A method of a base station apparatus is also described. The method includes transmitting a RRC message including first information configuring a PUCCH resource and second information configuring one or more PUSCH resources. The method also includes receiving on the PUCCH resource, a scheduling request. The method further includes transmitting on a PDCH resource, third information indicating a positive acknowledgment for the scheduling request, an index of the PDCH resource being determined based on an index of the PUCCH resource. The method additionally includes receiving on a PUSCH resource, uplink data based on the third information, the PUSCH resource being indicated, by the third information, among the one or more PUSCH resources.

[0040] Another method of a base station apparatus is described. The method includes transmitting a RRC message including first information configuring more than one PUSCH resources. The method also includes receiving on a first PUSCH resource among the more than one PUSCH resource, an initial transmission for uplink data. The method further includes transmitting on a PDCH resource, second information indicating a grant of a retransmission for the uplink data, the second information being used for indicating a second PUSCH resource among the more than one PUSCH resources. The method

additionally includes receiving on the second PUSCH resource, the retransmission for the uplink data based on a detection of the second information.

[0041] The 3rd Generation Partnership Project, also referred to as “3GPP,” is a collaboration agreement that aims to define globally applicable technical specifications and technical reports for third and fourth generation wireless communication systems. The 3GPP may define specifications for next generation mobile networks, systems and devices.

[0042] 3GPP Long Term Evolution (LTE) is the name given to a project to improve the Universal Mobile Telecommunications System (UMTS) mobile phone or device standard to cope with future requirements. In one aspect, UMTS has been modified to provide support and specification for the Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN).

[0043] At least some aspects of the systems and methods disclosed herein may be described in relation to the 3GPP LTE, LTE-Advanced (LTE-A) and other standards (e.g., 3GPP Releases 8, 9, 10, 11 and/or 12). However, the scope of the present disclosure should not be limited in this regard. At least some aspects of the systems and methods disclosed herein may be utilized in other types of wireless communication systems.

[0044] A wireless communication device may be an electronic device used to communicate voice and/or data to a base station, which in turn may communicate with a network of devices (e.g., public switched telephone network (PSTN), the Internet, etc.). In describing systems and methods herein, a wireless communication device may alternatively be referred to as a mobile station, a UE, an access terminal, a subscriber station, a mobile terminal, a remote station, a user terminal, a terminal, a subscriber unit, a mobile device, etc. Examples of wireless communication devices include cellular phones, smart phones, personal digital assistants (PDAs), laptop computers, netbooks, e-readers, wireless modems, etc. In 3GPP specifications, a wireless communication device is typically referred to as a UE. However, as the scope of the present disclosure should not be limited to the 3GPP standards, the terms “UE” and “wireless communication device” may be used interchangeably herein to mean the more general term “wireless

communication device.” A UE may also be more generally referred to as a terminal device.

[0045] In 3GPP specifications, a base station is typically referred to as a Node B, an evolved Node B (eNB), a home enhanced or evolved Node B (HeNB) or some other similar terminology. As the scope of the disclosure should not be limited to 3GPP standards, the terms “base station,” “Node B,” “eNB,” and “HeNB” may be used interchangeably herein to mean the more general term “base station.” Furthermore, the term “base station” may be used to denote an access point. An access point may be an electronic device that provides access to a network (e.g., Local Area Network (LAN), the Internet, etc.) for wireless communication devices. The term “communication device” may be used to denote both a wireless communication device and/or a base station. An eNB may also be more generally referred to as a base station device.

[0046] It should be noted that as used herein, a “cell” may be any communication channel that is specified by standardization or regulatory bodies to be used for International Mobile Telecommunications-Advanced (IMT-Advanced) and all of it or a subset of it may be adopted by 3GPP as licensed bands (e.g., frequency bands) to be used for communication between an eNB and a UE. It should also be noted that in E-UTRA and E-UTRAN overall description, as used herein, a “cell” may be defined as “combination of downlink and optionally uplink resources.” The linking between the carrier frequency of the downlink resources and the carrier frequency of the uplink resources may be indicated in the system information transmitted on the downlink resources.

[0047] “Configured cells” are those cells of which the UE is aware and is allowed by an eNB to transmit or receive information. “Configured cell(s)” may be serving cell(s). The UE may receive system information and perform the required measurements on all configured cells. “Configured cell(s)” for a radio connection may consist of a primary cell and/or no, one, or more secondary cell(s). “Activated cells” are those configured cells on which the UE is transmitting and receiving. That is, activated cells are those cells for which the UE monitors the physical downlink control channel (PDCCH) and in the case

of a downlink transmission, those cells for which the UE decodes a physical downlink shared channel (PDSCH). “Deactivated cells” are those configured cells that the UE is not monitoring the transmission PDCCH. It should be noted that a “cell” may be described in terms of differing dimensions. For example, a “cell” may have temporal, spatial (e.g., geographical) and frequency characteristics.

[0048] Fifth generation (5G) cellular communications (also referred to as “New Radio”, “New Radio Access Technology” or “NR” by 3GPP) envisions the use of time/frequency/space resources to allow for enhanced mobile broadband (eMBB) communication and ultra-reliable low latency communication (URLLC) services, as well as massive machine type communication (mMTC) like services. In order for the services to use the time/frequency/space medium efficiently it would be useful to be able to flexibly schedule services on the medium so that the medium may be used as effectively as possible, given the conflicting needs of URLLC, eMBB, and mMTC. A new radio base station may be referred to as a gNB. A gNB may also be more generally referred to as a base station device.

[0049] Currently latency issues are addressed in LTE largely via scheduling and prioritization of transmissions. There are no real flexible uses of the medium outside of scheduling for Machine-Type Communications (MTC) and delay tolerant services, although the Narrowband Internet of Things (“NBIoT”) extensions to LTE employ a specific set of time/frequency resources. Moreover, there is little standardized information passed between different eNBs today that would enable such services to efficiently coexist. The systems and methods described herein teach various means for the eMBB, mMTC, and URLLC services to efficiently use the medium beyond what has been previously disclosed.

[0050] Specifically, the systems and methods described herein teach approaches for URLLC uplink (UL) transmission management to meet latency/reliability requirements and to address potential coexistence issues. The key requirements for URLLC relate to user (U)-plane latency and reliability. For URLLC, the target U-plane latency is 0.5ms each way for both UL and DL. The target reliability is $1 - 10^{-5}$ for X bytes within 1ms.

[0051] Various examples of the systems and methods disclosed herein are now described with reference to the Figures, where like reference numbers may indicate functionally similar elements. The systems and methods as generally described and illustrated in the Figures herein could be arranged and designed in a wide variety of different implementations. Thus, the following more detailed description of several implementations, as represented in the Figures, is not intended to limit scope, as claimed, but is merely representative of the systems and methods.

[0052] Figure 1 is a block diagram illustrating one implementation of one or more gNBs 160 and one or more UEs 102 in which systems and methods for ultra-reliable low latency communications (URLLC) operations may be implemented. The one or more UEs 102 communicate with one or more gNBs 160 using one or more antennas 122a-n. For example, a UE 102 transmits electromagnetic signals to the gNB 160 and receives electromagnetic signals from the gNB 160 using the one or more antennas 122a-n. The gNB 160 communicates with the UE 102 using one or more antennas 180a-n.

[0053] The UE 102 and the gNB 160 may use one or more channels 119, 121 to communicate with each other. For example, a UE 102 may transmit information or data to the gNB 160 using one or more uplink channels 121. Examples of uplink channels 121 include a PUCCH (Physical Uplink Control Channel) and a PUSCH (Physical Uplink Shared Channel), PRACH (Physical Random Access Channel), etc. For example, uplink channels 121 (e.g., PUSCH) may be used for transmitting UL data (i.e., Transport Block(s), Medium Access Control (MAC) Protocol Data Unit (PDU), and/or UL-SCH (Uplink-Shared Channel)).

[0054] Here, UL data may include URLLC data. The URLLC data may be UL-SCH data. Here, URLLC-PUSCH (i.e., different Physical Uplink Shared Channel from PUSCH) may be defined for transmitting the URLLC data. The URLLC-PUSCH described herein is assumed to be included in the PUSCH for the sake of simple description.

[0055] Also, for example, uplink channels 121 may be used for transmitting Hybrid Automatic Repeat Request- acknowledgment (HARQ-ACK), Channel State Information

(CSI), and/or Scheduling Request (SR). The HARQ-ACK may include information indicating a positive acknowledgment (ACK) or a negative acknowledgment (NACK) for DL data (i.e., Transport Block(s), Medium Access Control Protocol Data Unit (MAC PDU), and/or DL-SCH (Downlink-Shared Channel)).

[0056] The CSI may include information indicating a channel quality of downlink. The SR may be used for requesting UL-SCH (Uplink-Shared Channel) resources for new transmission and/or retransmission. Namely, the SR may be used for requesting UL resources for transmitting UL data.

[0057] The one or more gNBs 160 may also transmit information or data to the one or more UEs 102 using one or more downlink channels 119, for instance. Examples of downlink channels 119 include a PDCCH, a PDSCH, etc. Other kinds of channels may be used. The PDCCH may be used for transmitting Downlink Control Information (DCI).

[0058] Here, more than one DCI formats may be defined for DCI transmission. For example, DCI format that may be used for scheduling of PUSCH is defined. For example, DCI format to which CRC (Cyclic Redundancy Check) parity bits scrambled by SPS C-RNTI (Cell-Radio Network Temporary Identifier) are attached may be used for activating and/or deactivating UL data transmission (e.g., activating and/or deactivating (releasing) PUSCH resource for UL data transmission). Also, for example, DCI format to which CRC (Cyclic Redundancy Check) parity bits scrambled by URLLC C-RNTI (i.e., different RNTI from SPS C-RNTI) are attached may be used for activating and/or deactivating UL data transmission (e.g., activating and/or deactivating (releasing) PUSCH resource for URLLC data transmission).

[0059] Here, URLLC-PDCCH (i.e., different Physical Downlink Control Channel from PDCCH) may be defined for transmitting DCI format that may be used for activating and/or deactivating UL data transmission (e.g., activating and/or deactivating (releasing) PUSCH resource for URLLC data transmission). Also, URLLC-DCI format (i.e., different DCI format from DCI format) that is used for activating and/or deactivating UL data transmission (e.g., activating and/or deactivating (releasing) PUSCH resource for URLLC data transmission) may be defined. Here, the URLLC-PDCCH described herein

is assumed to be included in the PDCCH for the sake of simple description. Also, the URLLC-DCI format described herein is assumed to be included in the DCI format for the sake of simple description.

[0060] Here, the UE 102 may monitor (attempt to decode) PDCCH in a common search space and/or a UE-specific search space. Here, the UE-specific search space may be determined based on C-RNTI, SPS C-RNTI, and/or URLLC C-RNTI. Also, the UE receives the RRC signal including information that is used for determining the UE-specific search space.

[0061] Each of the one or more UEs 102 may include one or more transceivers 118, one or more demodulators 114, one or more decoders 108, one or more encoders 150, one or more modulators 154, a data buffer 104 and a UE operations module 124. For example, one or more reception and/or transmission paths may be implemented in the UE 102. For convenience, only a single transceiver 118, decoder 108, demodulator 114, encoder 150 and modulator 154 are illustrated in the UE 102, though multiple parallel elements (e.g., transceivers 118, decoders 108, demodulators 114, encoders 150 and modulators 154) may be implemented.

[0062] The transceiver 118 may include one or more receivers 120 and one or more transmitters 158. The one or more receivers 120 may receive signals from the gNB 160 using one or more antennas 122a-n. For example, the receiver 120 may receive and downconvert signals to produce one or more received signals 116. The one or more received signals 116 may be provided to a demodulator 114. The one or more transmitters 158 may transmit signals to the gNB 160 using one or more antennas 122a-n. For example, the one or more transmitters 158 may upconvert and transmit one or more modulated signals 156.

[0063] The demodulator 114 may demodulate the one or more received signals 116 to produce one or more demodulated signals 112. The one or more demodulated signals 112 may be provided to the decoder 108. The UE 102 may use the decoder 108 to decode signals. The decoder 108 may produce decoded signals 110, which may include a UE-decoded signal 106 (also referred to as a first UE-decoded signal 106). For example, the

first UE-decoded signal 106 may comprise received payload data, which may be stored in a data buffer 104. Another signal included in the decoded signals 110 (also referred to as a second UE-decoded signal 110) may comprise overhead data and/or control data. For example, the second UE-decoded signal 110 may provide data that may be used by the UE operations module 124 to perform one or more operations.

[0064] In general, the UE operations module 124 may enable the UE 102 to communicate with the one or more gNBs 160. The UE operations module 124 may include one or more of a UE URLLC module 126.

[0065] The UE URLLC module 126 may perform URLLC operations. URLLC operations may include grant-free data transmission (UL transmission without detection of downlink control information for triggering), sub-slot base data transmission, SR triggered data transmission (SR is sent before data transmission), SR-less data transmission (SR is not used), etc.

[0066] In the downlink, the OFDM access scheme with cyclic prefix (CP) may be employed, which may be also referred to as CP-OFDM. In the downlink, PDCCH, enhanced PDCCH (EPDCCH), PDSCH and the like may be transmitted. A downlink radio frame may consist of multiple pairs of downlink resource blocks (RBs) which is also referred to as physical resource blocks (PRBs). The downlink RB pair is a unit for assigning downlink radio resources, defined by a predetermined bandwidth (RB bandwidth) and a time slot. The downlink RB pair consists of two downlink RBs that are continuous in the time domain.

[0067] The downlink RB consists of twelve sub-carriers in frequency domain and seven (for normal CP) or six (for extended CP) OFDM symbols in time domain. A region defined by one sub-carrier in frequency domain and one OFDM symbol in time domain is referred to as a resource element (RE) and is uniquely identified by the index pair (k,l) in a slot, where k and l are indices in the frequency and time domains, respectively. While downlink subframes in one component carrier (CC) are discussed herein, downlink subframes are defined for each CC and downlink subframes are substantially in

synchronization with each other among CCs. An example of a resource grid in the downlink is discussed in connection with Figure 2.

[0068] In the uplink, in addition to CP-OFDM, a Single-Carrier Frequency Division Multiple Access (SC-FDMA) access scheme may be employed, which is also referred to as Discrete Fourier Transform-Spreading OFDM (DFT-S-OFDM). In the uplink, PUCCH, PUSCH, PRACH and the like may be transmitted. An uplink radio frame may consist of multiple pairs of uplink resource blocks. The uplink RB pair is a unit for assigning uplink radio resources, defined by a predetermined bandwidth (RB bandwidth) and a time slot. The uplink RB pair consists of two uplink RBs that are continuous in the time domain.

[0069] The uplink RB may consist of twelve sub-carriers in frequency domain and seven (for normal CP) or six (for extended CP) OFDM/DFT-S-OFDM symbols in time domain. A region defined by one sub-carrier in the frequency domain and one OFDM/DFT-S-OFDM symbol in the time domain is referred to as a RE and is uniquely identified by the index pair (k,l) in a slot, where k and l are indices in the frequency and time domains respectively. While uplink subframes in one component carrier (CC) are discussed herein, uplink subframes are defined for each CC. An example of a resource grid in the uplink is discussed in connection with Figure 3.

[0070] The UE URLLC module 126 may perform URLLC uplink (UL) transmission management to meet latency/reliability requirements and to address potential coexistence issues. The key requirements for URLLC relate to U-plane latency and reliability. For URLLC, the target U-plane latency is 0.5ms each way for both UL and DL. The target reliability is $1 - 10^{-5}$ for X bytes within 1ms.

[0071] Some approaches for meeting URLLC requirements may include the following: semi-static resource allocation for UL data transmission; dynamic indication of available resource (e.g., by broadcast DCI) for UL data transmission; normal SR-based transmission; and other solutions are not precluded.

[0072] For semi-static resource allocation (also referred to as semi-persistent scheduling (SPS)), there are several basic procedures: radio resource control (RRC)

configuration (i.e., a RRC message, a RRC signal), activation, UL transmission and deactivation. The RRC configuration may be exchanged between the gNB 160 and the UE 102 through a RRC layer. And, the RRC signal may be included in a higher layer signal. At the beginning, the gNB 160 should allocate SPS resource (e.g., a Physical Resource Block (PRB) index of SPS resource) and function to a specific UE 102 by SPS-Config, which is shown in the SPS-Config information element of Listing 1.

[0073] Here, the SPS resource may include (correspond to) UL resource, a frequency resource, UL-SCH resource, and/or PUSCH resource. Also, the gNB 160 may allocate SPS resource, which is shown in the URLLC-Config information element of Listing 2. Here, for example, the gNB 160 may configure a periodicity (e.g., a time resource) by using the RRC signal, and indicate SPS resource (e.g., a frequency resource) by using DCI format.

[0074] Also, the gNB 160 may transmit multiple configuration (e.g., multiple periodicities and multiple SPS resources) by using the RRC signal and indicate one configuration (e.g., one periodicity and one SPS resource) by using DCI format. Also, the gNB 160 may transmit multiple periodicities by using the RRC signal and indicate one periodicity and one SPS resource by using DCI format. In these cases, the DCI format may be the DCI format used for activating and/or deactivating UL transmission as mentioned above.

[0075] Also, the gNB 160 may allocate Dynamic Scheduling (DS) resource (also referred to as DS resource). Here, the DS resource may include (correspond to) UL resource, a frequency resource, UL-SCH resource, and/or PUSCH resource. For example, DS resource may be scheduled by using DCI format to which CRC parity bits scrambled by C-RNTI.

[0076] Also, the DS resource may be used for transmitting eMBB data. Namely, there may be the first UL transmission on the first SPS resource, the second UL transmission on the second SPS resource, and the third UL transmission on the DS resource. Here, the first SPS resource and the second SPS resource may be allocated different method as above mentioned (e.g., different RNTI may be used for allocation, different PDCCH may

be used for allocation, different DCI format may be used for allocation, and/or different periodicity may be used for allocation; etc.).

[0077] Here, in a case of collision of the first UL transmission and the second UL transmission in a same timing (e.g., in a same subframe, in a same slot, in a same mini-slot, and/or in a same symbol), only the second UL transmission may be performed, and the first UL transmission may be dropped. Namely, the second SPS resource may be used for UL transmission.

[0078] Also, in a case of collision of the first UL transmission and the third UL transmission in a same timing, only the third UL transmission may be performed, and the first UL transmission may be dropped. Namely, the DS resource may be used for UL transmission.

[0079] Also, in a case of collision of the second UL transmission and the third UL transmission in a same timing, only the second UL transmission may be performed, and the third transmission may be dropped. Namely, the second SPS resource may be used for UL transmission. Here, in a case of collision of the second UL transmission and the third UL transmission in a same timing, only the third UL transmission may be performed, and the second UL transmission may be dropped. Namely, the DS resource may be used for UL transmission.

[0080] Also, in a case of collision of the second UL transmission and the third UL transmission in a same timing, the second and the third transmissions are performed. Namely, the second SPS resource and/or the DS resource may be used for UL transmission. Here, in these cases, a Single-Carrier Frequency Division Multiple Access (SC-FDMA) access scheme may be applied.

```
-- ASN1START
```

```
SPS-Config ::= SEQUENCE {  
    semiPersistSchedC-RNTI          C-RNTI          OPTIONAL,  
    sps-ConfigDL                    SPS-ConfigDL      OPTIONAL, --
```

Need ON			
sps-ConfigUL	SPS-ConfigUL	OPTIONAL	--
Need ON			
}			
SPS-ConfigDL ::= CHOICE{			
release	NULL,		
setup	SEQUENCE {		
semiPersistSchedIntervalDL	ENUMERATED {		
	sf10, sf20, sf32, sf40, sf64, sf80,		
	sf128, sf160, sf320, sf640, spare6,		
	spare5, spare4, spare3, spare2,		
	spare1},		
numberOfConfSPS-Processes	INTEGER (1..8),		
n1PUCCH-AN-PersistentList	N1PUCCH-AN-PersistentList,		
...,			
[[twoAntennaPortActivated-r10	CHOICE {		
release	NULL,		
setup	SEQUENCE {		
n1PUCCH-AN-PersistentListP1-r10	N1PUCCH-AN-		
PersistentList			
}			
}			
OPTIONAL	-- Need ON		
]]			
}			
}			
SPS-ConfigUL ::= CHOICE {			

```

release                NULL,
setup                  SEQUENCE {
    semiPersistSchedIntervalUL    ENUMERATED {-- Period of UL SPS
                                         sf10, sf20, sf32, sf40, sf64, sf80,
                                         sf128, sf160, sf320, sf640, sf1-v14xy,
                                         sf2-v14xy, sf3-v14xy, sf4-v14xy,
                                         sf5-v14xy, spare1},
    implicitReleaseAfter          ENUMERATED {e2, e3, e4, e8},
    p0-Persistent                 SEQUENCE {
        p0-NominalPUSCH-Persistent    INTEGER (-126..24),
        p0-UE-PUSCH-Persistent        INTEGER (-8..7)
    } OPTIONAL, -- Need OP
    twoIntervalsConfig            ENUMERATED {true}
OPTIONAL, -- Cond TDD
    ...,
    [[ p0-PersistentSubframeSet2-r12    CHOICE {
        release                NULL,
        setup                  SEQUENCE {
            p0-NominalPUSCH-PersistentSubframeSet2-r12
INTEGER (-126..24),
            p0-UE-PUSCH-PersistentSubframeSet2-r12
INTEGER (-8..7)
        }
    } OPTIONAL
    ]],
    [[ numberOfConfUISPS-Processes-r13    INTEGER (1..8)
OPTIONAL -- Need OR
    ]]
}

```

```
}

N1PUCCH-AN-PersistentList ::=      SEQUENCE (SIZE (1..4)) OF INTEGER
(0..2047)

-- ASN1STOP
```

Listing 1

```
-- ASN1START

URLLC-Config ::= SEQUENCE {
    URLLCSchedC-RNTI      C-RNTI (or URLLC-RNTI)
    OPTIONAL,             -- Need OR
    URLLC-ConfigUL        URLLC-ConfigUL        OPTIONAL
}

URLLC-ConfigUL ::= CHOICE {
    release                NULL,
    setup                  SEQUENCE {
        URLLCInterval      ENUMERATED {-- Period of UL SPS
                                sf10, sf20, sf32, sf40, sf64, sf80,
                                sf128, sf160, sf320, sf640},
        implicitReleaseAfter (or URLLC-Timer)  ENUMERATED {e2, e3, e4, e8},
        p0-URLLC           SEQUENCE {
            p0-NominalPUSCH-URLLC      INTEGER (-126..24),
            p0-UE-PUSCH-URLLC          INTEGER (-8..7)
        }
    }
    OPTIONAL,             -- Need OP
```

```
N1PUCCH-AN-PersistentList ::= SEQUENCE (SIZE (1..4)) OF INTEGER  
(0..2047)  
  
-- ASN1STOP
```

Listing 2

[0081] After UL SPS is configured and activated, the UE 102 knows it has been allocated SPS UL resources in the subframes that satisfy the following equations:

$$(10 * SFN + subframe) = [(10 * SFNstart_time + subframestart_time) + N * semiPersistSchedIntervalUL + Subframe_Offset * (N \bmod 2)] \bmod 10240,$$

where *SFNstart_time* and *subframestart_time* are the System Frame number (SFN) and subframe, respectively, at the time the configured uplink grant was (re-)initialized. The details can be checked in TS 36.321 Section 5.10.1. Then, the UE 102 may start UL transmission. In Release 8, the UE 102 keeps transmitting at the allocated resources until UL SPS is deactivated explicitly and implicitly. In Release 14, the UE 102 transmits as needed and skips the allocated resources when there is no transport block (TB) for transmission.

[0082] To better utilize SPS for URLLC UL, there are two remaining problems. The first one is how to determine the period. URLLC may use a shorter scheduling interval. Thus, the granularity of the periodicity for UL data transmission (i.e., URLLCInterval) may be configured as subframe level, slot level, mini-slot level, and/or symbol level. And the granularity of the periodicity may depend on the new radio (NR) frame structure. Regardless, the period is supposed to be less than 0.5 ms. Due to the sporadic nature of URLLC service, the UE 102 can waste most of the allocated resources.

[0083] The second problem is when to activate or deactivate UL SPS. Since URLLC services are unpredictable in most cases, it is hard to avoid a waste of resource due to the

latency/reliability requirement. For example, UL SPS should be activated as early as possible before the URLLC traffic comes. As a result, SPS can be used for URLLC UL but it may waste resources.

[0084] As mentioned above, the gNB 160 may, using the PDCCH (i.e., DCI format), activate and/or deactivate (release) the first UL transmission on the first SPS resource. Here, the UE 102 may transmit HARQ-ACK (also referred to as confirmation information) based on a detection of the PDCCH indicating activation and/or deactivation (release) of the first UL transmission. For example, the HARQ-ACK for the PDCCH indicating activation and/or deactivation of the first UL transmission may be transmitted on PUCCH and/or using MAC control element (CE).

[0085] Also, the gNB 160 may, using the PDCCH (i.e., DCI format), activate and/or deactivate (release) the second UL transmission on the second SPS resource. The UE 102 may transmit HARQ-ACK (also referred to as confirmation information) based on a detection of the PDCCH indicating activation and/or deactivation (release) of the second UL transmission. For example, HARQ-ACK for the second UL transmission may be transmitted on PUCCH and/or using MAC CE. Here, in these cases, in a case that the HARQ-ACK is transmitted using MAC CE, HARQ-ACK MAC CE may be defined. And, the HARQ-ACK MAC CE may be identified by a MAC PDU subheader with LCID (Logical Channel ID).

[0086] Here, the same LCID (i.e., a single common LCID) may be used for a single common HARQ-ACK MAC CE for PDCCH indicating activation and/or deactivation of the first UL transmission and PDCCH indicating activation and/or deactivation of the second UL transmission. For example, the index “10101” may be used as the value of LCID for the HARQ-ACK MAC CE for PDCCH indicating activation and/or deactivation of the first UL transmission and PDCCH indicating activation and/or deactivation of the second UL transmission.

[0087] Here, different LCID may be used for the HARQ-ACK MAC CE for PDCCH indicating activation and/or deactivation of the first UL transmission (i.e., a first HARQ-ACK MAC CE) and the HARQ-ACK MAC CE for PDCCH indicating activation and/or

deactivation of the second UL transmission (i.e., a second HARQ-ACK MAC CE). For example, an index “10101” may be used as a value of LCID for the first HARQ-ACK MAC CE. And, an index “10011” may be used as a value of LCID for the second HARQ-ACK MAC CE.

[0088] Also, in a case that different value(s) of LCID(s) is used for the first HARQ-ACK MAC CE and the second HARQ-ACK MAC CE, the Logical Channel Prioritization procedure may be applied. Namely, a prioritization of logical channel (e.g., MAC CE) may be applied for the first HARQ-ACK MAC CE and the second HARQ-ACK MAC CE. For example, the UE 102 may control a scheduling of uplink data (i.e., UL transmission) by signaling of each logical channel. Namely, the UE 102 may allocate resources, according to a priority order (i.e., the Logical Channel Prioritization procedure), for all UL data that is available for transmission on the logical channel, and may not transmit UL data that is not available for transmission on the logical channel. For example, the Logical Channel Prioritization procedure may be applied when a new transmission is performed. For example, for the Logical Channel Prioritization procedure, the UE 102 may prioritize the second HARQ-ACK MAC CE over the first HARQ-ACK MAC CE. Also, for the Logical Channel Prioritization procedure, the UE 102 may prioritize the first HARQ-ACK MAC CE over the second HARQ-ACK MAC CE.

[0089] For scheduling request (SR), first of all, each UE 102 has its own SR resource(s) (e.g., PUCCH format 1, PUCCH format 3, UL control channel long format, and/or UL control channel short format), which is allocated by an eNB. SR resource is periodic, which is configured by *SchedulingRequestConfig*. An example of the *SchedulingRequestConfig* resource element is provided in Listing 3.

```
-- ASN1START

SchedulingRequestConfig ::=      CHOICE {
    release                      NULL,
    setup                        SEQUENCE {
```

sr-PUCCH-ResourceIndex	INTEGER (0..2047),	--PUCCH1 resource
sr-ConfigIndex	INTEGER (0..157),	--period and offset
dss-TransMax	ENUMERATED {	
	n4, n8, n16, n32, n64, spare3, spare2, spare1 }	
	}	
	}	
SchedulingRequestConfig-v1020 ::=	SEQUENCE {	
sr-PUCCH-ResourceIndexP1-r10	INTEGER (0..2047)	
OPTIONAL	-- Need OR	
	}	
SchedulingRequestConfigSCell-r13 ::=	CHOICE {	
release	NULL,	
setup	SEQUENCE {	
sr-PUCCH-ResourceIndex-r13	INTEGER (0..2047),	
sr-PUCCH-ResourceIndexP1-r13	INTEGER (0..2047)	
OPTIONAL,	-- Need OR	
sr-ConfigIndex-r13	INTEGER (0..157),	
dss-TransMax-r13	ENUMERATED {	
	n4, n8, n16, n32, n64, spare3, spare2,	
spare1 }		
	}	
	}	
-- ASN1STOP		

Listing 3

[0090] In Listing 3, sr-ConfigIndex indicates the SR transmission period and offset, which is shown in Table (1) (from Table 10.1.5-1 of TS 36.213). SR transmission instances are the uplink subframes satisfying

$$\left(10 \times n_f + \left\lfloor n_s / 2 \right\rfloor - N_{\text{OFFSET,SR}}\right) \bmod SR_{\text{PERIODICITY}} = 0$$

SR configuration Index I_{SR}	SR periodicity (ms) $SR_{\text{PERIODICITY}}$	SR subframe offset $N_{\text{OFFSET,SR}}$
0 – 4	5	I_{SR}
5 – 14	10	$I_{SR} - 5$
15 – 34	20	$I_{SR} - 15$
35 – 74	40	$I_{SR} - 35$
75 – 154	80	$I_{SR} - 75$
155 – 156	2	$I_{SR} - 155$
157	1	$I_{SR} - 157$

Table (1)

[0091] When UL data arrives, the UE 102 will send SR at the next available SR resource. Then the UE 102 waits for the UL grant (e.g., DCI format 0 or 4), including resource block assignment, modulation and coding scheme (MCS). Finally, the UE 102 can transmit UL data at the allocated resource indicated by the UL grant.

[0092] To meet the latency requirement, SR periodicity should be shortened. Thus, the granularity of the periodicity for SR resource (i.e., SR transmission) may be configured as subframe level, slot level, mini-slot level, and/or symbol level. For example, the eNB/gNB 160 may configure SR resource of PUCCH format 1. Also, the eNB/gNB 160 may configure and/or indicate SR resource of UL control channel long format (the first PUCCH format). Namely, SR resource of UL control channel long format may be configured by the RRC signal and/or indicated by using PDCCH (e.g.,

DCI format that is used for scheduling of PDSCH). Also, SR resource of UL control channel short format (the second PUCCH format) may be configured by the RRC signal and/or indicated by DCI (e.g., DCI format that is used for scheduling of PDSCH). Here, for example each periodicity of the SR resource of different PUCCH format(s) may be configured as subframe level, slot level, mini-slot level, and/or symbol level. However, the timing between SR from the UE 102 and UL grant from an eNB, as well as the timing between UL grant and UL data transmission cannot guarantee the low latency. Thus, SR for URLLC UL may be possible but the latency requirement is difficult to satisfy. Therefore, there is a need for a more efficient method to meet the latency/reliability requirements of URLLC without wasting resources.

[0093] The described systems and methods teach procedures and signaling for efficient uplink transmission. Based on the information carried by (new) SR, multi-bits new signaling and pre-configuration, there can be many cases. Two approaches for procedures and signaling for efficient uplink transmission as described herein.

[0094] A first approach may be used for resource configuration of a scheduling request (SR), an initial transmission, additional transmission and/or retransmission. A second approach may be used for resource configuration of an initial transmission, additional transmission and/or retransmission. Examples of these first and second approaches are described in connection with Figure 11.

[0095] These procedures introduce a multi-bits new signaling. This new signaling may be triggered by SR, an initial transmission or a retransmission. This new signaling may trigger an initial transmission and the retransmission. This new signaling may also acknowledge a successful transmission.

[0096] This new signaling may indicate one or more of the following. The purpose of this new signaling may be indicated. This may include a grant of a new transmission, a grant of the retransmission, an acknowledgement of a successful transmission, a combination of any two above. A UE 102 may not need the explicit indication for the purpose of this new signaling

[0097] This new signaling may indicate resource allocation (e.g., primary resource). This resource allocation indication may include resource indices. This may include an index offset from the pre-configured resources, a bitmap among prescribed resources, and an absolute value of the resource index. The UE 102 may derive the resource location from the timing of the received new signaling.

[0098] This resource allocation indication may indicate what are primary resources. For example, this may include all resources, pre-configured resources for initial transmissions-first (which can be used by one or multiple UEs 102), pre-configured resources for retransmissions-first (which can be used by one or multiple UEs 102), or pre-configured resources shared by initial transmissions and retransmissions.

[0099] The resource allocation indication may indicate resource allocation (e.g., additional resources). This indication may include resource indices. The resource indices may include an index offset from the pre-configured resources, a bitmap among prescribed resources and/or an absolute value of the resource index. The UE 102 may derive the resource location from the timing of the received new signaling

[00100] The resource allocation indication may indicate the number of additional resources. Additional resources may be deterministic from the number of additional resources.

[00101] The resource allocation indication may indicate what are the potential additional resources. This may include all resources, a resource pool for initial transmissions, and/or a resource pool for retransmissions. The additional resource may be time division multiplexed with the pre-configured primary resource or the additional resource may be frequency division multiplexed with the pre-configured primary resource.

[00102] The resource allocation indication may also provide an antenna port indication, precoding indication, MCS indication, redundancy version indication and frequency hopping indication.

[00103] The procedure for approach 1 may use a multi-bits new SR signaling. This new SR may indicate one or more of the following: priority level of the transmission,

buffer status, MCS, the number of required resources, numerology (Sub Carrier Spacing (SCS), e.g., 15 kHz, 30 kHz and/or 60 kHz), services or requirements (e.g., eMBB or URLLC). The number of bits may be changed by eNB/gNB 160 by RRC, DCI or a MAC control element (CE). The MAC CE may be exchanged between the eNB/gNB 160 and the UE 102 through a MAC layer. And, the MAC CE may be included in the higher layer signal. The number of bits may be determined by the number of choices provided for UE 102.

[00104] The procedures may need pre-configuration before sending SR or initial transmission. The configuration may indicate one or more of the following: SR resources, initial transmission resources, retransmission resources, additional resources, MCS, numerology (SCS, e.g. 15 kHz, 30 kHz and/or 60 kHz), antenna port indication, and precoding indication.

[00105] This pre-configuration before sending SR or initial transmission may be configured by RRC, MAC CE, DCI (where the DCI may be same as or different from the multi-bits new signaling above), or any combination of the methods above.

[00106] The UE operations module 124 may provide information 148 to the one or more receivers 120. For example, the UE operations module 124 may inform the receiver(s) 120 when to receive retransmissions.

[00107] The UE operations module 124 may provide information 138 to the demodulator 114. For example, the UE operations module 124 may inform the demodulator 114 of a modulation pattern anticipated for transmissions from the gNB 160.

[00108] The UE operations module 124 may provide information 136 to the decoder 108. For example, the UE operations module 124 may inform the decoder 108 of an anticipated encoding for transmissions from the gNB 160.

[00109] The UE operations module 124 may provide information 142 to the encoder 150. The information 142 may include data to be encoded and/or instructions for encoding. For example, the UE operations module 124 may instruct the encoder 150 to encode transmission data 146 and/or other information 142. The other information 142 may include PDSCH HARQ-ACK information.

[00110] The encoder 150 may encode transmission data 146 and/or other information 142 provided by the UE operations module 124. For example, encoding the data 146 and/or other information 142 may involve error detection and/or correction coding, mapping data to space, time and/or frequency resources for transmission, multiplexing, etc. The encoder 150 may provide encoded data 152 to the modulator 154.

[00111] The UE operations module 124 may provide information 144 to the modulator 154. For example, the UE operations module 124 may inform the modulator 154 of a modulation type (e.g., constellation mapping) to be used for transmissions to the gNB 160. The modulator 154 may modulate the encoded data 152 to provide one or more modulated signals 156 to the one or more transmitters 158.

[00112] The UE operations module 124 may provide information 140 to the one or more transmitters 158. This information 140 may include instructions for the one or more transmitters 158. For example, the UE operations module 124 may instruct the one or more transmitters 158 when to transmit a signal to the gNB 160. For instance, the one or more transmitters 158 may transmit during a UL subframe. The one or more transmitters 158 may upconvert and transmit the modulated signal(s) 156 to one or more gNBs 160.

[00113] Each of the one or more gNBs 160 may include one or more transceivers 176, one or more demodulators 172, one or more decoders 166, one or more encoders 109, one or more modulators 113, a data buffer 162 and a gNB operations module 182. For example, one or more reception and/or transmission paths may be implemented in a gNB 160. For convenience, only a single transceiver 176, decoder 166, demodulator 172, encoder 109 and modulator 113 are illustrated in the gNB 160, though multiple parallel elements (e.g., transceivers 176, decoders 166, demodulators 172, encoders 109 and modulators 113) may be implemented.

[00114] The transceiver 176 may include one or more receivers 178 and one or more transmitters 117. The one or more receivers 178 may receive signals from the UE 102 using one or more antennas 180a-n. For example, the receiver 178 may receive and downconvert signals to produce one or more received signals 174. The one or more received signals 174 may be provided to a demodulator 172. The one or more transmitters

117 may transmit signals to the UE 102 using one or more antennas 180a-n. For example, the one or more transmitters 117 may upconvert and transmit one or more modulated signals 115.

[00115] The demodulator 172 may demodulate the one or more received signals 174 to produce one or more demodulated signals 170. The one or more demodulated signals 170 may be provided to the decoder 166. The gNB 160 may use the decoder 166 to decode signals. The decoder 166 may produce one or more decoded signals 164, 168. For example, a first eNB-decoded signal 164 may comprise received payload data, which may be stored in a data buffer 162. A second eNB-decoded signal 168 may comprise overhead data and/or control data. For example, the second eNB-decoded signal 168 may provide data (e.g., PDSCH HARQ-ACK information) that may be used by the gNB operations module 182 to perform one or more operations.

[00116] In general, the gNB operations module 182 may enable the gNB 160 to communicate with the one or more UEs 102. The gNB operations module 182 may include one or more of a gNB URLLC module 194. The gNB URLLC module 194 may perform URLLC operations as described herein.

[00117] The gNB operations module 182 may provide information 188 to the demodulator 172. For example, the gNB operations module 182 may inform the demodulator 172 of a modulation pattern anticipated for transmissions from the UE(s) 102.

[00118] The gNB operations module 182 may provide information 186 to the decoder 166. For example, the gNB operations module 182 may inform the decoder 166 of an anticipated encoding for transmissions from the UE(s) 102.

[00119] The gNB operations module 182 may provide information 101 to the encoder 109. The information 101 may include data to be encoded and/or instructions for encoding. For example, the gNB operations module 182 may instruct the encoder 109 to encode information 101, including transmission data 105.

[00120] The encoder 109 may encode transmission data 105 and/or other information included in the information 101 provided by the gNB operations module 182. For

example, encoding the data 105 and/or other information included in the information 101 may involve error detection and/or correction coding, mapping data to space, time and/or frequency resources for transmission, multiplexing, etc. The encoder 109 may provide encoded data 111 to the modulator 113. The transmission data 105 may include network data to be relayed to the UE 102.

[00121] The gNB operations module 182 may provide information 103 to the modulator 113. This information 103 may include instructions for the modulator 113. For example, the gNB operations module 182 may inform the modulator 113 of a modulation type (e.g., constellation mapping) to be used for transmissions to the UE(s) 102. The modulator 113 may modulate the encoded data 111 to provide one or more modulated signals 115 to the one or more transmitters 117.

[00122] The gNB operations module 182 may provide information 192 to the one or more transmitters 117. This information 192 may include instructions for the one or more transmitters 117. For example, the gNB operations module 182 may instruct the one or more transmitters 117 when to (or when not to) transmit a signal to the UE(s) 102. The one or more transmitters 117 may upconvert and transmit the modulated signal(s) 115 to one or more UEs 102.

[00123] It should be noted that a DL subframe may be transmitted from the gNB 160 to one or more UEs 102 and that a UL subframe may be transmitted from one or more UEs 102 to the gNB 160. Furthermore, both the gNB 160 and the one or more UEs 102 may transmit data in a standard special subframe.

[00124] It should also be noted that one or more of the elements or parts thereof included in the eNB(s) 160 and UE(s) 102 may be implemented in hardware. For example, one or more of these elements or parts thereof may be implemented as a chip, circuitry or hardware components, etc. It should also be noted that one or more of the functions or methods described herein may be implemented in and/or performed using hardware. For example, one or more of the methods described herein may be implemented in and/or realized using a chipset, an application-specific integrated circuit (ASIC), a large-scale integrated circuit (LSI) or integrated circuit, etc.

[00125] Figure 2 is a diagram illustrating one example of a resource grid for the downlink. The resource grid illustrated in Figure 2 may be utilized in some implementations of the systems and methods disclosed herein. More detail regarding the resource grid is given in connection with Figure 1.

[00126] In Figure 2, one downlink subframe 269 may include two downlink slots 283. N_{RB}^{DL} is downlink bandwidth configuration of the serving cell, expressed in multiples of N_{sc}^{RB} , where N_{sc}^{RB} is a resource block 289 size in the frequency domain expressed as a number of subcarriers, and N_{symb}^{DL} is the number of OFDM symbols 287 in a downlink slot 283. A resource block 289 may include a number of resource elements (RE) 291.

[00127] For a PCell, N_{RB}^{DL} is broadcast as a part of system information. For an SCell (including a Licensed Assisted Access (LAA) SCell), N_{RB}^{DL} is configured by a RRC message dedicated to a UE 102. For PDSCH mapping, the available RE 291 may be the RE 291 whose index l fulfils $l \geq l_{data,start}$ and/or $l_{data,end} \geq l$ in a subframe.

[00128] In the downlink, the OFDM access scheme with cyclic prefix (CP) may be employed, which may be also referred to as CP-OFDM. In the downlink, PDCCH, EPDCCH, PDSCH and the like may be transmitted. A downlink radio frame may consist of multiple pairs of downlink resource blocks (RBs) which is also referred to as physical resource blocks (PRBs). The downlink resource block (RB) pair is a unit for assigning downlink radio resources, defined by a predetermined bandwidth (RB bandwidth) and a time slot. The downlink RB pair consists of two downlink RBs that are continuous in the time domain.

[00129] The downlink RB consists of twelve sub-carriers in frequency domain and seven (for normal CP) or six (for extended CP) OFDM symbols in time domain. A region defined by one sub-carrier in frequency domain and one OFDM symbol in time domain is referred to as a resource element (RE) and is uniquely identified by the index pair (k,l) in

a slot, where k and l are indices in the frequency and time domains, respectively. While downlink subframes in one component carrier (CC) are discussed herein, downlink subframes are defined for each CC and downlink subframes are substantially in synchronization with each other among CCs.

[00130] Figure 3 is a diagram illustrating one example of a resource grid for the uplink. The resource grid illustrated in Figure 3 may be utilized in some implementations of the systems and methods disclosed herein. More detail regarding the resource grid is given in connection with Figure 1.

[00131] In Figure 3, one uplink subframe 369 may include two uplink slots 383. N_{RB}^{UL} is uplink bandwidth configuration of the serving cell, expressed in multiples of N_{sc}^{RB} , where N_{sc}^{RB} is a resource block 389 size in the frequency domain expressed as a number of subcarriers, and N_{symb}^{UL} is the number of SC-FDMA symbols 393 in an uplink slot 383. A resource block 389 may include a number of resource elements (RE) 391.

[00132] For a PCell, N_{RB}^{UL} is broadcast as a part of system information. For an SCell (including an LAA SCell), N_{RB}^{UL} is configured by a RRC message dedicated to a UE 102.

[00133] In the uplink, in addition to CP-Orthogonal Frequency Division Multiplexed (OFDM), a Single-Carrier Frequency Division Multiple Access (SC-FDMA) access scheme may be employed, which is also referred to as Discrete Fourier Transform-Spreading OFDM (DFT-S-OFDM). In the uplink, PUCCH, PUSCH, PRACH and the like may be transmitted. An uplink radio frame may consist of multiple pairs of uplink resource blocks. The uplink RB pair is a unit for assigning uplink radio resources, defined by a predetermined bandwidth (RB bandwidth) and a time slot. The uplink RB pair consists of two uplink RBs that are continuous in the time domain.

[00134] The uplink RB may consist of twelve sub-carriers in frequency domain and seven (for normal CP) or six (for extended CP) OFDM/DFT-S-OFDM symbols in time

domain. A region defined by one sub-carrier in the frequency domain and one OFDM/DFT-S-OFDM symbol in the time domain is referred to as a RE and is uniquely identified by the index pair (k,l) in a slot, where k and l are indices in the frequency and time domains respectively. While uplink subframes in one component carrier (CC) are discussed herein, uplink subframes are defined for each CC.

[00135] Figure 4 shows examples of several numerologies 401. The numerology #1 401a may be a basic numerology (e.g., a reference numerology). For example, a RE 495a of the basic numerology 401a may be defined with subcarrier spacing 405a of 15 kHz in frequency domain and $2048T_s + \text{CP length}$ (e.g., $160T_s$ or $144T_s$) in time domain (i.e., symbol length #1 403a), where T_s denotes a baseband sampling time unit defined as $1/(15000 \cdot 2048)$ seconds. For the i -th numerology, the subcarrier spacing 405 may be equal to $15 \cdot 2^i$ and the effective OFDM symbol length $2048 \cdot 2^{-i} \cdot T_s$. It may cause the symbol length is $2048 \cdot 2^{-i} \cdot T_s + \text{CP length}$ (e.g., $160 \cdot 2^{-i} \cdot T_s$ or $144 \cdot 2^{-i} \cdot T_s$). In other words, the subcarrier spacing of the $i+1$ -th numerology is a double of the one for the i -th numerology, and the symbol length of the $i+1$ -th numerology is a half of the one for the i -th numerology. Figure 4 shows four numerologies, but the system may support another number of numerologies. Furthermore, the system does not have to support all of the 0-th to the I -th numerologies, $i=0, 1, \dots, I$.

[00136] For example, the first UL transmission on the first SPS resource as above mentioned may be performed only on the numerology #1 401a (e.g., a subcarrier spacing of 15 kHz). Here, the UE 102 may acquire (detect) the numerology #1 401a based on a synchronization signal. Also, the UE 102 may receive a dedicated RRC signal including information (e.g., a handover command) configuring the numerology #1 401a. The dedicated RRC signal may be a UE-specific signal. Here, the first UL transmission on the first SPS resource may be performed on the numerology #1 401a, the numerology #2 401b (a subcarrier spacing of 30 kHz), and/or the numerology #3 401c (a subcarrier spacing of 60 kHz).

[00137] Also, the second UL transmission on the second SPS resource as above mentioned may be performed only on the numerology #3 401c. Here, for example, the UE

102 may receive System Information (e.g., Master Information Block (MIB) and/or System Information Block (SIB)) including information configuring the numerology #2 401b and/or the numerology #3 401c.

[00138] Also, the UE 102 may receive the dedicated RRC signal including information (e.g., the handover command) configuring the numerology #2 401b and/or the numerology #3 401c. The System Information (e.g., MIB) may be transmitted on BCH (Broadcast Channel) and/or the dedicated RRC signal. The System Information (e.g., SIB) may contain information relevant when evaluating if a UE 102 is allowed to access a cell and/or defines the scheduling of other system information. The System Information (SIB) may contain radio resource configuration information that is common for multiple UEs 102. Namely, the dedicated RRC signal may include each of multiple numerology configurations (the first numerology 401a, the second numerology 401b, and/or the third numerology 401c) for each of UL transmissions (e.g., each of UL-SCH transmissions, each of PUSCH transmissions). Also, the dedicated RRC signal may include each of multiple numerology configurations (the first numerology 401a, the second numerology 401b, and/or the third numerology 401c) for each of DL transmissions (each of PDCCH transmissions).

[00139] Figure 5 shows examples of subframe structures for the numerologies 501 that are shown in Figure 4. Given that a slot 283 includes $N_{\text{symb}}^{\text{DL}}$ (or $N_{\text{symb}}^{\text{UL}}$) = 7 symbols, the slot length of the $i+1$ -th numerology 501 is a half of the one for the i -th numerology 501, and eventually the number of slots 283 in a subframe (i.e., 1 ms) becomes double. It may be noted that a radio frame may include 10 subframes, and the radio frame length may be equal to 10 ms.

[00140] Figure 6 shows examples of slots 683 and sub-slots 607. If a sub-slot 607 is not configured by higher layer, the UE 102 and the eNB/gNB 160 may only use a slot 683 as a scheduling unit. More specifically, a given transport block may be allocated to a slot 683. If the sub-slot 607 is configured by higher layer, the UE 102 and the eNB/gNB 160 may use the sub-slot 607 as well as the slot 683. The sub-slot 607 may include one or

more OFDM symbols. The maximum number of OFDM symbols that constitute the sub-slot 607 may be $N_{\text{symb}}^{\text{DL}}-1$ (or $N_{\text{symb}}^{\text{UL}}-1$).

[00141] The sub-slot length may be configured by higher layer signaling. Alternatively, the sub-slot length may be indicated by a physical layer control channel (e.g., by DCI format).

[00142] The sub-slot 607 may start at any symbol within a slot 683 unless it collides with a control channel. There could be restrictions of mini-slot length based on restrictions on starting position. For example, the sub-slot 607 with the length of $N_{\text{symb}}^{\text{DL}}-1$ (or $N_{\text{symb}}^{\text{UL}}-1$) may start at the second symbol in a slot 683. The starting position of a sub-slot 607 may be indicated by a physical layer control channel (e.g., by DCI format). Alternatively, the starting position of a sub-slot 607 may be derived from information (e.g., search space index, blind decoding candidate index, frequency and/or time resource indices, PRB index, a control channel element index, control channel element aggregation level, an antenna port index, etc.) of the physical layer control channel which schedules the data in the concerned sub-slot 607.

[00143] In cases when the sub-slot 607 is configured, a given transport block may be allocated to either a slot 683, a sub-slot 607, aggregated sub-slots 607 or aggregated sub-slot(s) 607 and slot 683. This unit may also be a unit for HARQ-ACK bit generation.

[00144] Figure 7 shows examples of scheduling timelines 709. For a normal DL scheduling timeline 709a, DL control channels are mapped the initial part of a slot 783a. The DL control channels 711 schedule DL shared channels 713a in the same slot 783a. HARQ-ACKs for the DL shared channels 713a (i.e., HARQ-ACKs each of which indicates whether or not transport block in each DL shared channel 713a is detected successfully) are reported via UL control channels 715a in a later slot 783b. In this instance, a given slot 783 may contain either one of DL transmission and UL transmission.

[00145] For a normal UL scheduling timeline 709b, DL control channels 711b are mapped the initial part of a slot 783c. The DL control channels 711b schedule UL shared channels 717a in a later slot 783d. For these cases, the association timing (time shift)

between the DL slot 783c and the UL slot 783d may be fixed or configured by higher layer signaling. Alternatively, it may be indicated by a physical layer control channel (e.g., the DL assignment DCI format, the UL grant DCI format, or another DCI format such as UE-common signaling DCI format which may be monitored in common search space).

[00146] For a self-contained base DL scheduling timeline 709c, DL control channels 711c are mapped to the initial part of a slot 783e. The DL control channels 711c schedule DL shared channels 713b in the same slot 783e. HARQ-ACKs for the DL shared channels 713b are reported in UL control channels 715b, which are mapped at the ending part of the slot 783e.

[00147] For a self-contained base UL scheduling timeline 709d, DL control channels 711d are mapped to the initial part of a slot 783f. The DL control channels 711d schedule UL shared channels 717b in the same slot 783f. For these cases, the slot 783f may contain DL and UL portions, and there may be a guard period between the DL and UL transmissions.

[00148] The use of a self-contained slot may be upon a configuration of self-contained slot. Alternatively, the use of a self-contained slot may be upon a configuration of the sub-slot. Yet alternatively, the use of a self-contained slot may be upon a configuration of shortened physical channel (e.g., PDSCH, PUSCH, PUCCH, etc.).

[00149] Figure 8 shows examples of DL control channel monitoring regions. One or more sets of PRB(s) may be configured for DL control channel monitoring. In other words, a control resource set is, in the frequency domain, a set of PRBs within which the UE 102 attempts to blindly decode downlink control information, where the PRBs may or may not be frequency contiguous, a UE 102 may have one or more control resource sets, and one DCI message may be located within one control resource set. In the frequency-domain, a PRB is the resource unit size (which may or may not include a demodulation reference signal (DM-RS)) for a control channel. A DL shared channel may start at a later OFDM symbol than the one(s) which carries the detected DL control channel. Alternatively, the DL shared channel may start at (or earlier than) an OFDM symbol than

the last OFDM symbol which carries the detected DL control channel. In other words, dynamic reuse of at least part of resources in the control resource sets for data for the same or a different UE 102, at least in the frequency domain may be supported.

[00150] Figure 9 shows examples of DL control channel which consists of more than one control channel elements. When the control resource set spans multiple OFDM symbols, a control channel candidate may be mapped to multiple OFDM symbols or may be mapped to a single OFDM symbol. One DL control channel element may be mapped on REs defined by a single PRB and a single OFDM symbol. If more than one DL control channel elements are used for a single DL control channel transmission, DL control channel element aggregation may be performed.

[00151] The number of aggregated DL control channel elements is referred to as DL control channel element aggregation level. The DL control channel element aggregation level may be 1 or 2 to the power of an integer. The gNB 160 may inform a UE 102 of which control channel candidates are mapped to each subset of OFDM symbols in the control resource set. If one DL control channel is mapped to a single OFDM symbol and does not span multiple OFDM symbols, the DL control channel element aggregation is performed within an OFDM symbol, namely multiple DL control channel elements within an OFDM symbol are aggregated. Otherwise, DL control channel elements in different OFDM symbols can be aggregated.

[00152] Figure 10 shows examples of UL control channel structures. UL control channel may be mapped on REs which are defined a PRB and a slot in frequency and time domains, respectively. This UL control channel may be referred to as a long format (or just the 1st format). UL control channels may be mapped on REs on a limited OFDM symbols in time domain. This may be referred to as a short format (or just the 2nd format). The UL control channels with a short format may be mapped on REs within a single PRB. Alternatively, the UL control channels with a short format may be mapped on REs within multiple PRBs. For example, interlaced mapping may be applied, namely the UL control channel may be mapped to every N PRBs (e.g. 5 or 10) within a system bandwidth.

[00153] Figure 11 illustrates examples of a first approach and a second approach for efficient uplink transmission signaling. Based on the information carried by (new) SR, multi-bits new signaling and pre-configuration, there can be many cases.

[00154] A first approach (Approach-1) may be used for resource configuration of a scheduling request (SR), an initial transmission, additional transmission and/or retransmission. In step 1, the UE 1102a may send a scheduling request (SR) to an eNB/gNB 1160a. For example, the SR may be transmitted on PUCCH resource(s) (i.e., SR resource(s) of PUCCH format 1, SR resource(s) of PUCCH format 3, SR resource(s) of UL control channel long format, and/or SR resource(s) of UL control channel short format).

[00155] In step 2, the eNB/gNB 1160a may send multi-bits new signaling to the UE 1102a. Here, the multi-bits new signaling may be transmitted on a Physical Downlink HARQ-ACK Indicator Channel (PDHICH). Here, the PDHICH is described for the sake of simple description, but a name of a physical downlink channel may be different from the PDHICH. For example, the PDHICH may be used for carrying information associated with HARQ-ACK in response to UL transmission (e.g., PUCCH transmission and/or SR transmission). Here, the SR transmission may be performed on PUCCH format 1, PUCCH format 3, UL control channel long format, and/or UL control channel short format. Namely, information associated with DL HARQ-ACK in response to UL transmission (e.g., PUCCH transmission and/or SR transmission) may be sent on the PDHICH.

[00156] In step 3, the UE 1102a may send an initial transmission to the eNB/gNB 1160a. For example, the UE 1102a may perform, based on a detection of PDHICH transmission in subframe n , the corresponding UL transmission (e.g., PUSCH transmission) in subframe $n+k$ according to PDHICH information. Here, a value of k may be defined, in advance, by specifications. For example, a value of k may be different for FDD (Frequency Division Duplexing) and TDD (Time Division Duplexing). Namely, a value of k may be different for each of types of frame structure (e.g., a frame structure type 1 and a frame structure type 2). Also, a value of k may be set as subframe level, slot

level, mini-slot level, and/or symbol level. Also, the gNB 1160a may configure a value of k by using the dedicated RRC signal.

[00157] Here, a PDHICH resource may be identified an index (e.g. an index pair of a time resource, a frequency resource, a group number, and/or a sequence index). For example, for UL transmission (e.g., PUCCH transmission, and/or SR transmission) in a subframe n , the UE 1102a may determine, based on UL resource (e.g., SPS resource and/or PUCCH resource), the corresponding PDHICH resource in a subframe $n+p$.

[00158] Also, for UL transmission (e.g., PUCCH transmission, and/or SR transmission) in a subframe n , the UE 1102a may determine, based on an offset value that is configured by the gNB 1160a, the corresponding PDHICH resource in a subframe $n+p$. Here, a value of p may be specified, in advance, by specifications. And, a value of p may be different for FDD and TDD. Namely, a value of p may be different for each of types of frame structure (e.g., a frame structure type 1 and a frame structure type 2). Here, a value of p may be set as subframe level, slot level, mini-slot level, and/or symbol level. Also, the gNB 1160a may configure a value of p by using the dedicated RRC signal.

[00159] As above mentioned, an index of SPS resource (i.e., the PRB index of SPS resource) may be configured and/or indicated by the gNB 1160a using the RRC signal and/or DCI format. And, a first correspondence (a first association) of the index of PDHICH resource and the index of SPS resource may be defined and/or configured. Namely, the UE 1102a determine, based on the first correspondence, the PDHICH resource (i.e., the index of PDHICH) for UL transmission (e.g., PUCCH transmission and/or SR transmission).

[00160] Also, a second correspondence (association) of the index of PDHICH resource and the index of PUCCH resource may be defined and/or configured. And, the UE 1102a determine, based on the second correspondence, the PDHICH resource (i.e., the index of PDHICH) for UL transmission (e.g., PUCCH transmission and/or SR transmission). Namely, the UE 1102a may determine the PDHICH resource according to the first correspondence and/or the second correspondence.

[00161] Also, an offset value for the first correspondence may be configured by the gNB 1160a using the dedicated RRC signal. Also, an offset value for the second correspondence may be configured by the gNB 1160a using the dedicated RRC signal.

[00162] In step 4, the eNB/gNB 1160a may respond with additional multi-bits new signaling. In step 5, the UE 1102a may send a retransmission with or without additional transmission. In step 6, the eNB/gNB 1160a may respond with multi-bits new signaling.

[00163] A second approach may be used for resource configuration of an initial transmission, additional transmission and/or retransmission. In step 1, the UE 1102b may send an initial transmission to the eNB/gNB 1160b. In step 2, the eNB/gNB 1160b may respond additional multi-bits new signaling. In step 3, the UE 1102b may send a retransmission with or without additional transmission. In step 4, the eNB/gNB 1160b may respond with multi-bits new signaling.

[00164] In an implementation (case 1), MCS, numerology, antenna port, precoding may be pre-configured before step 1. Here, for URLLC data transmission, only a single antenna port may be used. And, the number (index) of the antenna port used for URLLC transmission may be configured by using the dedicated RRC signal and/or specified, in advance, by specifications. In an implementation (case 1.1), only one resource pool (for initial transmission, retransmission and/or additional transmission) may be pre-configured before step 1. For example, the gNB may configure one resource pool (e.g., PUSCH resource) by using the dedicated RRC signal. In this case, the UE 1102 knows the location of the resource (e.g., periodicity, time offset, resource block assignment and hopping resource allocation). The UE 1102 can use the configured one resource pool (i.e., the configured one resource) for initial transmission, retransmission and/or additional transmission. Namely, the UE 1102 may always use, based on a detection of the PDHICH information, the configured resource for initial transmission, retransmission, and/or additional transmission.

[00165] In an implementation (case 1.1.1), the SR resource may be preconfigured. In this case, the UE 1102 has its own SR resource (e.g., periodicity, offset, etc.) and will send a scheduling request before the data transmission.

[00166] In the case where there is no additional transmission, the procedure may be implemented as follows. In a first step (step 1a), after the TB arrives, the UE 1102 may use the next available SR resource to send a scheduling request (SR) to the eNB/gNB 1160. For example, SR resource(s) of PUCCH format 1 may be used for only transmitting a positive SR (i.e., requesting UL-SCH resources for initial transmission). Also, SR resource(s) of PUCCH format 3 may be used for only transmitting a positive SR and/or a negative SR (i.e., requesting and/or not requesting UL-SCH resources for initial transmission). Also, SR resource(s) of UL control channel long format and/or UL control channel short format may be used for transmitting multi-bit SR. In a second step (step 2a), after receiving and decoding the SR, the eNB/gNB 1160 sends the new signaling to the UE 1102. In this case, the new signal can be a one-bit trigger (e.g., '1' means that the UE 1102 can transmit the data at the pre-configured resource). Namely, for example, one-bit information used for granting (triggering, permitting) PUSCH transmission may be transmitted on PDHICH. The timing may be determined by the eNB/gNB 1160, which may be based on some scheduling considerations. For example, as above mentioned, for uplink transmission (e.g., PUCCH transmission, and/or SR transmission) in a subframe n , the UE 1102a may determine the corresponding PDHICH resource in a subframe $n+p$. Here, as above mentioned, the UE 1102a determine the PDHICH resource based on SPS resource, PUCCH resource, and/or offset value which is configured by the gNB 1160.

[00167] In a third step (step 3a), after receiving and decoding the new signaling, the UE 1102 may send out the initial transmission at the pre-configured resource. The timing may be derived from the timing of the new signaling. If UE 1102 does not receive the new signaling for X scheduling units after it sends out the SR, it will send out the initial transmission at the next pre-configured resource. X is determined by the latency requirement.

[00168] In a fourth step (step 4a), if the eNB/gNB 1160 receives and decodes the TB successfully, it will send the ACK-like new signaling (e.g. '1') to the UE 1102, which indicates a successful transmission. Otherwise, it will send the NACK-like new signaling (e.g. '0') to the UE 1102, which triggers a retransmission. Namely, for example, one-bit

information used for granting (triggering, permitting) and/or not granting (not triggering, not permitting) PUSCH transmission may be transmitted on PDHICH. On the other hand, the ACK-like new signaling may also trigger a new transmission for another TB if the UE 1102 sent another SR before.

[00169] In a fifth step (step 5a), if the UE 1102 receives the ACK-like new signaling, the UE 1102 will not do retransmission. In addition, if the UE 1102 has another TB to transmit and has sent out the corresponding SR before, it will transmit the new TB at the pre-configured resource. If the UE 1102 receives the NACK-like new signaling, the UE 1102 may retransmit the TB at the pre-configured resource no matter whether there is a new TB to transmit or not. In other words, the new TB will not be transmitted until the previous TB has been received and decoded successfully by eNB/gNB 1160. In a sixth step (step 6a), step 4a or step 1a may be repeated.

[00170] To summarize this implementation, if the new signaling is triggered by a SR, then it is a simplified UL grant. If the new signaling is triggered by a transmission/retransmission, then it is an ACK/NACK and/or a simplified grant for new transmission or retransmission.

[00171] In the case where there is additional transmission, the procedure may be implemented as follows. There can be an extended version with a multi-bits new signaling. One more bit can be added to the new signaling described above to indicate the usage of an additional resource. Since there is only one resource pool, the additional transmission will use the same resource which is pre-configured for initial transmission and retransmission. For example, after receiving the multi-bits new signaling '11', the UE 1102 knows that it can transmit at the next two pre-configured resources. It is equivalent to a granted initial transmission and an immediate retransmission without NACK. After receiving the multi-bits new signaling '10', the UE 1102 knows it can only transmit at the next one pre-configured resource. The similar rule is applied to retransmission when the UE 1102 receives the new signaling '01' or '00'. Moreover, more bits can be added to the new signaling to indicate more additional resources. The additional bits can be used to indicate the number of additional resources or a bitmap.

[00172] In another implementation (case 1.1.2), SR is not used. In this case, the UE 1102 does not send a scheduling request (SR) before the initial transmission. When the TB arrives, the UE 1102 will use the pre-configured resource to send the initial transmission to the eNB/gNB 1160. The rest of the steps in this implementation are the same as step 4a and step 5a as described above in case 1.1.1. In summary of this implementation, the initial transmission is grant-free while the retransmission is grant-based.

[00173] In yet another implementation (case 1.1.3), the multi-bits new SR is pre-configured. Here, the multi-bits SR may be transmitted on SR resource(s) of PUCCH format 1, SR resource(s) of PUCCH format 3, SR resource(s) of UL control channel long format, and/or UL control channel short format. For example, the SR may indicate the service or requirement (e.g., eMBB or URLLC). In an example, one-bit '1' can indicate the SR is from a URLLC service. Then, the eNB/gNB 1160 knows the service is much more important than any other service and it should guarantee the latency requirement and send out the multi-bits new signaling to the corresponding UE 1102. Namely, one or more SR bits used for requesting UL-SCH resources for new transmission of each of the services and/or the requirements (e.g., eMBB service and/or URLLC service) may be defined. Namely, each value of one or more SR bits may indicate requesting of UL-SCH resources for new transmission of each of the services and/or the requirements.

[00174] Also, for example, the SR may indicate the priority level of the transmission. Different URLLC services may have different requirements for latency and reliability. A multi-bits SR can indicate the priority level of the transmission. For example, a value '00' of multi-bits SR may indicate the highest priority; a value '01' of multi-bits SR may indicate the second priority; a value '10' of multi-bits SR may indicate the third priority; and a value '11' of multi-bits SR may indicate the lowest priority. Then, the eNB/gNB 1160 knows how to schedule the transmissions based on the priority levels and may send out the multi-bits new signaling above. For example, the requested transmission with the highest priority should be allocated with the immediate next pre-configured resource. For scheduling requests with the same priority level, the eNB/gNB 1160 can adopt a round-

robin or random selection. Namely, one or more SR bits used for requesting UL-SCH resources for UL transmission of each of the priority level may be defined. Namely, each value of one or more SR bits may indicate a requesting of UL-SCH resources for new transmission of each of the priority level.

[00175] Also, for example, the SR may indicate a buffer status. The buffer status (e.g., a buffer status reporting procedure) may be used to provide the serving gNB with information about the amount of data available for transmission in the UL buffers associated with the MAC entity. Namely, the buffer status may be used to provide the gNB with the information about the amount of data available for transmission in the UL buffers. The Buffer Size may identify the total amount of data available across all logical channels of a logical channel group after all MAC PDUs for the transmission (e.g., the transmission time interval) have been built. Different transmissions may have different buffer sizes. A multi-bits SR can indicate the coarse buffer size. For example, a value '00' of multi-bits SR may indicate a buffer size $\leq x1$; a value '01' of multi-bits SR may indicate $x1 < \text{buffer size} \leq x2$; a value '10' of multi-bits SR may indicate $x2 < \text{buffer size} \leq x3$; and a value '11' of multi-bits SR may indicate buffer size $> x3$. Then, the eNB/gNB 1160 may allocate a corresponding number of resources according to the buffer size and may send out the corresponding multi-bits new signaling. Namely, one or more SR bits used for indicating information on the buffer status may be defined. Namely, each value of one or more SR bits may indicate each of amount of data available for transmission in the UL buffers.

[00176] Also, for example, the SR may indicate the number of required resources (i.e., the required amount of UL resources). Different transmissions may need different numbers of resources due to the consideration of MCS/buffer size or repetition for reliability. A multi-bits SR can indicate the number of required resources. For example, a value '00' of multi-bits SR may indicate no additional resource is required; a value '01' of multi-bits SR may indicate one additional resource is required; a value '10' of multi-bits SR may indicate two additional resources are required; and a value '11' of multi-bits SR may indicate three additional resources are required. Then, the eNB/gNB 1160 may

allocate corresponding number of resources according the request and may send out the corresponding multi-bits new signaling. It should be noted that the multi-bits new signaling can always rewrite the request. Namely, one or more SR bits used for indicating the amount of UL resources may be defined. Namely, each value of one or more SR bits may indicate each of amount of UL resources.

[00177] Also, for example, the SR may be used for a requesting of UL resource of a numerology (i.e., SCS, e.g. 15 kHz, 30 kHz and/or 60 kHz) for UL transmission (e.g., new transmission and/or retransmission). Here, the UL resource may include the SPS resource, and/or the DS resource. According to the assumption of case 1, one or more numerologies are pre-configured (e.g. configured by the gNB using the RRC signal). The UE 1102 may request UL transmission on UL resource with a different numerology. A multi-bits SR can indicate the required numerology of UL transmission. For example, a value '00' of multi-bits SR may indicate requesting of UL resources of 15 kHz SCS for UL transmission; a value '01' of multi-bits SR may indicate requesting of UL resources of 30 kHz SCS for UL transmission; a value '10' of multi-bits SR may indicate requesting of UL resources of 60 kHz SCS for UL transmission; and a value '11' of multi-bits SR may indicate requesting of UL resources of 120 kHz SCS for UL transmission. There should be an additional bit in the multi-bits new signaling above to tell the UE 1102 whether such a numerology is allowed or not. For example, the additional bit '1' indicates the UE 1102 can transmit by using the requested numerology. Otherwise, the UE 1102 uses the pre-configured default numerology. Namely, one or more SR bits used for indicating the numerology (i.e., SCS) for UL resources may be defined. Namely, each value of one or more SR bits may indicate each of numerology (i.e., SCS) for UL resources. Here, the number of SR bit(s) may be determined based on the configured one or more numerologies. Namely, the UE 1102 may determine the number of SR bit(s) based on the information configuring the one or more numerologies. For example, in a case that only 15 kHz SCS is configured as the numerology, the number of SR bits may be one bit (i.e., one bit SR may be used). And, in a case that 15 kHz SCS and 30 KHz are configured as the numerologies, the number of SR bits may be two bits

(i.e., two bits SR may be used). Also, in a case that 15 kHz SCS, 30 KHz and 60 KHz are configured as the numerologies, the number of SR bits may be two bits (i.e., two bits SR may be used). Also, the interpretation of a value of one or more SR bits may be determined based on the configured one or more numerologies. Namely, the UE 1102 may determine, based on the configured numerologies, a correspondence of the value of one or more SR bits and the requested numerologies. For example, in a case that only 15 kHz SCS is configured, a value '1' of SR bit may indicate requesting of UL resource of 15 kHz SCS for UL transmission. And, for example, in a case that only 60 kHz SCS is configured, a value '1' of SR bit may indicate requesting of UL resource of 60 kHz SCS for UL transmission. Also, for example, in a case that 15 kHz SCS and 30 kHz SCS are configured, a value '01' of SR bits may indicate requesting of UL resource of 15 kHz SCS for UL transmission. And, in this case, a value '10' of SR bits may indicate requesting of UL resource of 30 kHz SCS for UL transmission. Also, for example, in a case that 15 kHz SCS and 60 kHz SCS are configured, a value '01' of SR bits may indicate requesting of UL resource of 15 kHz SCS for UL transmission. And, in this case, a value '10' of SR bits may indicate requesting of UL resource of 60 kHz SCS for UL transmission. Also, for example, in a case that 30 kHz SCS and 60 kHz SCS are configured, a value '01' of SR bits may indicate requesting of UL resource of 30 kHz SCS for UL transmission. And, in this case, a value '10' of SR bits may indicate requesting of UL resource of 60 kHz SCS for UL transmission.

[00178] Also, for example, the SR may indicate the MCS of the requested transmission. According to the assumption of case 1, the MCS is pre-configured. The UE 1102 may request a different MCS. A multi-bits SR can indicate the MCS of the required transmission. There should be an additional bit in the multi-bits new signaling above to tell the UE 1102 whether such a MCS is allowed or not. For example, the additional bit '1' indicates the UE 1102 can transmit by using the requested MCS. Otherwise, the UE 1102 uses the pre-configured default MCS. It should be noted that the number of bits for all kinds of SRs above can be changed by eNB/gNB 1160 (e.g., MIB, SIB, RRC, DCI or

MAC CE). The number of bits included in the SR may be determined by the number of choices provided to the UE 1102.

[00179] In another implementation (case 1.2), two resource pools (one is for initial transmission and/or additional transmission, while the other is for retransmission and/or additional transmission) are pre-configured before step 1. In this case, the UE 1102 knows the locations of these two kinds of resources (e.g. periodicity, time offset, resource block assignment and hopping resource allocation). The UE 1102 can use the initial transmission resource pool for initial transmission and retransmission resource pool for retransmission.

[00180] This implementation separates the initial transmission resource and the retransmission resource. Here, the initial transmission resource means that the resource is primarily used by initial transmission and may be used by additional transmission or retransmission. The retransmission resource means that the resource is primarily used by retransmission and may be used by additional transmission or initial transmission. The two resource pools can be time division multiplexed, frequency division multiplexed or both.

[00181] In an implementation (case 1.2.1), the SR resource is pre-configured. As described in case 1.1.1 above, the new transmission may wait until the previous transmission/retransmission is successful. Thus, the new transmission may fail to meet the latency requirement. That is a motivation to separate the initial transmission resource and the retransmission source. On the other hand, the retransmission resource can be shared by multiple groups of UEs 1102 since the retransmission may not happen frequently.

[00182] The multi-bits new signaling may contain two parts. Part 1 may correspond to an initial transmission while part 2 may correspond to retransmission. These two parts can be mapped into physical channels together or separately. At the UE 1102 side, there may be two logic buffer queues. One is for initial transmissions while the other is for retransmissions.

[00183] In the case where there is no additional transmission, the procedure may be implemented as follows. In a first step (step 1b), after the TB arrives, the UE 1102 will use the next pre-configured SR resource to send a scheduling request to the eNB/gNB 1160. The TB will be restored in the initial transmission buffer queue.

[00184] In a second step (step 2b), after receiving and decoding the SR, the eNB/gNB 1160 sends the new signaling with part 1 to trigger the initial transmission. In this case, the new signal can be a one-bit trigger (no matter what the bit is, the UE 1102 can transmit the data at the pre-configured resource). The timing is determined by the eNB/gNB 1160, which may be based on some scheduling considerations.

[00185] In a third step (step 3b), after receiving and decoding the new signaling with part 1, the UE 1102 sends out the initial transmission at the pre-configured resource. The timing is derived from the timing of the new signaling. If the UE 1102 does not receive the new signaling for X scheduling units after it sends out the SR, it will send out the initial transmission at the next pre-configured resource. X is determined by the latency requirement.

[00186] In a fourth step (step 4b), if the eNB/gNB 1160 receives and decodes the TB successfully, it will send the ACK-like new signaling part 1 (e.g. '1') to UE, which indicates a successful transmission and may also trigger a new transmission for another TB if the UE 1102 sent another SR before. Otherwise, it will send the NACK-like new signaling part 1 (e.g. '0') to the UE 1102, which indicates a retransmission is required. Thus, the eNB/gNB 1160 will send out the new signaling part 2 simultaneously or separately to indicate the grant of the retransmission and/or ACK/NACK of a previous retransmission. For example, new signaling part 2 with bit '1' indicates that the retransmission of the previous TB is successful (if there was such a retransmission before) and it is also the grant of the retransmission for the following TB in the retransmission buffer queue or the current TB which just failed for the initial transmission. On the other hand, the new signaling part 2 with bit '0' indicates that the retransmission of the previous TB failed and another retransmission is required. In this

case, the UE 1102 cannot do retransmission for the following TB in the retransmission buffer queue or the current TB which just failed for the initial transmission.

[00187] In a fifth step (step 5a), if the UE 1102 receives the ACK-like new signaling part 1, the UE 1102 may clear the buffer of the current TB in the initial transmission buffer queue. If the UE 1102 receives the NACK-like new signaling part 1, the UE 1102 may move the buffer of the current TB from the initial transmission buffer queue into the retransmission buffer queue. In addition, no matter whether the received new signaling part 1 is ACK-like or NACK-like, if the UE 1102 has another TB to transmit and has sent out the corresponding SR before, it will transmit the new TB at the next pre-configured resource. If the UE 1102 receives the new signaling part 2 with bit '0', the UE 1102 may retransmit the previous TB in the retransmission buffer queue at the next pre-configured retransmission resource. Otherwise, the UE 1102 clears the buffer of the previous TB in the retransmission buffer queue and transmits the immediate following TB in the retransmission buffer queue (which also includes the TB just moved from the initial transmission buffer queue due to the failure of the initial transmission). However, if the retransmission buffer queue is empty, there is no action corresponding to the new signaling part 2. In a sixth step (step 6b), step 4b or step 1b may be repeated.

[00188] As an example, the case with a processed initial transmission, a new coming TB and a processed retransmission is shown as following:

[00189] In the case where there is additional transmission, the procedure may be implemented as follows. There can be an extended version with additional transmission. One or more bits can be added to the new signaling part 1 and part 2 above to indicate the usage of an additional resource. The additional transmission for the same TB may be provided to enhance the reliability of the initial transmission or the retransmission or both. Since there are two resource pools, the additional transmission will use the resource pool which is pre-configured for initial transmission and/or the resource pool which is pre-configured for retransmission. Some examples of using additional transmissions are described in connection with Figures 12–14. In these examples, the resource pools are

frequency division multiplexed. However, they can also be time division multiplexed or even spatial division multiplexed.

[00190] The remaining question is how to use additional bits to indicate the usage of additional transmission. The additional bits added to the new signaling part 1 and/or part 2 can be used as a simple trigger for the additional transmission at the pre-defined resource position or to indicate the number of additional resources at the pre-defined resource set or a bitmap of the pre-defined resource set.

[00191] In another implementation (case 1.2.2), the SR is not used. As described above in case 1.1.2, the retransmission is grant-based but it may conflict with the grant-free initial transmission since they use the same resource pool. Thus, it may be better to manage the retransmission in a separated resource pool. In this case, the UE 1102 does not send a scheduling request before the initial transmission. When the TB arrives, the UE 1102 will use the next pre-configured resource to send the initial transmission to the eNB/gNB 1160. The rest of the steps are the same as step 4b and step 5b in case 1.2.1.

[00192] Contention may happen in the initial transmissions but contention can be avoided in retransmissions since retransmissions are grant-based in a separate resource pool. Additional transmissions can be used or not, which is similar to case 1.2.1. An example where two UEs 1102 fail in the initial transmission and retransmissions are granted in the retransmission resource pool with additional transmissions in the initial transmission resource pool is described in connection with Figure 15. To summarize, if the initial transmission is treated as a special SR, the case here (case 1.2.2) is equivalent to case 1.2.1.

[00193] In another implementation, (case 1.2.3), multi-bits new SR is pre-configured. This implementation can be the same as case 1.1.3.

[00194] In another implementation, (case 1.3), three or more resource pools may be pre-configured before step 1. Besides the initial transmission resource pool and the retransmission resource pool, one or more additional resource pools are pre-configured for additional transmission only. Comparing to case 1.2, more bits can be added to the new signaling part 1 and/or part 2 to indicate the usage of the additional resource

pool/pools. The additional bits mentioned here can be used as a simple trigger for the additional transmission at the pre-defined resource position or to indicate the number of additional resources at the pre-defined resource set or a bitmap of the pre-defined resource set in the additional resource pool/pools. Other parts can be the same as case 1.2.

[00195] In another implementation, (case 1.4), no resource pool is pre-configured before step 1. In this case, the multi-bits new signaling needs to indicate the resource position exactly for granted transmission/retransmission.

[00196] In another implementation, (case 2), the MCS, numerology, antenna port, precoding (at least one of them) are not pre-configured before step 1 of the procedures above. In this case, the multi-bits new signaling needs to indicate the missing parameters for granted transmission/retransmission or whether the UE 1102 can reuse the parameter from other transmissions/services/measurements.

[00197] Figure 12 is a first example illustrating an initial transmission with additional transmission. This is an implementation of case 1.2.1 described in connection with Figure 11.

[00198] In this example, each UE 102 has its own pre-configured initial transmission resource pool and shares the retransmission resource pool with other UE/UEs 102. Additional transmission can use the initial transmission resource pool and/or the retransmission resource pool if available. Here, an uplink grant (UG) is used instead of the new signaling part 1 since the new signaling part 1 serves as a simplified uplink grant.

[00199] In the configured resource of UE-1 for initial transmission, a scheduling request (SR-1) triggers an uplink grant (UG-1). The UG-1 is a multi-bits UL grant indicating resources for initial transmission and adjacent resources in time/frequency domain if not occupied.

[00200] In the configured resource of UE-2 for initial transmission, a scheduling request (SR-2) triggers an uplink grant (UG-2). The UG-2 is a multi-bits UL grant indicating resources for initial transmission and adjacent resources in time/frequency domain if not occupied.

[00201] Figure 13 is a second example illustrating an initial transmission with additional transmission. This is an implementation of case 1.2.1 described in connection with Figure 11.

[00202] In this example, the only difference from the example described in connection with Figure 12 above is that an initial transmission pool can be shared by a group of UEs. A configured resource may be shared by groups of UEs for retransmission.

[00203] A first UE group (UE group 1) includes UE 1-1 and UE 1-2. In the configured resource of UE group 1 for initial transmission, a scheduling request (SR 1-1) triggers an uplink grant (UG 1-1) for UE 1-1. The UG 1-1 is a multi-bits UL grant indicating a resource for initial transmission for UE 1-1. The UG 1-1 also indicates an additional resource in frequency domain that can be used by either UE 1-1 or UE 1-2 or neither. A second scheduling request (SR-1-2) triggers an uplink grant (UG 1-2) for UE 1-2. The UG 1-2 is a multi-bits UL grant indicating a resource for initial transmission for UE 1-2. In this example, the adjacent resource in the time domain is used by UE 1-2 and cannot be used by UE 1-1.

[00204] A second UE group (UE group 2) includes UE 2-1 and UE 2-2. In the configured resource of UE group 2 for initial transmission, a scheduling request (SR 2-1) triggers an uplink grant (UG 2-1) for UE 2-1. The UG 2-1 is a multi-bits UL grant indicating a resource for initial transmission for UE 2-1. The UG 2-1 also indicates an additional resource in frequency domain that can be used by either UE 2-1 or UE 2-2 or neither. A second scheduling request (SR-2-2) triggers an uplink grant (UG 2-2) for UE 2-2. The UG 2-2 is a multi-bits UL grant indicating a resource for initial transmission for UE 2-2. In this example, the adjacent resource in the time domain is used by UE 2-2 and cannot be used by UE 2-1.

[00205] Figure 14 is an example illustrating a retransmission with additional transmission. This is an implementation of case 1.2.1 described in connection with Figure 11.

[00206] Additional transmission for retransmission can use the initial transmission resource pool and/or the retransmission resource pool if available. Here, 'NACK' is used

instead of the new signaling part 2 since the new signaling part 2 in this example serves as a grant for the retransmission resource.

[00207] A first UE group (UE group 1) includes UE 1-1 and UE 1-2. In the configured resource of UE group 1 for initial transmission, a scheduling request (SR 1-1) triggers an uplink grant (UG 1-1) for UE 1-1. However, a transmission for UE 1-2 fails. The UG 1-1 is a multi-bits UL grant indicating a resource for initial transmission for UE 1-1. The NACK 1-2 for UE 1-2 indicates resources and adjacent resources in time/frequency domain for retransmission by UE 1-2.

[00208] A second UE group (UE group 2) includes UE 2-1 and UE 2-2. A transmission for UE 2-1 fails. A second scheduling request (SR-1-2) triggers an uplink grant (UG 1-2) for UE 1-2. The NACK 2-1 for UE 2-1 indicates resources and adjacent resources in time/frequency domain for retransmission by UE 2-1.

[00209] Figure 15 is an example illustrating transmission without a scheduling request (SR). This is an implementation of case 1.2.2 described in connection with Figure 11.

[00210] In this case, a UE does not send a scheduling request (SR) before the initial transmission. When a transport block (TB) arrives, the UE will use the next pre-configured resource to send the initial transmission to the eNB/gNB.

[00211] In this example, two UEs (UE 1-1 and UE 1-2) fail in the initial transmission and retransmissions are granted in the retransmission resource pool with additional transmissions in the initial transmission resource pool.

[00212] A NACK 1-1 indicates resources and adjacent resources in time/frequency domain for retransmission by UE 1-1. In the configured resource for UE group 1, the UE 1-1 does not have any new transmission. Therefore, the resource can be used for retransmission. The shared resource may be used for retransmission for TB1 of UE 1-1.

[00213] A NACK 1-2 indicates resources and adjacent resources in time/frequency domain for retransmission by UE 1-2. In the configured resource for UE group 1, the UE 1-2 has a new transmission. Therefore, the resource cannot be used for retransmission. The shared resource may be used for retransmission for TB1 of UE 1-2.

[00214] Figure 16 illustrates various components that may be utilized in a UE 1602. The UE 1602 described in connection with Figure 16 may be implemented in accordance with the UE 102 described in connection with Figure 1. The UE 1602 includes a processor 1603 that controls operation of the UE 1602. The processor 1603 may also be referred to as a central processing unit (CPU). Memory 1605, which may include read-only memory (ROM), random access memory (RAM), a combination of the two or any type of device that may store information, provides instructions 1607a and data 1609a to the processor 1603. A portion of the memory 1605 may also include non-volatile random access memory (NVRAM). Instructions 1607b and data 1609b may also reside in the processor 1603. Instructions 1607b and/or data 1609b loaded into the processor 1603 may also include instructions 1607a and/or data 1609a from memory 1605 that were loaded for execution or processing by the processor 1603. The instructions 1607b may be executed by the processor 1603 to implement the methods described above.

[00215] The UE 1602 may also include a housing that contains one or more transmitters 1658 and one or more receivers 1620 to allow transmission and reception of data. The transmitter(s) 1658 and receiver(s) 1620 may be combined into one or more transceivers 1618. One or more antennas 1622a-n are attached to the housing and electrically coupled to the transceiver 1618.

[00216] The various components of the UE 1602 are coupled together by a bus system 1611, which may include a power bus, a control signal bus and a status signal bus, in addition to a data bus. However, for the sake of clarity, the various buses are illustrated in Figure 16 as the bus system 1611. The UE 1602 may also include a digital signal processor (DSP) 1613 for use in processing signals. The UE 1602 may also include a communications interface 1615 that provides user access to the functions of the UE 1602. The UE 1602 illustrated in Figure 16 is a functional block diagram rather than a listing of specific components.

[00217] Figure 17 illustrates various components that may be utilized in a gNB 1760. The gNB 1760 described in connection with Figure 17 may be implemented in accordance with the gNB 160 described in connection with Figure 1. The gNB 1760

includes a processor 1703 that controls operation of the gNB 1760. The processor 1703 may also be referred to as a central processing unit (CPU). Memory 1705, which may include read-only memory (ROM), random access memory (RAM), a combination of the two or any type of device that may store information, provides instructions 1707a and data 1709a to the processor 1703. A portion of the memory 1705 may also include non-volatile random access memory (NVRAM). Instructions 1707b and data 1709b may also reside in the processor 1703. Instructions 1707b and/or data 1709b loaded into the processor 1703 may also include instructions 1707a and/or data 1709a from memory 1705 that were loaded for execution or processing by the processor 1703. The instructions 1707b may be executed by the processor 1703 to implement the methods described above.

[00218] The gNB 1760 may also include a housing that contains one or more transmitters 1717 and one or more receivers 1778 to allow transmission and reception of data. The transmitter(s) 1717 and receiver(s) 1778 may be combined into one or more transceivers 1776. One or more antennas 1780a-n are attached to the housing and electrically coupled to the transceiver 1776.

[00219] The various components of the gNB 1760 are coupled together by a bus system 1711, which may include a power bus, a control signal bus and a status signal bus, in addition to a data bus. However, for the sake of clarity, the various buses are illustrated in Figure 17 as the bus system 1711. The gNB 1760 may also include a digital signal processor (DSP) 1713 for use in processing signals. The gNB 1760 may also include a communications interface 1715 that provides user access to the functions of the gNB 1760. The gNB 1760 illustrated in Figure 17 is a functional block diagram rather than a listing of specific components.

[00220] Figure 18 is a block diagram illustrating one implementation of a UE 1802 in which systems and methods for URLLC operations may be implemented. The UE 1802 includes transmit means 1858, receive means 1820 and control means 1824. The transmit means 1858, receive means 1820 and control means 1824 may be configured to perform one or more of the functions described in connection with Figure 1 above. Figure 16

above illustrates one example of a concrete apparatus structure of Figure 18. Other various structures may be implemented to realize one or more of the functions of Figure 1. For example, a DSP may be realized by software.

[00221] Figure 19 is a block diagram illustrating one implementation of a gNB 1960 in which systems and methods for URLLC operations may be implemented. The gNB 1960 includes transmit means 1917, receive means 1978 and control means 1982. The transmit means 1917, receive means 1978 and control means 1982 may be configured to perform one or more of the functions described in connection with Figure 1 above. Figure 17 above illustrates one example of a concrete apparatus structure of Figure 19. Other various structures may be implemented to realize one or more of the functions of Figure 1. For example, a DSP may be realized by software.

[00222] Figure 20 is a flow diagram illustrating a communication method 2000 of a user equipment (UE) 102. The UE 102 may receive 2002, from a base station apparatus (gNB) 160, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The UE 102 may also receive 2004 on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission. The UE 102 may further transmit 2006, to the gNB 160, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information. The UE 102 may additionally perform 2008 on a physical uplink shared channel, to the gNB 160, the uplink data transmission based on the first information and the second information. The UE 102 may also receive 2010 on the physical downlink control channel, from the gNB 160, third information used for indicating a deactivation for the uplink data transmission. The UE 102 may further transmit 2012, to the gNB 160, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of logical channel identifier (LCID) may be used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

[00223] Figure 21 is a flow diagram illustrating a communication method 2100 of a base station apparatus (gNB) 160. The gNB 160 may transmit 2102, to a user equipment (UE) 102, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The gNB 160 may also transmit 2104 on a physical downlink control channel, to the UE 102, second information used for indicating an activation for the uplink data transmission. The gNB 160 may further receive 2106, from the UE 102, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information. The gNB 160 may additionally receive 2108 on a physical uplink shared channel, from the UE 102, the uplink data transmission based on the first information and the second information. The gNB 160 may also transmit 2110 on the physical downlink control channel, to the UE 102, third information used for indicating a deactivation for the uplink data transmission. The gNB 160 may further receive 2112, from the UE 102, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information

[00224] The term “computer-readable medium” refers to any available medium that can be accessed by a computer or a processor. The term “computer-readable medium,” as used herein, may denote a computer- and/or processor-readable medium that is non-transitory and tangible. By way of example, and not limitation, a computer-readable or processor-readable medium may comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to carry or store desired program code in the form of instructions or data structures and that can be accessed by a computer or processor. Disk and disc, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray® disc where disks usually reproduce data magnetically, while discs reproduce data optically with lasers.

[00225] It should be noted that one or more of the methods described herein may be implemented in and/or performed using hardware. For example, one or more of the methods described herein may be implemented in and/or realized using a chipset, an application-specific integrated circuit (ASIC), a large-scale integrated circuit (LSI) or integrated circuit, etc.

[00226] Each of the methods disclosed herein comprises one or more steps or actions for achieving the described method. The method steps and/or actions may be interchanged with one another and/or combined into a single step without departing from the scope of the claims. In other words, unless a specific order of steps or actions is required for proper operation of the method that is being described, the order and/or use of specific steps and/or actions may be modified without departing from the scope of the claims.

[00227] It is to be understood that the claims are not limited to the precise configuration and components illustrated above. Various modifications, changes and variations may be made in the arrangement, operation and details of the systems, methods, and apparatus described herein without departing from the scope of the claims.

[00228] A program running on the gNB 160 or the UE 102 according to the described systems and methods is a program (a program for causing a computer to operate) that controls a CPU and the like in such a manner as to realize the function according to the described systems and methods. Then, the information that is handled in these apparatuses is temporarily stored in a RAM while being processed. Thereafter, the information is stored in various ROMs or HDDs, and whenever necessary, is read by the CPU to be modified or written. As a recording medium on which the program is stored, among a semiconductor (for example, a ROM, a nonvolatile memory card, and the like), an optical storage medium (for example, a DVD, a MO, a MD, a CD, a BD, and the like), a magnetic storage medium (for example, a magnetic tape, a flexible disk, and the like), and the like, any one may be possible. Furthermore, in some cases, the function according to the described systems and methods described above is realized by running the loaded program, and in addition, the function according to the described systems and methods is

realized in conjunction with an operating system or other application programs, based on an instruction from the program.

[00229] Furthermore, in a case where the programs are available on the market, the program stored on a portable recording medium can be distributed or the program can be transmitted to a server computer that connects through a network such as the Internet. In this case, a storage device in the server computer also is included. Furthermore, some or all of the gNB 160 and the UE 102 according to the systems and methods described above may be realized as an LSI that is a typical integrated circuit. Each functional block of the gNB 160 and the UE 102 may be individually built into a chip, and some or all functional blocks may be integrated into a chip. Furthermore, a technique of the integrated circuit is not limited to the LSI, and an integrated circuit for the functional block may be realized with a dedicated circuit or a general-purpose processor. Furthermore, if with advances in a semiconductor technology, a technology of an integrated circuit that substitutes for the LSI appears, it is also possible to use an integrated circuit to which the technology applies.

[00230] Moreover, each functional block or various features of the base station device and the terminal device used in each of the aforementioned embodiments may be implemented or executed by a circuitry, which is typically an integrated circuit or a plurality of integrated circuits. The circuitry designed to execute the functions described in the present specification may comprise a general-purpose processor, a digital signal processor (DSP), an application specific or general application integrated circuit (ASIC), a field programmable gate array (FPGA), or other programmable logic devices, discrete gates or transistor logic, or a discrete hardware component, or a combination thereof. The general-purpose processor may be a microprocessor, or alternatively, the processor may be a conventional processor, a controller, a microcontroller or a state machine. The general-purpose processor or each circuit described above may be configured by a digital circuit or may be configured by an analogue circuit. Further, when a technology of making into an integrated circuit superseding integrated circuits at the present time appears due to advancement of a semiconductor technology, the integrated circuit by this technology is also able to be used.

[00231] What is claimed is:

CLAIMS

1. A user equipment (UE), comprising:
receiving circuitry configured to receive, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission, the receiving circuitry configured to receive on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission; and
transmitting circuitry configured to transmit, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information, the transmitting circuitry configured to perform on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information, wherein
the receiving circuitry is configured to receive on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission,
the transmitting circuitry is configured to transmit, to the base station apparatus, confirmation information MAC CE for the third information, and
a MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.
2. A base station apparatus, comprising:
transmitting circuitry configured to transmit, to a user equipment, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission, the transmitting circuitry configured to transmit on a physical downlink control channel, to the user

equipment, second information used for indicating an activation for the uplink data transmission; and
receiving circuitry configured to receive, from the user equipment, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information, the receiving circuitry configured to receive on a physical uplink shared channel, from the user equipment, the uplink data transmission based on the first information and the second information, wherein
the transmitting circuitry is configured to transmit on the physical downlink control channel, to the user equipment, third information used for indicating a deactivation for the uplink data transmission,
the receiving circuitry is configured to receive, from the user equipment, confirmation information MAC CE for the third information, and
a MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

3. A communication method of a user equipment comprising:
receiving, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission;
receiving on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission;
transmitting, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information;

- performing on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information;
- receiving on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission; and
- transmitting, to the base station apparatus, confirmation information MAC CE for the third information, wherein
- a MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.
4. A communication method of a base station apparatus comprising:
- transmitting, to a user equipment, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission;
- transmitting on a physical downlink control channel, to the user equipment, second information used for indicating an activation for the uplink data transmission;
- receiving, from the user equipment, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information;
- receiving on a physical uplink shared channel, from the user equipment, the uplink data transmission based on the first information and the second information;
- transmitting on the physical downlink control channel, to the user equipment, third information used for indicating a deactivation for the uplink data transmission; and

receiving, from the user equipment, confirmation information MAC CE for the third information, wherein
a MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.

ABSTRACT

A user equipment (UE) is described that includes receiving circuitry configured to receive, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission, the receiving circuitry configured to receive on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission. Transmitting circuitry is configured to transmit, to the base station apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information, the transmitting circuitry configured to perform on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information. The receiving circuitry is also configured to receive on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission.

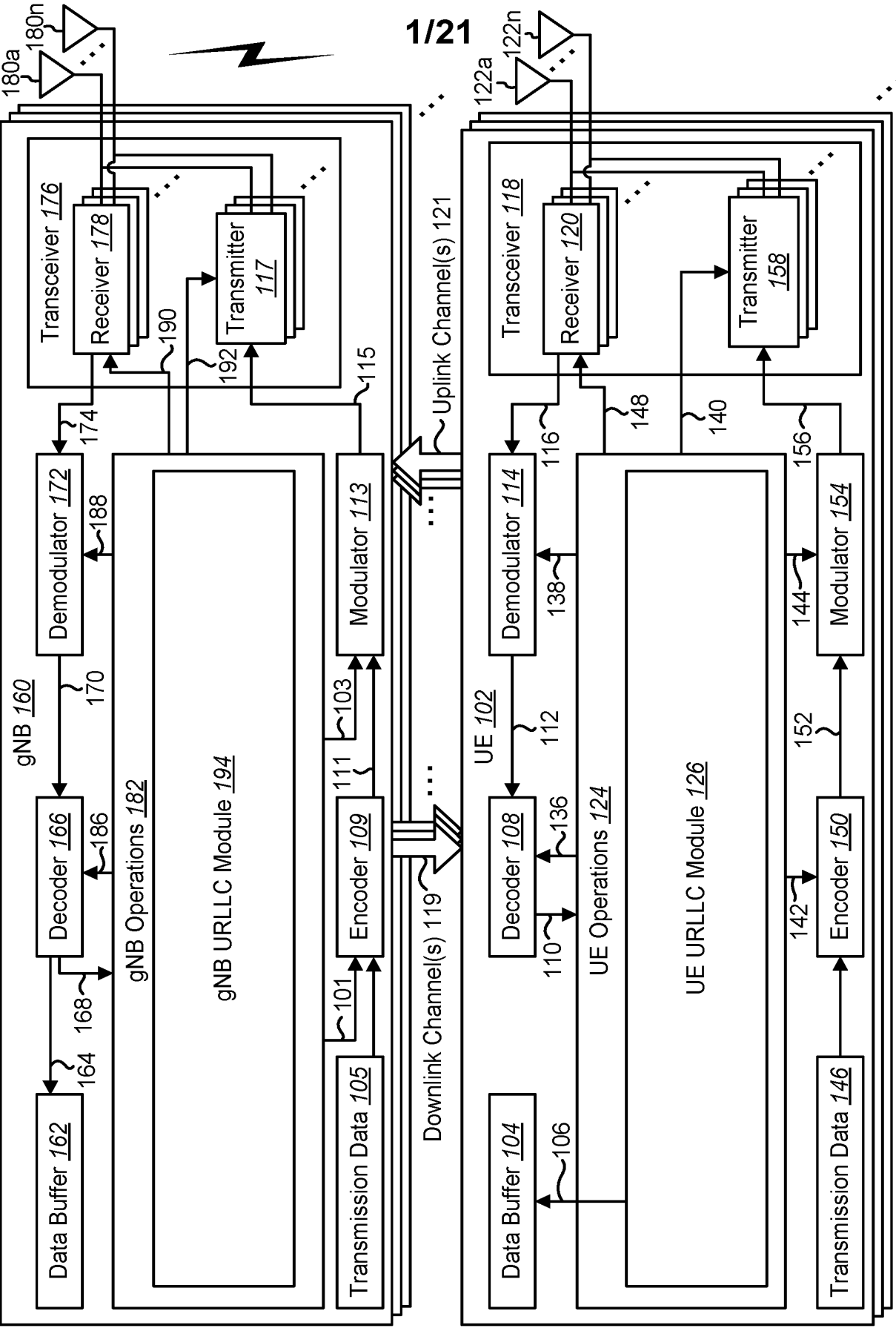


FIG. 1

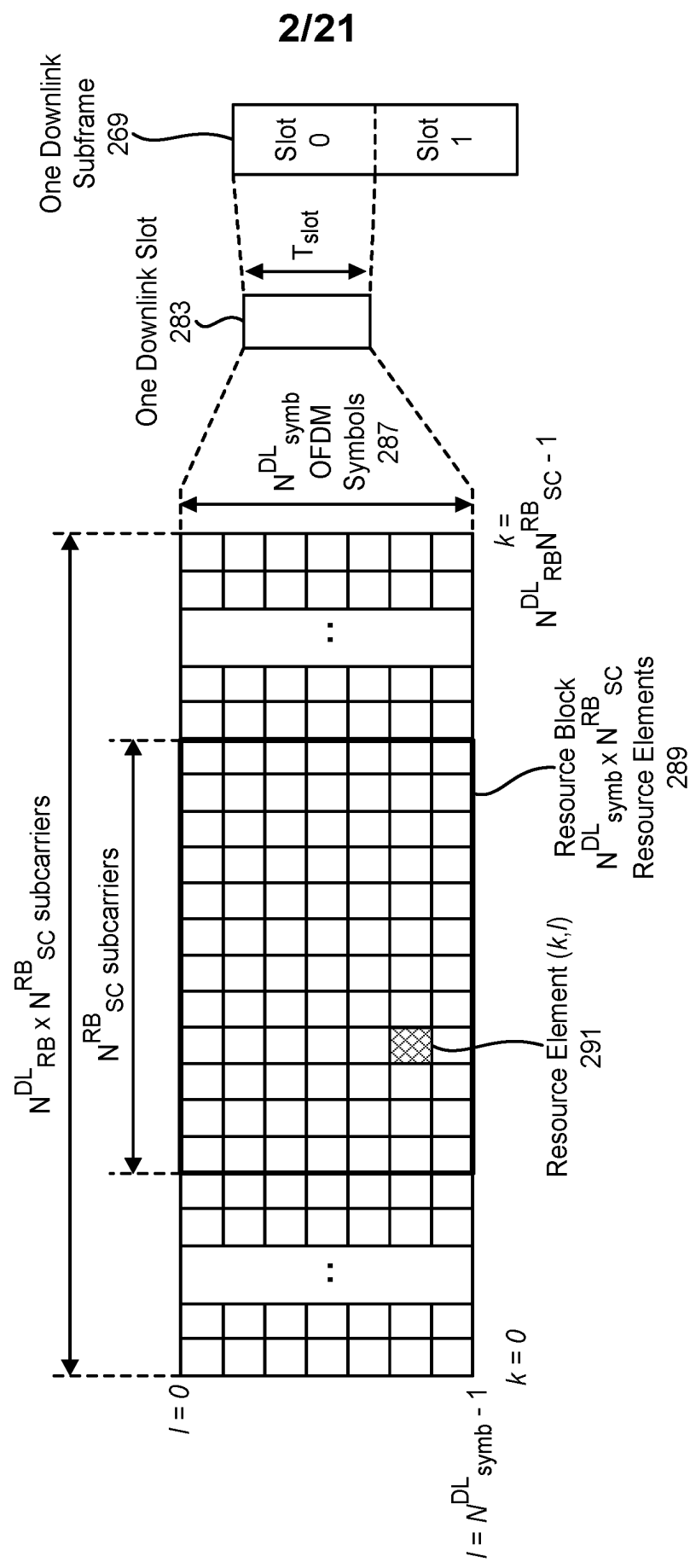


FIG. 2

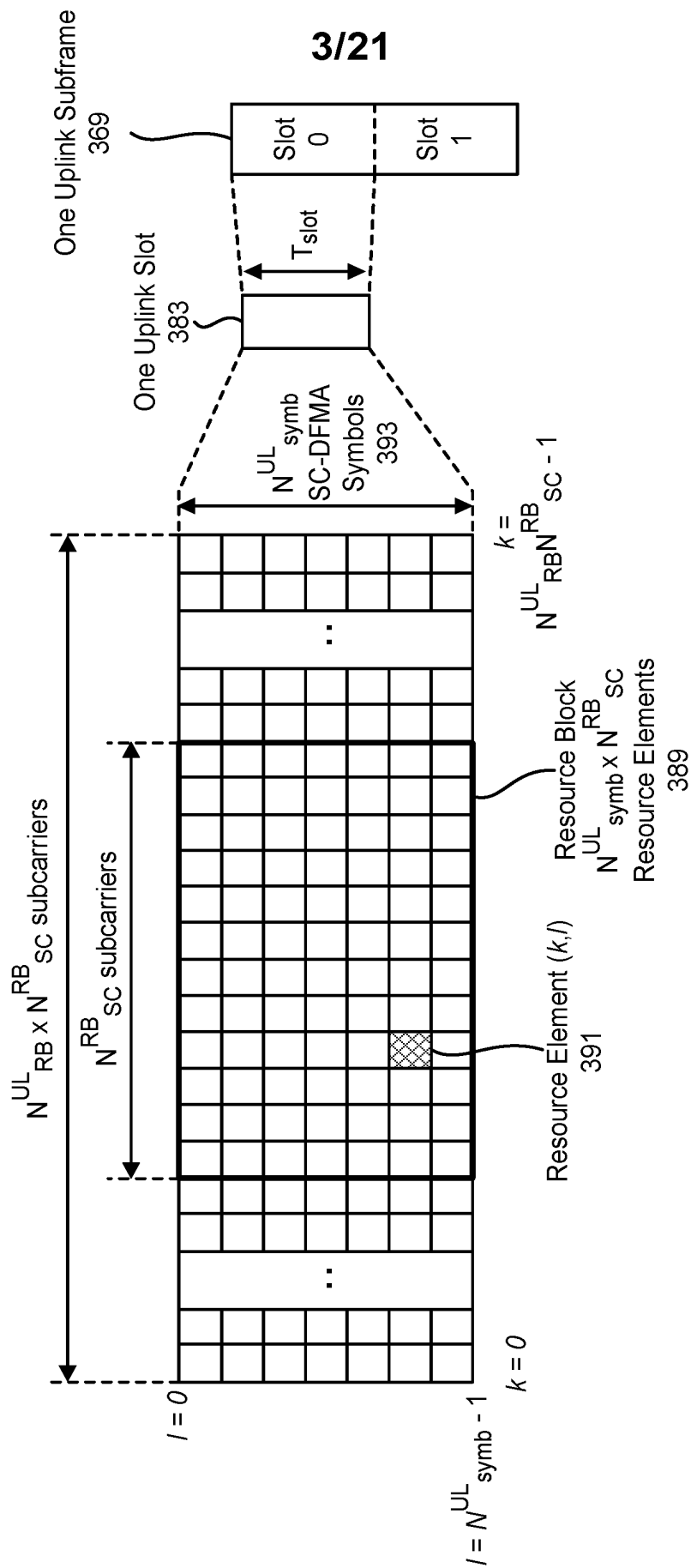


FIG. 3

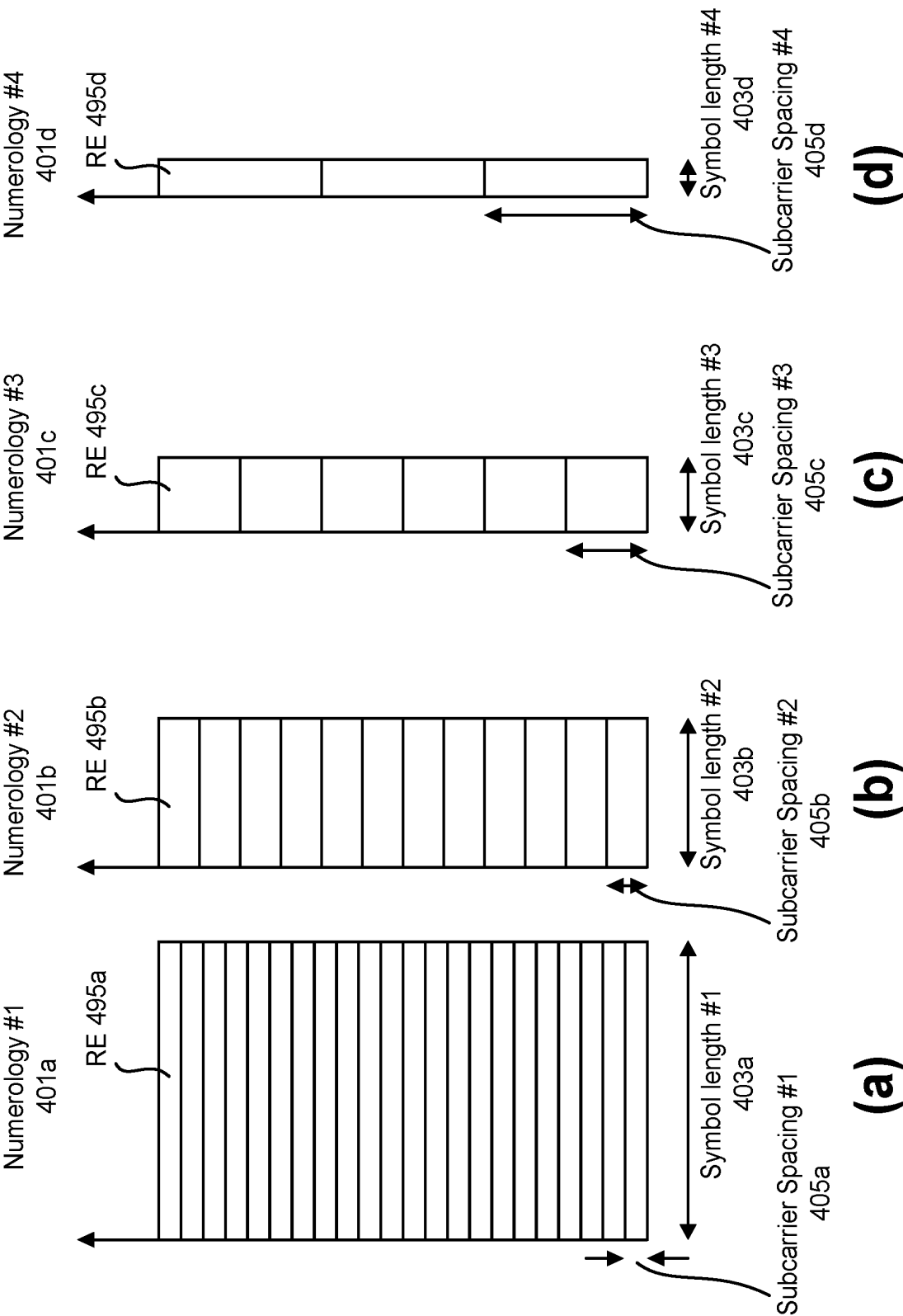


FIG. 4

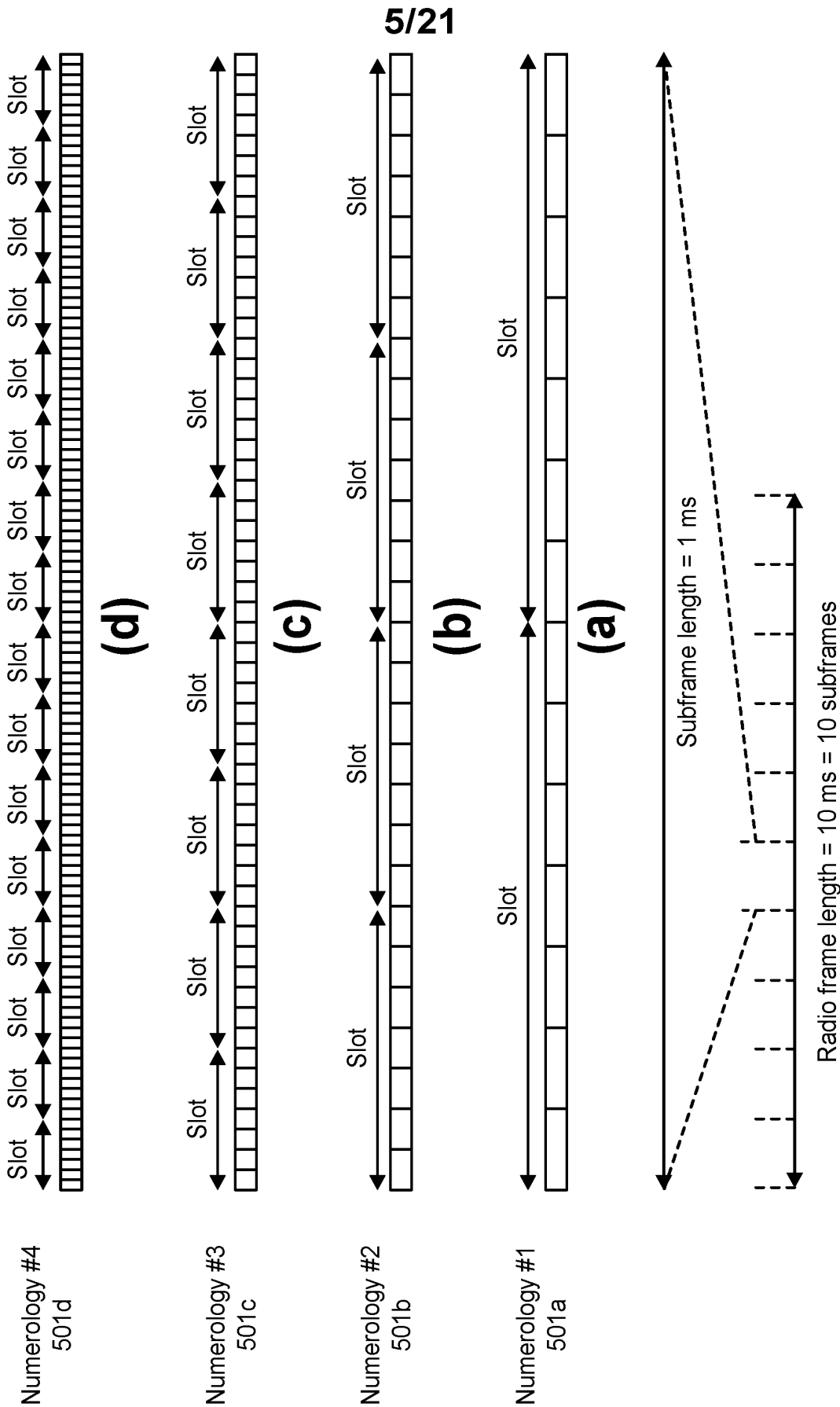


FIG. 5

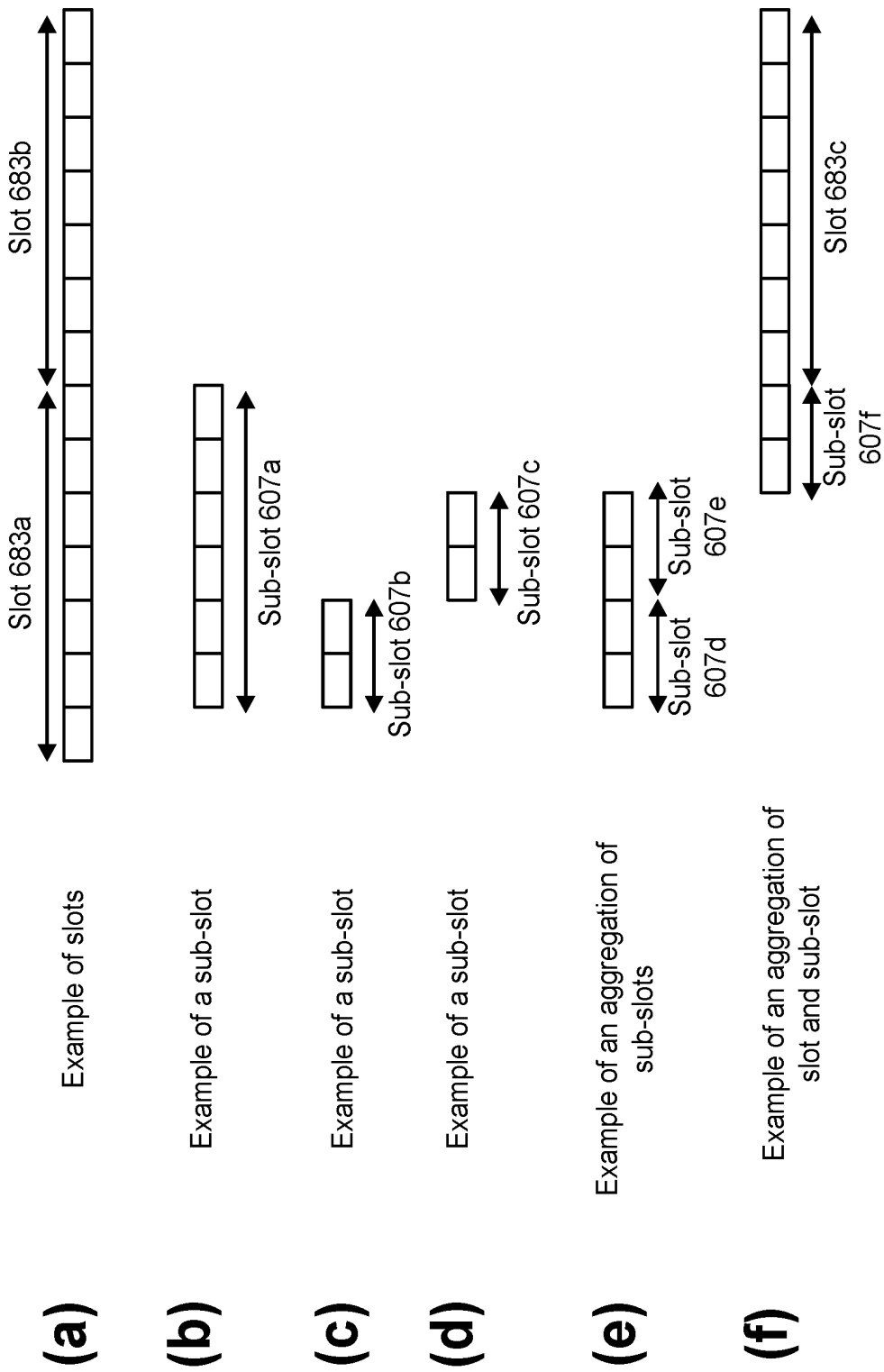


FIG. 6

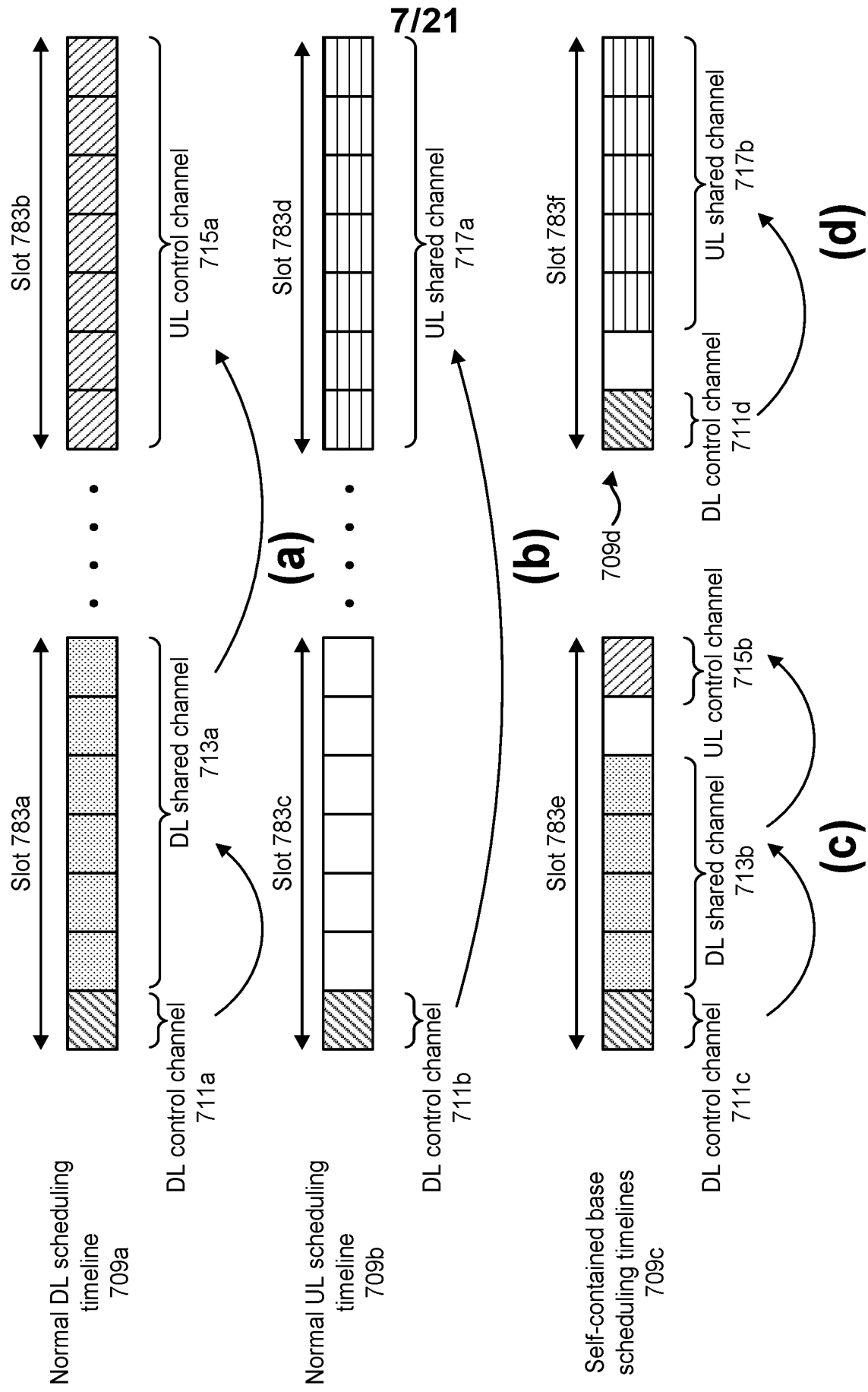


FIG. 7

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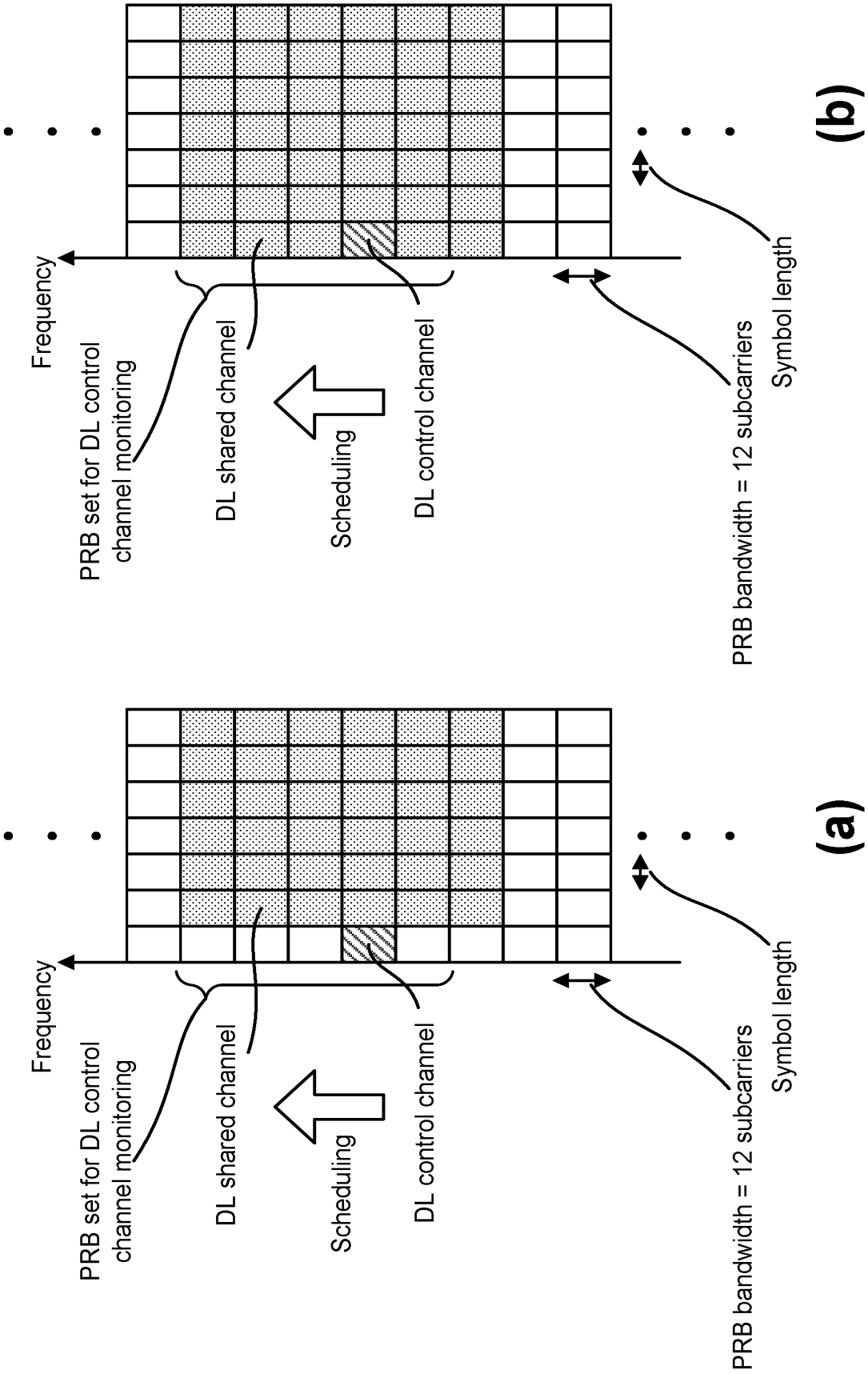


FIG. 8

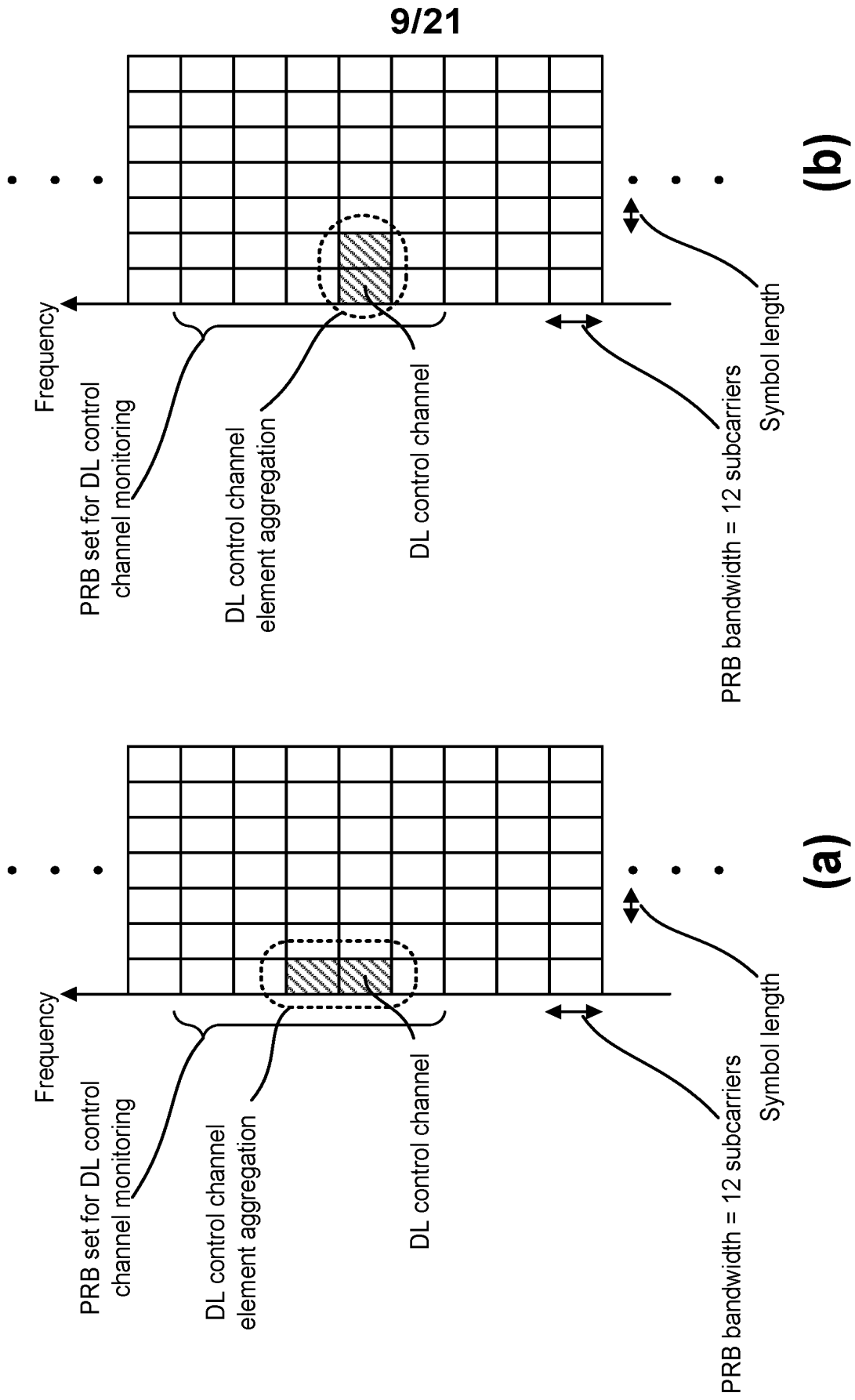


FIG. 9

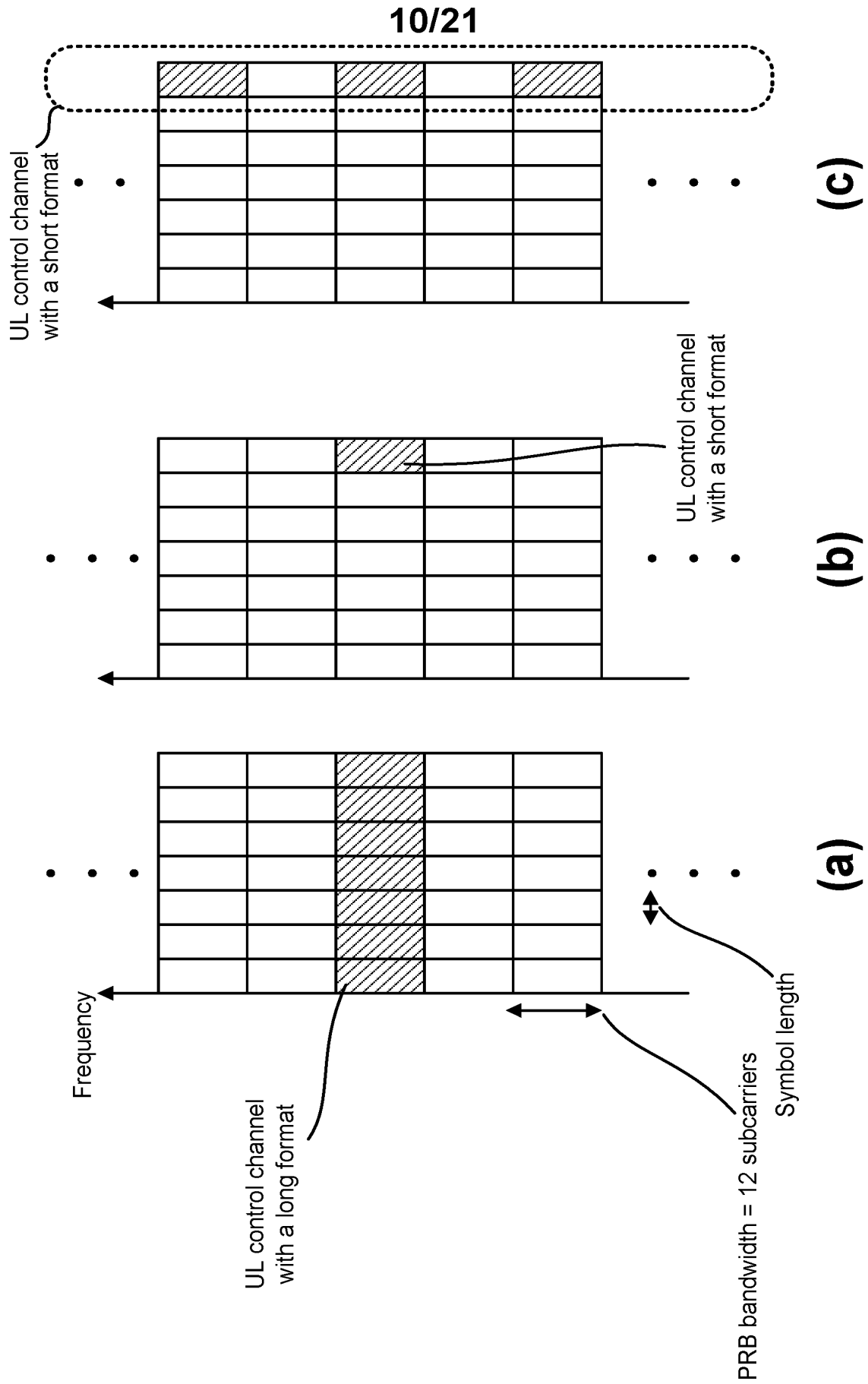


FIG. 10

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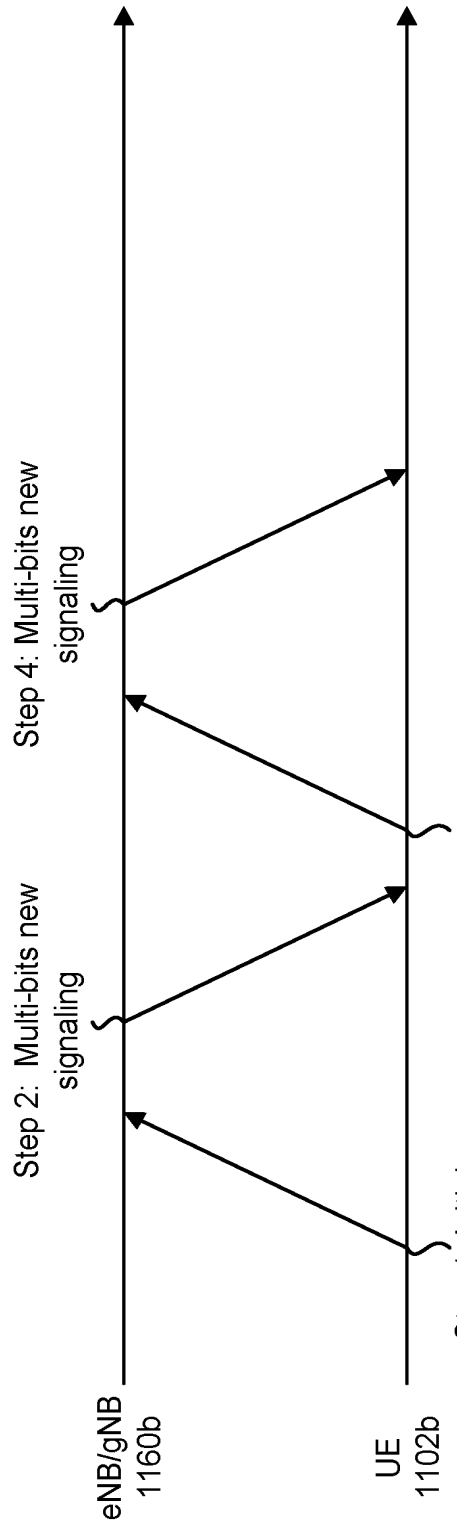
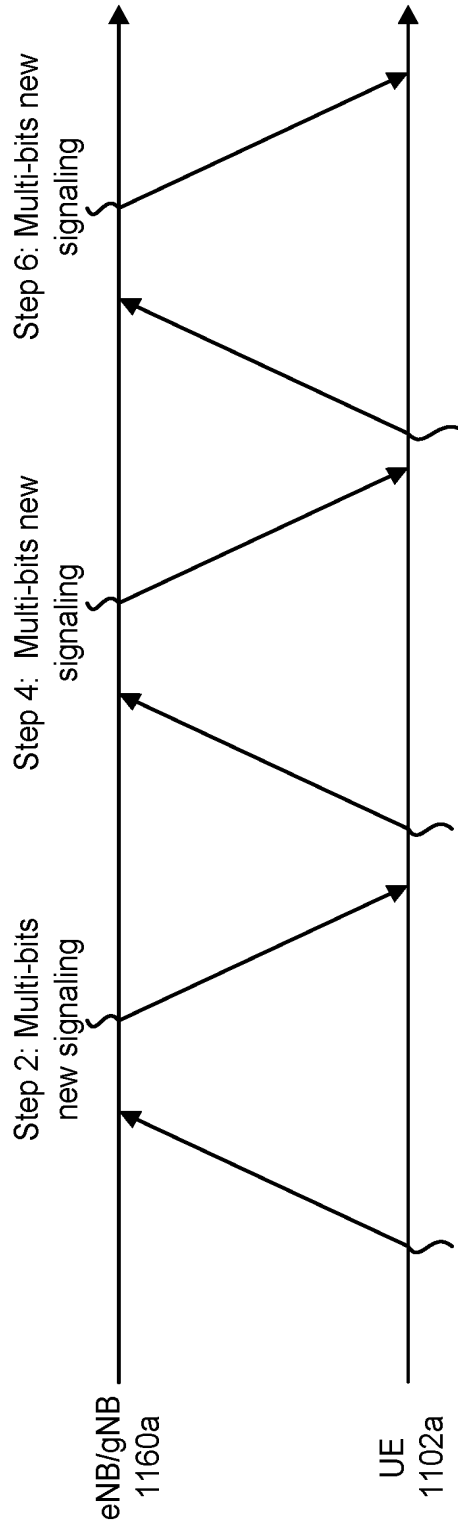


FIG. 11

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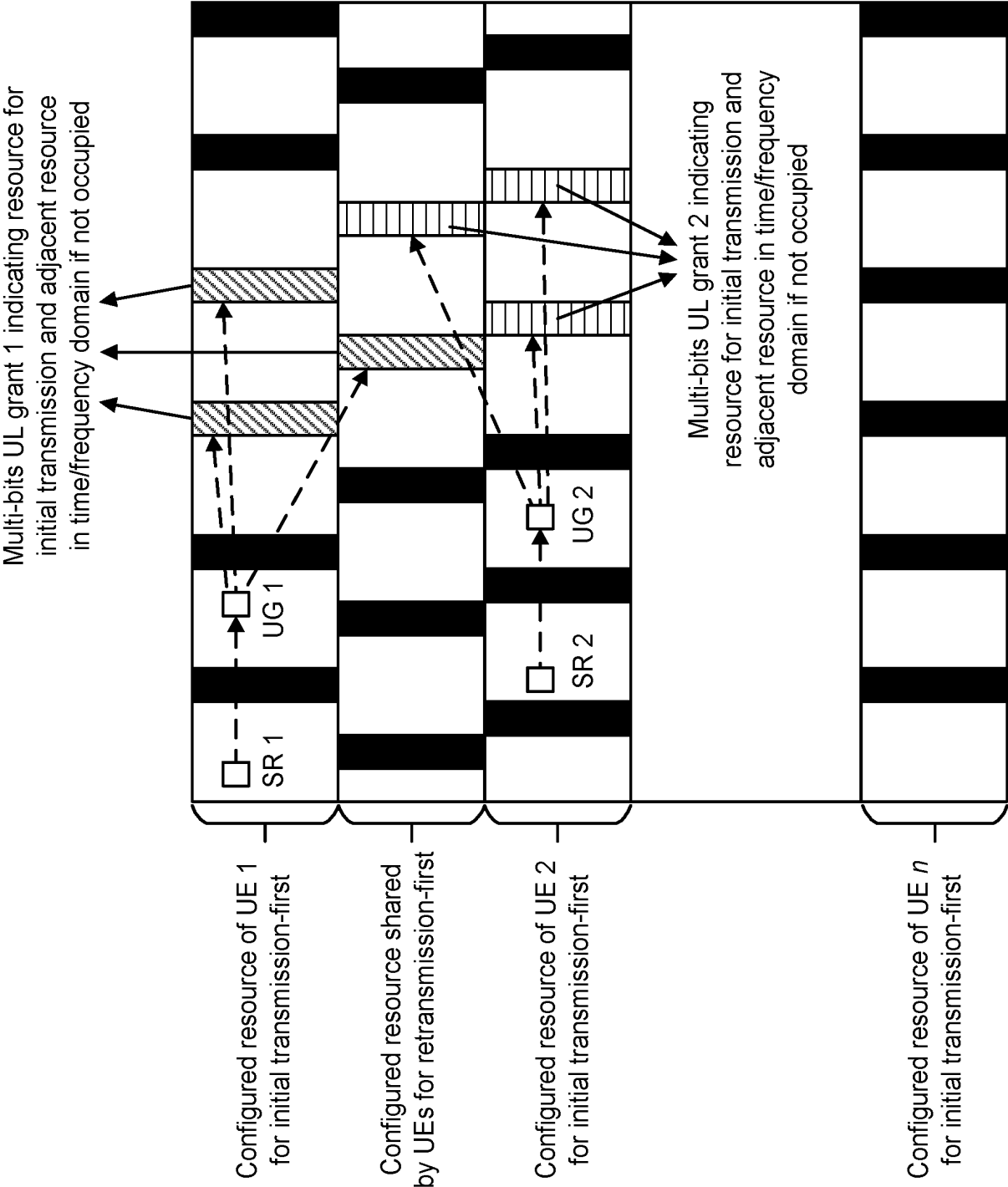


FIG. 12

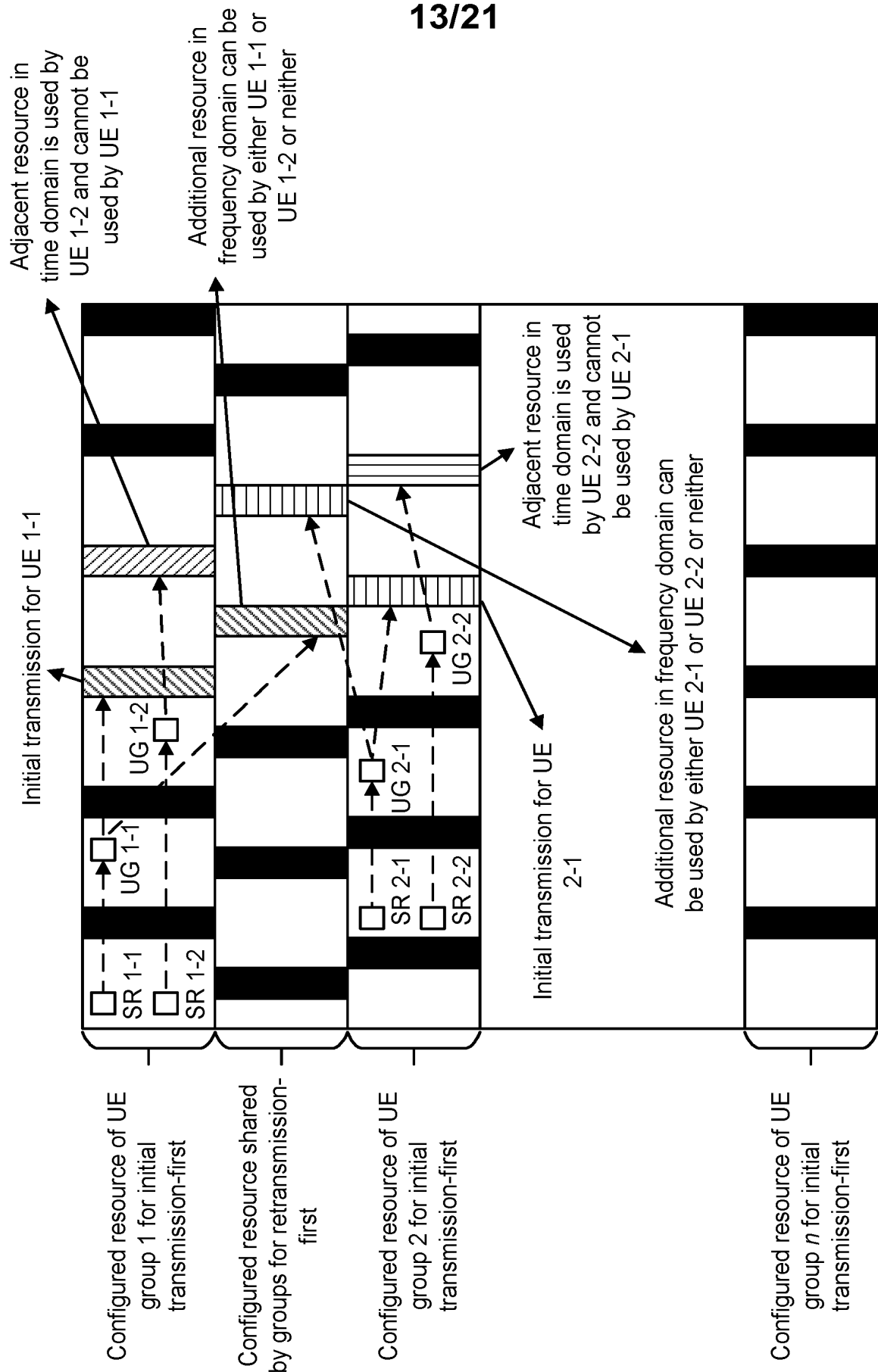


FIG. 13

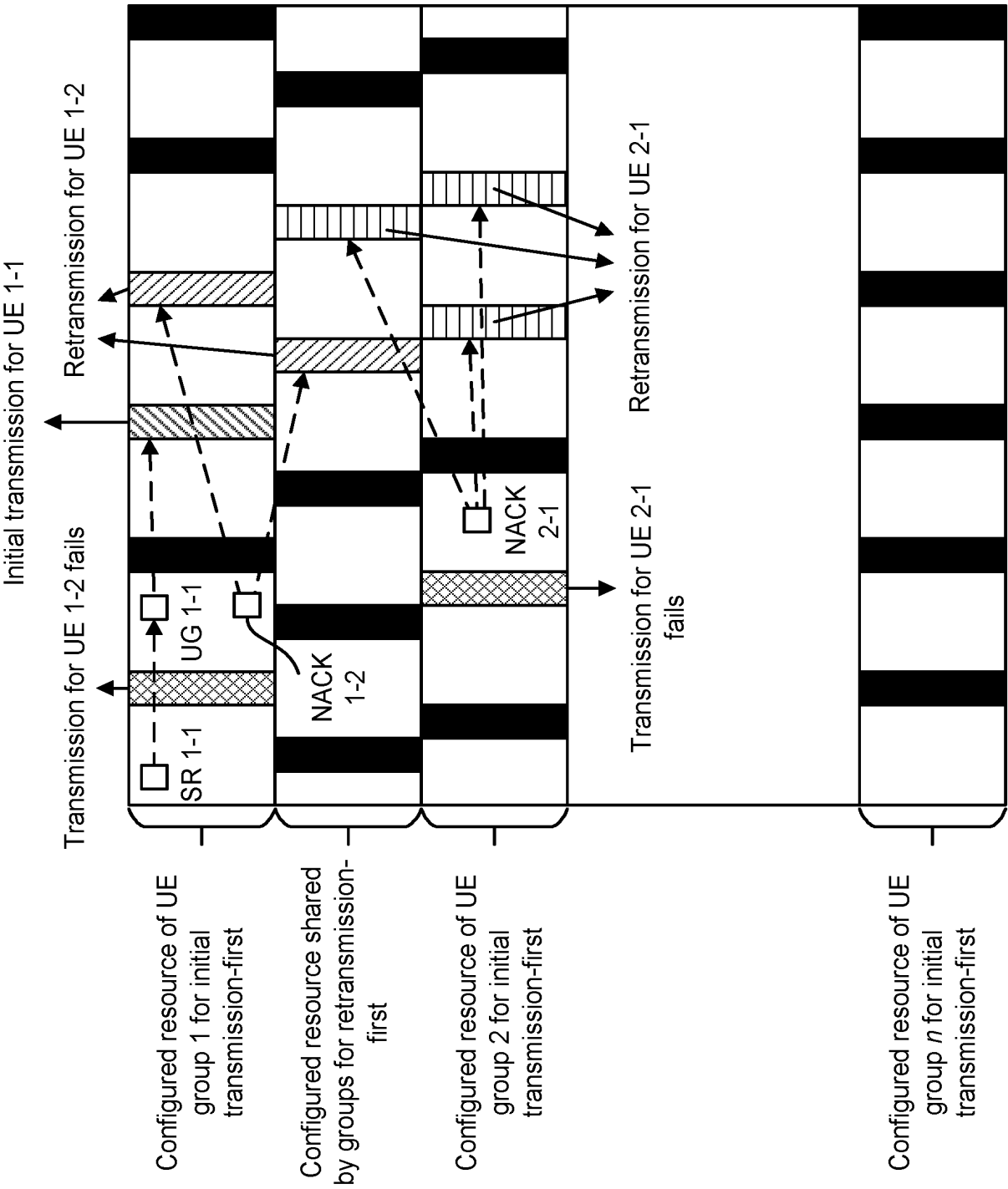


FIG. 14

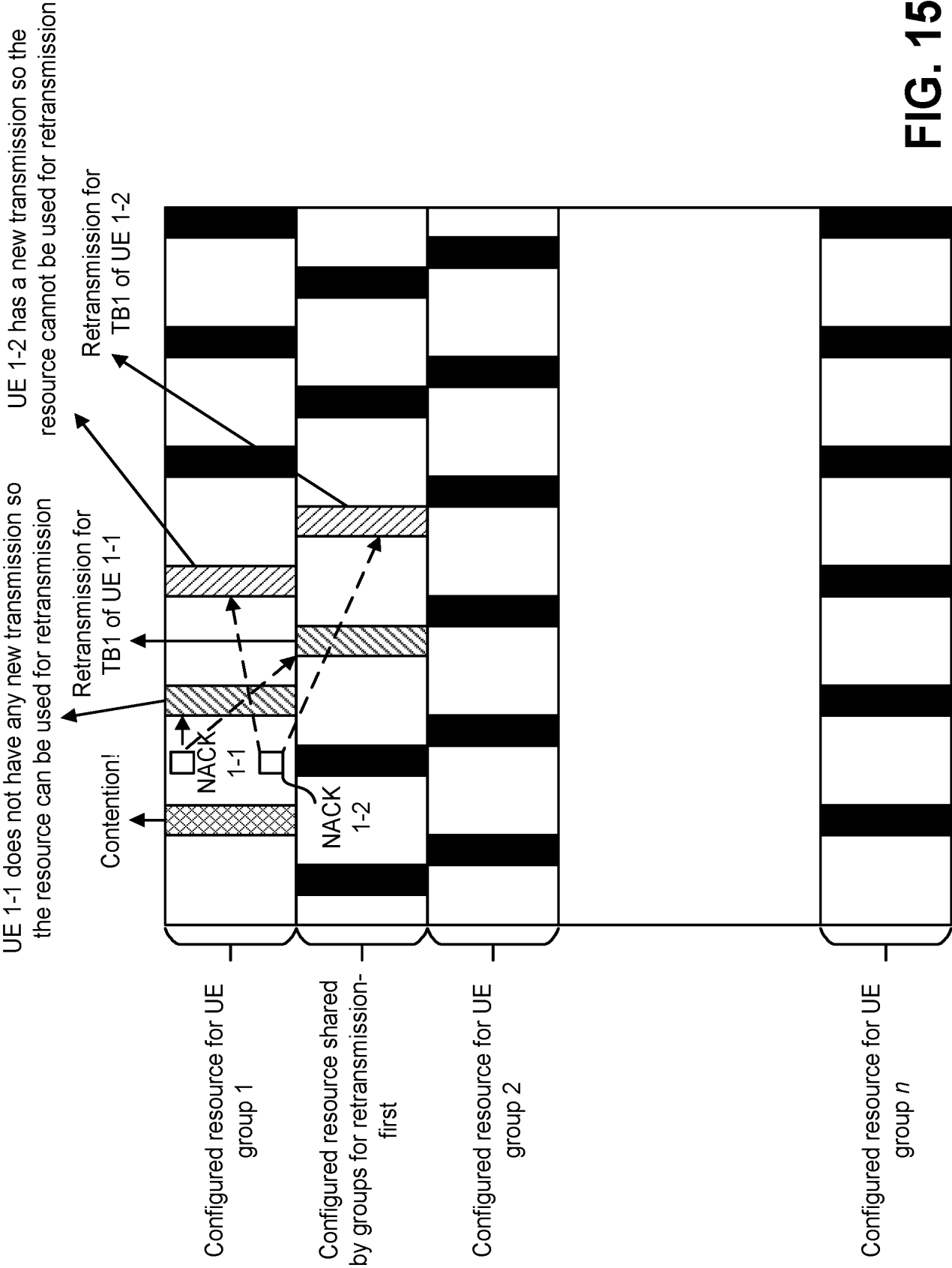


FIG. 15

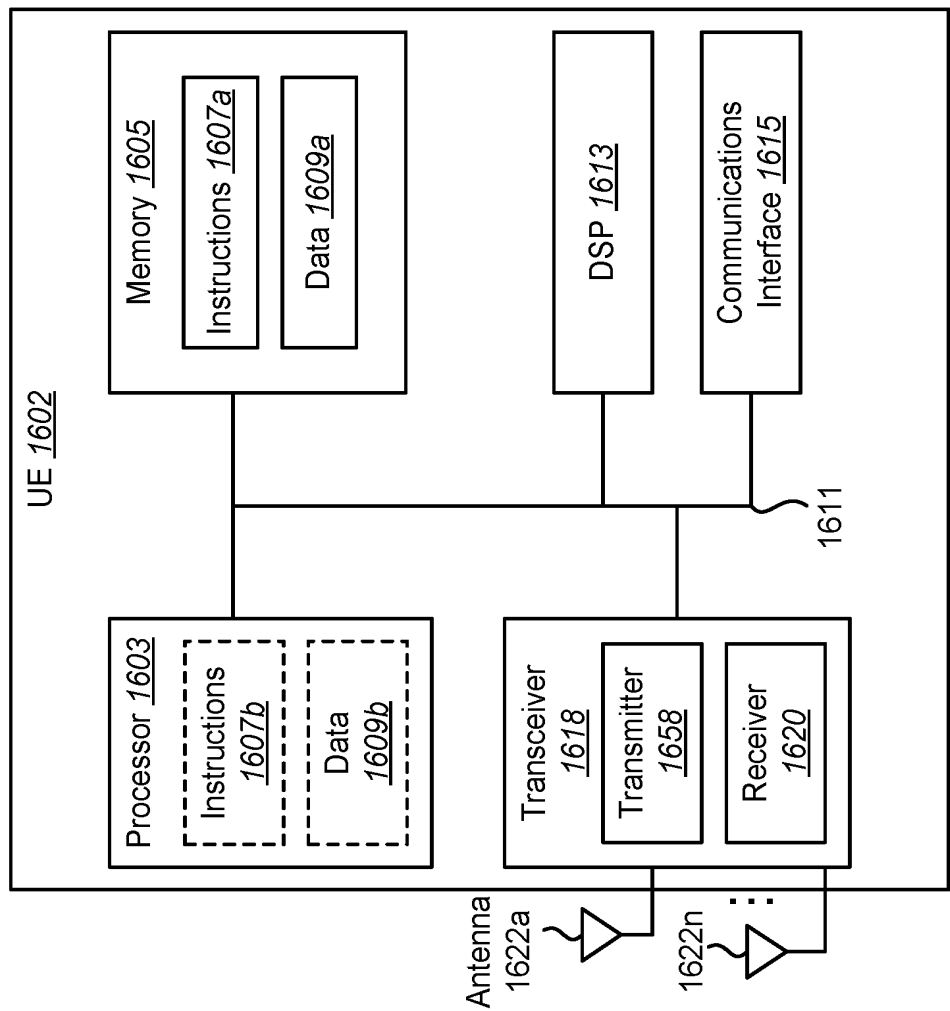


FIG. 16

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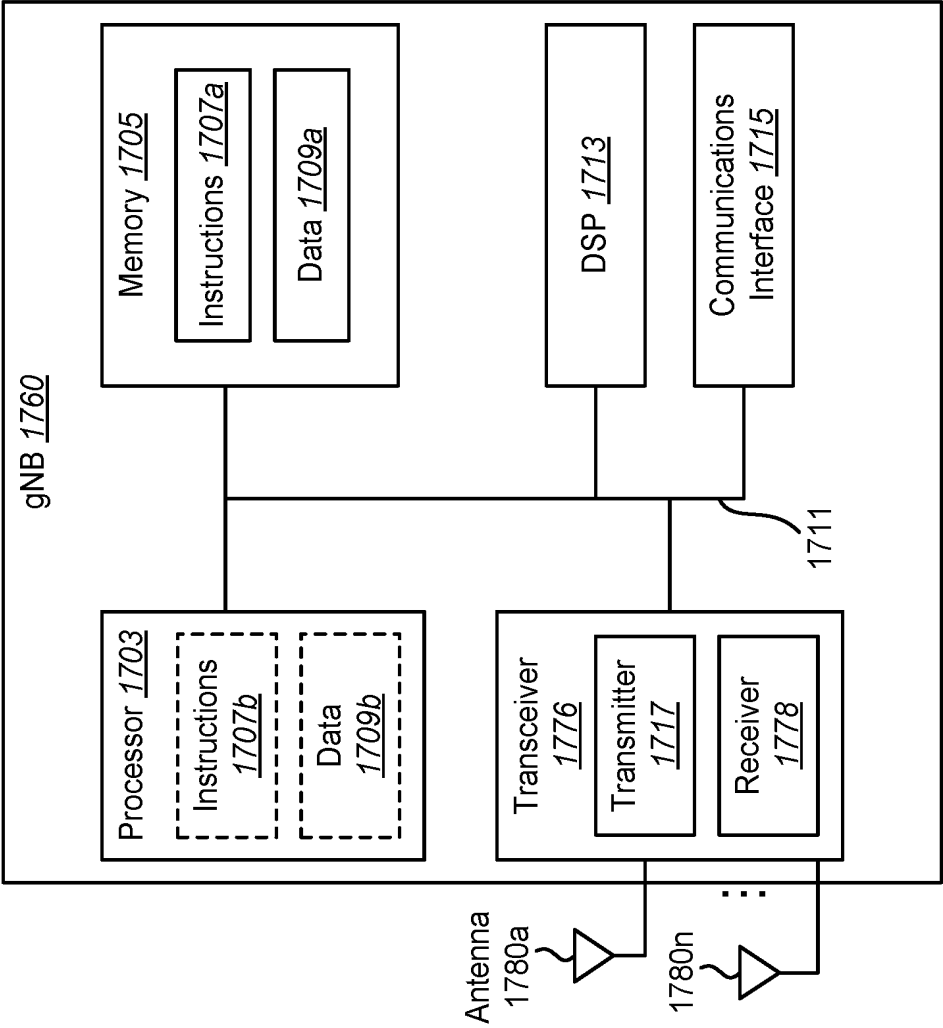


FIG. 17

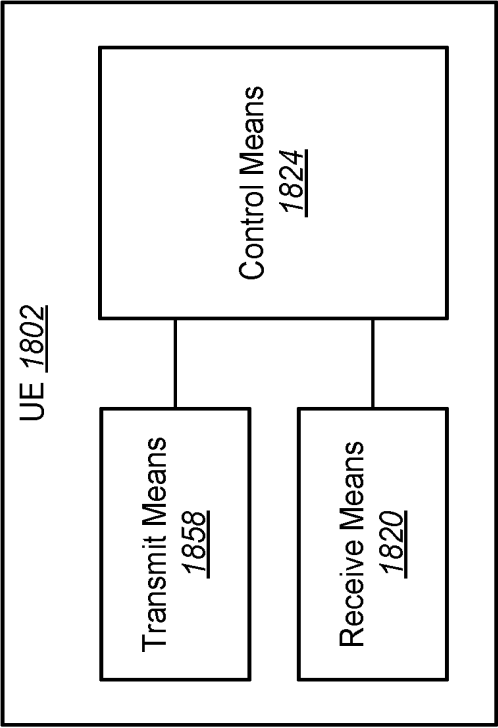


FIG. 18

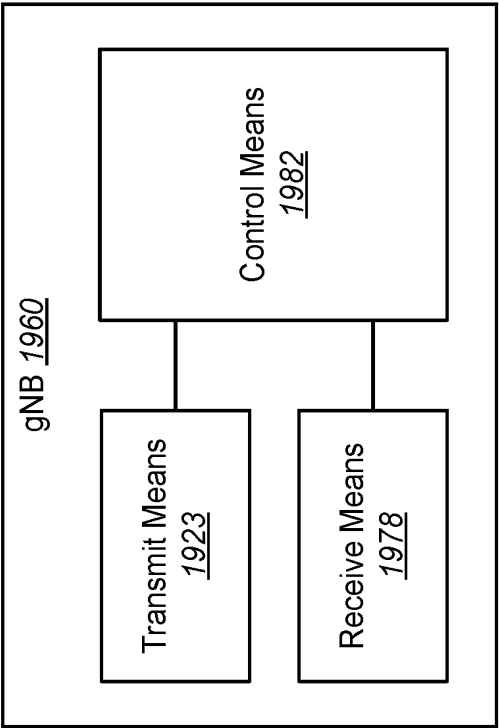


FIG. 19

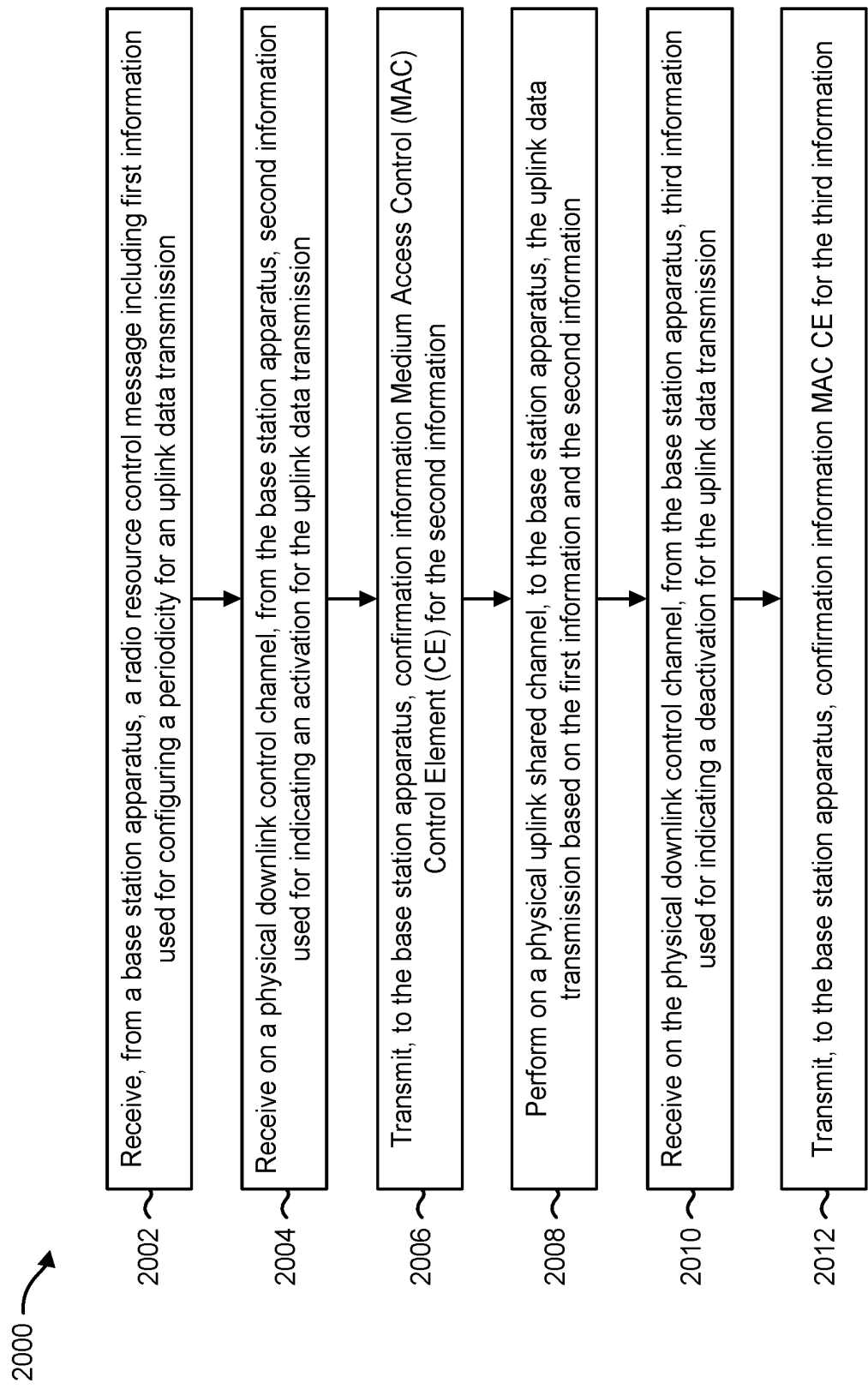


FIG. 20

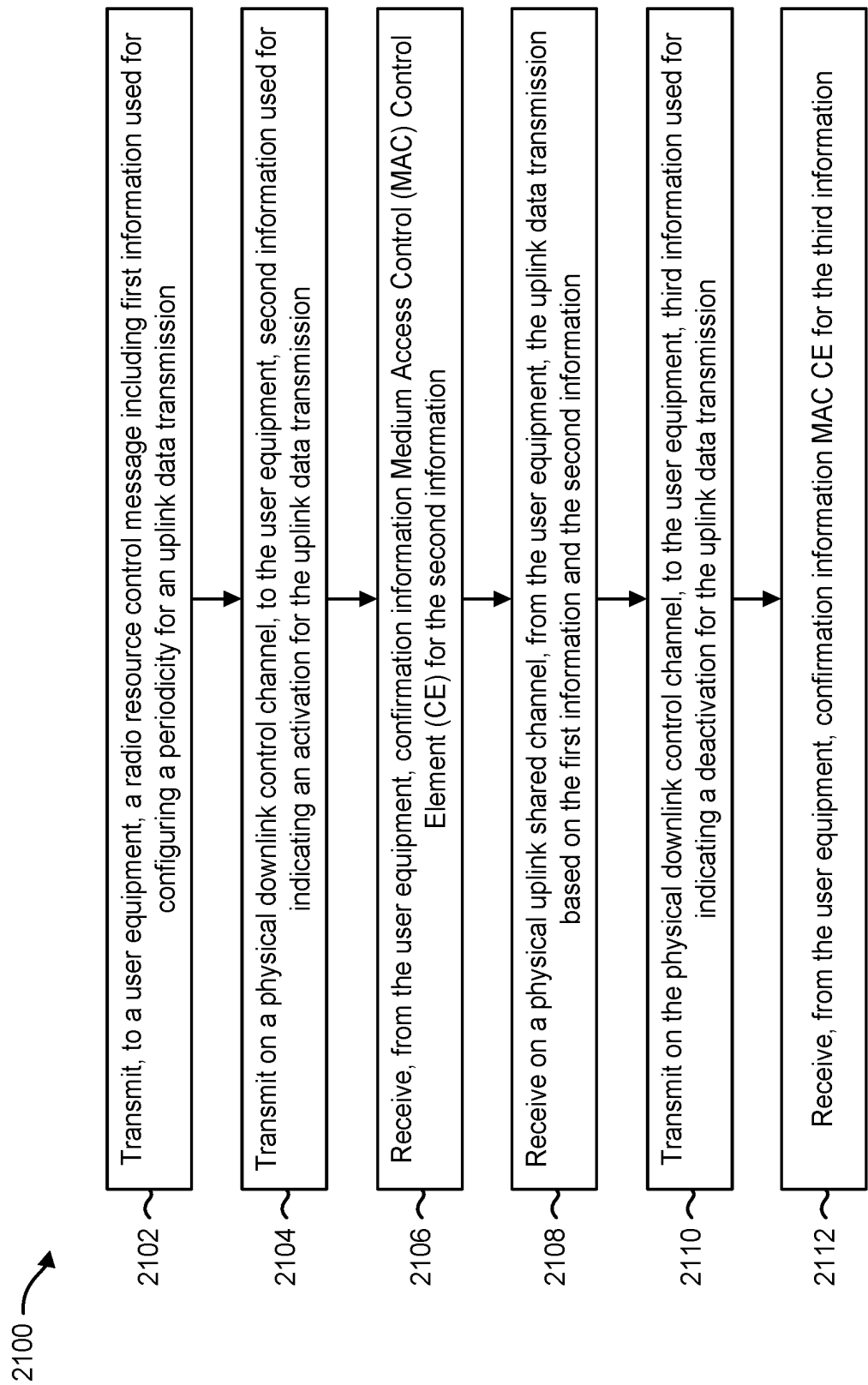


FIG. 21

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		SLA3700	
		Application Number			
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Attorney Docket Number	SLA3700	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	21	Suggested Figure for Publication (if any)	20

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

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	50735		

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	PCTUS2018012039	2018-01-02
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62443464	2017-01-06
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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove
			Access Code ⁱ (if applicable)

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

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

Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear		
☒ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:		
Name of the Deceased or Legally Incapacitated Inventor:		
If the Applicant is an Organization check here. ☒		
Organization Name	Sharp Laboratories of America, Inc.	
Mailing Address Information For Applicant:		
Address 1	5750 NW Pacific Rim Boulevard	
Address 2		
City	Camas	State/Province WA
Country	US	Postal Code 98607
Phone Number		Fax Number
Email Address		
Additional Applicant Data may be generated within this form by selecting the Add button. Add		

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:[Remove](#)

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Wesley L. Austin/		Date (YYYY-MM-DD)	2018-01-03
First Name	Wesley L.	Last Name	Austin	Registration Number
				42273
Additional Signature may be generated within this form by selecting the Add button. Add				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SLA3700
		Application Number	
Title of Invention	SIGNALING, PROCEDURES, USER EQUIPMENT AND BASE STATIONS FOR UPLINK ULTRA RELIABLE LOW LATENCY COMMUNICATIONS		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.