

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

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

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

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

APPLE 1002

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas, Marshall Division on the following

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

DOCKET NO. 2:24-cv-00203	DATE FILED 3/20/2024	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF APEX BEAM TECHNOLOGIES LLC		DEFENDANT SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 11,917,581	2/27/2024	Apex Beam Technologies LLC
2 10,965,434	3/30/2021	Apex Beam Technologies LLC
3 11,139,944	10/5/2021	Apex Beam Technologies LLC
4 11,108,639	8/31/2021	Apex Beam Technologies LLC
5 10,986,695	4/20/2021	Apex Beam Technologies LLC

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

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

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

DECISION/JUDGEMENT

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

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas, Marshall Division on the following

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

DOCKET NO. 2:24-cv-00203	DATE FILED 3/20/2024	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF APEX BEAM TECHNOLOGIES LLC		DEFENDANT SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 10,979,128	4/13/2021	Apex Beam Technologies LLC
2 11,637,615	4/25/2023	Apex Beam Technologies LLC
3		
4		
5		

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

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

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

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	03/30/2021	10965434	2019-001Ut	9030

148908 7590 03/10/2021
ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

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):

Alireza Babaei, Fairfax, VA;

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

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)

148908 7590 02/01/2021

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030

TITLE OF INVENTION: Scheduling Activation and Release

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	05/03/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
CUNNINGHAM, KEVIN M	2461	370-330000

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

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

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

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

1 Alireza Babaei
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

PanPsy Technologies, LLC

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

Fairfax, VA

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 /Alireza Babaei/Date 2021-02-20Typed or printed name Alireza BabaeiRegistration No. 75,833

Electronic Patent Application Fee Transmittal				
Application Number:		17084933		
Filing Date:		30-Oct-2020		
Title of Invention:		Scheduling Activation and Release		
First Named Inventor/Applicant Name:		Alireza Babaei		
Filer:		Alireza Babaei		
Attorney Docket Number:		2019-001Ut		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	600	600

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				600

Electronic Acknowledgement Receipt	
EFS ID:	41976291
Application Number:	17084933
International Application Number:	
Confirmation Number:	9030
Title of Invention:	Scheduling Activation and Release
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
Filer Authorized By:	
Attorney Docket Number:	2019-001Ut
Receipt Date:	20-FEB-2021
Filing Date:	30-OCT-2020
Time Stamp:	18:39:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 600
RAM confirmation Number	E20212JI44084402
Deposit Account	
Authorized User	

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

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	2019-001Ut_IssueFee.pdf	102642	no	1
			240b4658b0b51117f1bd3eeaca2e39d3e32a7b5b		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30123	no	2
			d9ff5f987cba0446d688a6c17e6b69a119ced8b3d		
Warnings:					
Information:					
Total Files Size (in bytes):			132765		
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
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

148908 7590 02/01/2021
ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

EXAMINER

CUNNINGHAM, KEVIN M

ART UNIT PAPER NUMBER

2461

DATE MAILED: 02/01/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030

TITLE OF INVENTION: Scheduling Activation and Release

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	05/03/2021

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)

148908 7590 02/01/2021

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030

TITLE OF INVENTION: Scheduling Activation and Release

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	05/03/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
CUNNINGHAM, KEVIN M	2461	370-330000

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 ☐ Government4a. 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.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030
148908	7590	02/01/2021	EXAMINER	
ALIREZA BABAEI			CUNNINGHAM, KEVIN M	
4525 Gilbertson Road			ART UNIT	
Fairfax, VA 22032			PAPER NUMBER	
			2461	
DATE MAILED: 02/01/2021				

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); (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. 17/084,933	Applicant(s) Babaei, Alireza	
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461	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 the amendments filed on 1/18/2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3. ☒ The allowed claim(s) is/are 1-20. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

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

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

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

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

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

* Certified copies not received: _____.

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

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

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

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

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 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 _____.
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/KEVIN M CUNNINGHAM/
Primary Examiner, Art Unit 2461

<i>Index of Claims</i> 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

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

CLAIMS										
☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	12/02/2020	01/28/2021							
1	1	✓	=							
2	2	✓	=							
3	3	✓	=							
4	4	✓	=							
5	5	✓	=							
6	6	✓	=							
7	7	✓	=							
8	8	✓	=							
9	9	✓	=							
10	10	✓	=							
11	11	✓	=							
12	12	✓	=							
13	13	✓	=							
14	14	✓	=							
15	15	✓	=							
16	16	✓	=							
17	17	✓	=							
18	18	✓	=							
19	19	✓	=							
20	20	✓	=							

<i>Search Notes</i> 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

CPC - Searched*		
Symbol	Date	Examiner
H04L5/0098	11/30/2020	KC

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
Inventor Search	11/30/2020	KC
CPC Search	11/30/2020	KC
Date Search	11/30/2020	KC
Text Search	11/30/2020	KC
Date and Text Search	12/02/2020	KC
NPL Search	12/02/2020	KC

/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461	
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<i>Search Notes</i> 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04L	5/0098, 5/001	01/28/2021	KC
H04W	76/11	01/28/2021	KC

/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461	
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Issue Classification 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

CPC						
Symbol				Type	Version	
H04L	/	5	/	0098	F	2013-01-01
H04L	/	5	/	001	I	2013-01-01
H04W	/	76	/	11	I	2018-02-01
H04W	/	72	/	1268	I	2013-01-01
H04W	/	72	/	14	I	2013-01-01

CPC Combination Sets						
Symbol			Type	Set	Ranking	Version
	/		/			

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461	28 January 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	27

Issue Classification 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04L		5	00
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
370	330

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461 (Primary Examiner)	28 January 2021 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 27

Issue Classification 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

☒ 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	1	10	10	19	19										
2	2	11	11	20	20										
3	3	12	12												
4	4	13	13												
5	5	14	14												
6	6	15	15												
7	7	16	16												
8	8	17	17												
9	9	18	18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461 (Primary Examiner) _____ (Date) _____		28 January 2021 O.G. Print Claim(s) 1	O.G. Print Figure 27

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(H04L5/0098.cpc. H04W76/11.cpc. H04L5/001.cpc.) and valid\$5 near3 DCI with configuration adj index with uplink near2 grant.clm.	USPAT	OR	ON	2021/01/28 10:19
L2	0	valid\$5 near3 DCI with configuration adj index with uplink near2 grant.clm.	USPAT	OR	ON	2021/01/28 10:19
L3	0	(H04L5/0098.cpc. H04W76/11.cpc. H04L5/001.cpc.) and automatic adj repeat adj request with first adj sequence with redundancy adj version with second adj sequence with comparing with bits.clm.	USPAT	OR	ON	2021/01/28 10:19
L4	0	automatic adj repeat adj request with first adj sequence with redundancy adj version with second adj sequence with comparing with bits.clm.	USPAT	OR	ON	2021/01/28 10:20

1/28/2021 10:20:21 AM

C:\Users\kcunningham\Documents\EAST\Workspaces\Cases\FY21 Oct-Mar\case 17084933.wsp

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 17/084,933		Filing Date 10/30/2020		☐ To be Mailed			
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)	(Column 2)								
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)					
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A							
☐ SEARCH FEE (37 CFR 1.16(k), (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 \$100 =							
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *		x \$480 =							
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL							
APPLICATION AS AMENDED - PART II											
AMENDMENT		(Column 1)	(Column 2)	(Column 3)							
	01/18/2021	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(i))	* 20	Minus ** 20	= 0	x \$100 =		0				
	Independent (37 CFR 1.16(h))	* 2	Minus *** 3	= 0	x \$480 =		0				
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
						TOTAL ADD'L FEE		0			
AMENDMENT		(Column 1)	(Column 2)	(Column 3)							
		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(i))	*	Minus **	=	x \$0 =						
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x \$0 =						
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
						TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE					
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/CRYSTAL QUEEN/					
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".											
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.											

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. :	17/084,933	Filed :	10/30/2020
Confirmation No.:	9030	Art Unit :	2461
Docket No. :	2019-001Ut	Examiner :	Kevin M. Cunningham
First Inventor :	Alireza Babaei	Customer No. :	148908

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

AMENDMENT AND REPLY

Sir/Madam:

In response to the Office Action dated December 9, 2020 (hereinafter, "Office Action"), please consider the Amendment and Reply below.

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

Remarks begin on page 8 of this paper.

Electronic Acknowledgement Receipt	
EFS ID:	41669985
Application Number:	17084933
International Application Number:	
Confirmation Number:	9030
Title of Invention:	Scheduling Activation and Release
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
Filer Authorized By:	
Attorney Docket Number:	2019-001Ut
Receipt Date:	18-JAN-2021
Filing Date:	30-OCT-2020
Time Stamp:	11:02:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2019-001Ut_2020-01-18_ResponseToNFOA.pdf	67882 d7f66355d1c38c31b237b3c384d2ae4500d1431e	yes	11

Multipart Description/PDF files in .zip description			
Document Description		Start	End
Applicant Arguments/Remarks Made in an Amendment		8	11
Claims		2	7
Amendment/Req. Reconsideration-After Non-Final Reject		1	1
Warnings:			
Information:			
Total Files Size (in bytes):		67882	
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.			

Application No.: 17/084,933
Amendment dated January 18, 2021
Reply to Office Action dated December 9, 2020

REMARKS

I. Status of Claims

- a. Claims 1-20 are pending in this application.
- b. Claims 1 and 12 are independent claims.
- c. Claims 1, 2, 4-20 are currently amended.

Applicant thanks the Examiner for the thoughtful Office Action. Reconsideration and allowance are respectfully requested.

II. Statement of Substance of Interview

The Applicant thanks Examiner Cunningham for the courtesy of a telephonic interview (hereinafter “Interview”) with Inventor and Applicant’s representative Dr. Alireza Babaei on January 7, 2021. Prior to the Interview, the Applicant provided an Interview Agenda comprising a draft amendment to independent claim 1. During the interview, the Applicant discussed differences between the independent claim 1, as per the draft amendment, and the cited references. Examiner Cunningham indicated that the outstanding rejection would potentially be overcome by the draft amendment but advised that further consideration would be required. No agreement was reached.

The Office is invited to contact the undersigned should any further clarification or amendment be helpful in advancing prosecution.

III. Support for the Amendments to the Claims

Support for the amendments can be found at least in paragraphs [0176], [0180], [0181], [0221], [0225], and [0226] of the specification.

IV. Rejections under 35 U.S.C. § 112

Claim 20

Claim 20 is rejected under 35 U.S.C. § 112 for insufficient antecedent basis. The Applicant respectfully submits that the rejection is moot in light of the current amendment.

V. Rejections under 35 U.S.C. § 103

Claims 1, 2 and 4-20

Claims 1, 2 and 4-20 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Kim et al (US 2019/0208540, hereinafter Kim) and in view of 3GPP paper: “Enhanced UL configuration grant transmission” (R1-1910071, October 20, 2019, hereinafter Huawei). The Applicant respectfully traverses at least for the following reasons.

As currently amended, independent claim 1 recites the following:

1. A method comprising:

receiving, by a wireless device:

a first configuration parameter used in determination of a first sequence of one or more bits for downlink control information (DCI) validation;

a second configuration parameter used in determination of a second sequence of one or more bits for DCI validation; and

a third configuration parameter indicating a configuration index of an uplink configured grant configuration;

receiving a DCI comprising:

a hybrid automatic repeat request process number field comprising one or more first bits; and

a redundancy version field comprising one or more second bits;

validating the DCI:

based on comparing the one or more second bits with the second sequence and not based on the one or more first bits in response to the one or more first bits indicating the configuration index; and

based on comparing the one or more second bits with the second sequence and comparing the one or more first bits with the first sequence in response to the one or more first bits not indicating the configuration index; and

activating or deactivating resources associated with the uplink configured grant configuration.

Applicant respectfully submits that independent claim 1, as currently amended, is similar to the draft claim provided in the Interview Agenda. As discussed during the Interview, independent claim 1 is distinct from the cited art due to at least to the current amendments to independent claim 1. The cited art, either alone or in combination, do not disclose receiving “*a first configuration parameter used in determination of a first sequence of one or more bits for downlink control information (DCI) validation*” or receiving “*a second configuration parameter used in determination of a second sequence of one or more bits for DCI validation*”. Furthermore, the cited art, either alone or in combination, do not disclose validating the DCI “*based on comparing the one or more second bits with the second sequence and not based on the one or more first bits in response to the one or more first bits indicating the configuration index*” or validating the DCI “*based on comparing the one or more second bits with the second sequence and comparing the one or more first bits with the first sequence in response to the one or more first bits not indicating the configuration index*”.

For at least the above reasons, independent claim 1 is patentable over the cited art. Independent claim 12 includes analogous subject matter and is patentable over the cited art for substantially the same reasons. Claims 2, 4-11 and claims 13-20 are further patentable over the cited art for at least the same reasons as the independent claims from which they depend, and further in view of their own features. Accordingly, Applicant respectfully requests the rejection of claims 1, 2, 4-20 under 35 U.S.C. § 103 be reconsidered and withdrawn.

Claims 3

Claim 3 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Kim in view of Huawei and further in view of Ying et al (US 2018/0199334, hereinafter Ying). Applicant respectfully traverses.

Claims 3 is patentable over the cited art for at least the same reasons as the independent claims 1 from which it depends and further in view of its own features. Accordingly, Applicant respectfully requests the rejection of claim 3 under 35 U.S.C. § 103 be reconsidered and withdrawn.

Application No.: 17/084,933
Amendment dated January 18, 2021
Reply to Office Action dated December 9, 2020

VI. Conclusion

Applicant is of the belief that all the pending issues have been addressed. Nevertheless, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. Nothing in this reply should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this reply. Finally, the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

/Alireza Babaei/

Alireza Babaei

Registration No. 75,833

AMENDMENTS TO THE CLAIMS

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

1. (Currently Amended) A method comprising:

receiving, by a wireless device[[,]]; ~~receiving, by a wireless device, a first configuration parameter used in determination of a first sequence of one or more bits for downlink control information (DCI) validation; a second configuration parameter used in determination of a second sequence of one or more bits for DCI validation; and a third configuration parameter[s] indicating a configuration index of an uplink configured grant configuration;~~

~~a first configuration parameter used in determination of a first sequence of one or more bits for downlink control information (DCI) validation;~~

~~a second configuration parameter used in determination of a second sequence of one or more bits for DCI validation; and~~

~~a third configuration parameter[s] indicating a configuration index of an uplink configured grant configuration;~~

receiving a ~~downlink control information (DCI)~~ comprising:

~~a hybrid automatic repeat request (HARQ)-process number field comprising one or more first bits; and~~

~~a redundancy version field comprising one or more second bits;~~

~~determining whether a first value of the one or more first bits indicates a configuration index of the uplink configured grant configuration;~~

~~validating-determining that the DCI is a valid activation DCI or a valid release DCI:~~

~~based on comparing the one or more second bits with the second sequence and not based on the one or more first bits in response to the one or more first bits-first value-indicating the configuration index; and~~

~~based on comparing the one or more second bits with the second sequence and comparing the one or more first bits with the first sequence in response to the one or more first bits-first value not indicating the configuration index; and~~

~~activating or deactivating a plurality of resources associated with the uplink configured grant configuration.~~

2. (Currently Amended) The method of claim 1, further comprising receiving a fourth configuration parameter indicating one or more deactivation states, wherein ~~the~~ a first value, of the one or more first bits, indicates a first deactivation state corresponding to one or more uplink configured grant configurations comprising the uplink configured grant configuration.
3. (Original) The method of claim 1, further comprising transmitting a confirmation control element comprising a field with a second value indicating that the DCI indicating activation or deactivation of the uplink configured grant configuration, in a plurality of uplink configured grant confirmations, is received.
4. (Currently Amended) The method of claim 1, wherein:
 - ~~the configured grant~~ configuration parameters of the uplink configured grant configuration comprise a first radio network temporary identifier; and
 - the DCI is associated with the first radio network temporary identifier.
5. (Currently Amended) The method of claim 4, wherein:
 - the DCI further comprises a new data indicator field; and
 - ~~determining that~~ validating the DCI is ~~a valid activation DCI or a valid release DCI~~ is further based on the DCI being associated with the first radio network temporary identifier and based on a third value of the new data indicator field being zero.
6. (Currently Amended) The method of claim 1, wherein:
 - ~~the~~ a first value, of the one or more first bits, indicates the configuration index of the uplink configured grant configuration in a plurality of uplink configured grant configurations; and
 - ~~determining that~~ validating the DCI is ~~a valid activation DCI or a valid release DCI~~ is based on the one or more second bits and not based on the one or more first bits.

7. (Currently Amended) The method of claim 6, further comprising receiving ~~second~~ bandwidth part configuration parameters of a bandwidth part of a cell, wherein the plurality of uplink configured grant configurations are for the bandwidth part.
8. (Currently Amended) The method of claim 6, wherein the bandwidth part configuration parameters ~~comprise of the uplink configured grant configuration parameters~~ comprise comprising a first the third configuration parameter indicating the configuration index.
9. (Currently Amended) The method of claim 1, wherein[[,]]:
 - ~~in response to the a first value, of the one or more first bits, indicating~~ indicates the configuration index[[,]]; and
 - ~~determining that validating the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with the second sequence one or more second predetermined values.~~
10. (Currently Amended) The method of claim 1, wherein[[,]]:
 - ~~in response to the a first value, of the one or more first bits, does not indicating~~ indicate the configuration index[[,]]; and
 - ~~determining that validating the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with the second sequence one or more second predetermined values and comparing the one or more first bits with the first sequence one or more first predetermined values.~~
11. (Currently Amended) The method of claim ~~1-10~~, wherein:
 - the first sequence of one or more bits ~~first predetermined values~~ are all zeros; and
 - the second sequence of one or more bits ~~second predetermined values~~ are all zeros.
12. (Currently Amended) A method comprising:
 - receiving, by a wireless device[[,]]:

a first configuration parameter used in determination of a first sequence of one or more bits for downlink control information (DCI) validation;
a second configuration parameter used in determination of a second sequence of one or more bits for DCI validation; and
a third configuration parameter[[s]] indicating a configuration index of a
downlink semi-persistent scheduling (SPS) configuration;
receiving a ~~downlink control information (DCI)~~ comprising:
a hybrid automatic repeat request (~~HARQ~~) process number field comprising one or more first bits; and
a redundancy version field comprising one or more second bits;
~~determining whether a first value of the one or more first bits indicates a configuration index of the downlink SPS configuration;~~
~~validating-determining that the DCI is a valid activation DCI or a valid release DCI:~~
based on comparing the one or more second bits with the second sequence and not based on the one or more first bits in response to the one or more first bits ~~first value~~ indicating the configuration index; and
based on comparing the one or more second bits with the second sequence and comparing the one or more first bits with the first sequence in response to the one or more first bits ~~first value~~ not indicating the configuration index; and
activating or deactivating a ~~plurality of~~ resources associated with the downlink SPS configuration.

13. (Currently Amended) The method of claim 12, further comprising receiving a fourth configuration parameter indicating one or more deactivation states, wherein ~~the~~ a first value, of the one or more first bits, indicates a first deactivation state corresponding to one or more downlink SPS configurations comprising the downlink SPS configuration.
14. (Currently Amended) The method of claim 12, wherein:
the DCI further comprises a new data indicator field; and

~~determining that validating~~ the DCI is a valid activation DCI or a valid release DCI is further based on the DCI being associated with a first radio network temporary identifier and based on a second value of the new data indicator field being zero.

15. (Currently Amended) The method of claim 12, wherein:

~~the~~ a first value, of the one or more first bits, indicates the configuration index of the downlink SPS configuration in a plurality of downlink SPS configurations; and
~~determining that validating~~ the DCI is a valid activation DCI or a valid release DCI is based on the one or more second bits and not based on the one or more first bits.

16. (Currently Amended) The method of claim 15, further comprising receiving ~~second~~ bandwidth part configuration parameters of a bandwidth part of a cell, wherein the plurality of downlink SPS configurations are for the bandwidth part.

17. (Currently Amended) The method of claim 15, wherein the bandwidth part configuration parameters ~~comprise~~ of the downlink SPS configuration parameters ~~comprise comprising~~ a first the third configuration parameter indicating the configuration index.

18. (Currently Amended) The method of claim 12, wherein[.];

~~in response to the~~ a first value, of the one or more first bits, ~~indicating~~ indicates the configuration index[.]; and
~~determining that validating~~ the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with the second sequence ~~one or more second predetermined values~~.

19. (Currently Amended) The method of claim 12, wherein[.];

~~in response to the~~ a first value, of the one or more first bits, ~~does not indicating~~ indicate the configuration index[.]; and
~~determining that validating~~ the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with the second sequence ~~one or more~~

Application No.: 17/084,933
Amendment dated January 18, 2021
Reply to Office Action dated December 9, 2020

~~second predetermined values~~ and comparing the one or more first bits with the first sequence ~~one or more first predetermined values~~.

20. (Currently Amended) The method of claim 12, wherein:

the first sequence of one or more bits ~~first predetermined values~~ are all zeros; and
the second sequence of one or more bits ~~second predetermined values~~ are all zeros.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030
148908	7590	01/08/2021		
ALIREZA BABAEI 4525 Gilbertson Road Fairfax, VA 22032			EXAMINER CUNNINGHAM, KEVIN M	
			ART UNIT	PAPER NUMBER
			2461	
			MAIL DATE	DELIVERY MODE
			01/08/2021	PAPER

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.

<i>Applicant-Initiated Interview Summary</i>	Application No. 17/084,933	Applicant(s) Babaei, Alireza		
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461	AIA (First Inventor to File) Status Yes	Page 1 of 2

All participants (applicant, applicants representative, PTO personnel):

1. KEVIN M CUNNINGHAM (Primary Examiner); 2. Dr. Alireza Babaei (Attorney); Telephonic
Telephonic

Date of Interview: 07 January 2021

Claims Discussed: 1

Prior Art Discussed: Kim

Amendment proposed: Applicant proposed amendments to overcome the prior art.

Issues Discussed:

Proposed Amendments:
The proposed amendments appear to overcome the prior art of the record but further consideration is needed.

Attachment(s): Agenda, Proposed Amendments,

/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461	
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Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04

Please further see:

MPEP 713.04

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

37 CFR § 1.2 Business to be transacted in writing

U.S. Patent and Trademark Office
PTOL-413/413b (Rev. 01/01/2015)

Interview Summary

Paper No. 20210107

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

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

FOR DISCUSSION ONLY- NOT FOR ENTRY

Proposed Agenda for Interview

Application No. : 17/084,933
Docket No. : 2019-001Ut

Interview Plan:

Telephonic interview is scheduled on **Thursday, January 7, 2021 at 11:00 AM EST**. The Applicant will contact the Examiner at the Examiner's office telephone number at the appointed time.

Participants:

1. Inventor/Applicant's representative: Dr. Alireza Babaei, Reg. No. 75,833 (o: 703-798-0675)
2. Examiner: Kevin M. Cunningham (o: 571-272-1765)

Draft Claim:

The draft claim below is provided as an example for discussion purposes.

1. A method comprising:
 - receiving, by a wireless device[[,]]:
 - a first configuration parameter used in determination of a first sequence of one or more bits for downlink control information (DCI) validation;**
 - a second configuration parameter used in determination of a second sequence of one or more bits for DCI validation; and**
 - a third** configuration parameter[[s]] **indicating a configuration index** of an uplink configured grant configuration;
 - receiving a ~~downlink control information~~ (DCI) comprising:
 - a hybrid automatic repeat request (~~HARQ~~)-process number field comprising one or more first bits; and
 - a redundancy version field comprising one or more second bits;
 - ~~determining whether a first value of the one or more first bits indicates a configuration index of the uplink configured grant configuration;~~
 - validating determining that the DCI is a valid activation DCI or a valid release DCI:**
 - based on **comparing** the one or more second bits **with the second sequence** and not based on the one or more first bits in response to the ~~first value~~ **one or more first bits** indicating the configuration index; and

FOR DISCUSSION ONLY- NOT FOR ENTRY

based on **comparing** the one or more second bits **with the second sequence** and **comparing** the one or more first bits **with the first sequence** in response to the ~~first~~ **value one or more first bits** not indicating the configuration index; and activating or deactivating ~~a plurality of~~ resources associated with the uplink configured grant configuration.

Remarks:

Claim 1 is rejected under 35 U.S.C. § 103 as being unpatentable over US 2019/0208540 (“Kim”) in view of 3GPP paper R1-1910071 (“Huawei”). The applicant intends to discuss the differences between independent claim 1, as per the draft amendment, and the combination of cited art.



UNITED STATES PATENT AND TRADEMARK OFFICE

USPTO Automated Interview Request (AIR)

Dec 17 2020

This paper requesting to schedule and/or conduct an interview is appropriate because:

This submission is requested to be accepted as an authorization for this interview to communicate via the internet. Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned concerning scheduling of the interview via video conference, instant messaging, or electronic mail, and to conduct the interview in accordance with office practice including video conferencing.

Name(s):
Alireza Babaei

S-signature:
/Alireza Babaei/

Registration Number:
75833

U.S. Application Number:
17084933

Confirmation Number:
9030

E-mail Address:
ar.babaei@gmail.com

Phone Number:
+1 7037980675

Proposed Time of Interview:
1-7-2021 11:00 AM ET

Preferred Interview Type:
Telephonic

I am the applicant or applicant's representative for this application.

Topic for Discussion:
2019-001Ut | Discuss rejections. Please contact me at ar.babaei@gmail.com to confirm the interview.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030
148908	7590	12/09/2020	EXAMINER	
ALIREZA BABAEI 4525 Gilbertson Road Fairfax, VA 22032			CUNNINGHAM, KEVIN M	
			ART UNIT	PAPER NUMBER
			2461	
			MAIL DATE	DELIVERY MODE
			12/09/2020	PAPER

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.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 20 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

Claim 20 recites the limitation "the one or more first/second predetermined values" in lines 2 and 3. There is insufficient antecedent basis for this limitation in the claim. This could be fixed if claim 20 depended on claim 19 instead of claim 12.

Claim Rejections - 35 USC § 103

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.

Claims 1, 2 and 4-20 are rejected under 35 U.S.C. 103 as being unpatentable over Kim et al (US 2019/0208540, hereinafter Kim) and in view of 3GPP paper: "Enhanced UL configuration grant transmission" (R1-1910071, October 20, 2019, hereinafter Huawei).

1. **Regarding claim 1**, Kim discloses a method comprising: receiving, by a wireless device, configuration parameters of an uplink configured transmission configuration (**base station transmits pre-configuration parameters to the UE for uplink transmission, Para [0353]**); receiving a downlink control information (DCI) (**UE receives DCI for activating/de-activating uplink transmission, Para [0353]**) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits (**DCI format includes HARQ process number, Para [0364,367], made up of bits**); and a redundancy version field comprising one or more second bits (**DCI format includes redundancy version, Para [0364, 368], made up of bits**); and activating or deactivating a plurality of resources associated with the uplink configured transmission configuration (**activating or de-activating uplink transmission according to the DCI, Para [0353]**);
determining that the DCI is a valid activation DCI or a valid release DCI (**validation method and using fields in the DCI for validation of the activation or release of the uplink transmission, Para [0376]**); based on the one or more second bits and the one or more first bits in response to the first value not indicating the configuration index (**both the HARQ process number and redundancy version fields can be used for validation of activation or release of the uplink transmission, Para [0379, 380]**);

Kim discloses activation/release of resources for grant-less but not grant based activation/release nor discloses determining whether a first value of the one or more first bits indicates a configuration index of the uplink configured grant configuration; nor validation being based on the one or more second bits and not based on the one or more first bits in response to the first value indicating the configuration index. Kim does disclose **the HARQ field may not be used for validation if the HARQ field is used to signal number of HARQ process indexes to be configured, Para [0379]**. Huawei discloses **UL configured grant configurations, activating and releasing UL configured grant using DCI fields, page 1, the HPN field can be used to indicate the configuration (index)**

- to be activated or released, otherwise it can be used for validation, page 3/proposal 4. In view of the combination the HPN field can be used for indicating configuration index or can be used for validation along with the RV field.** It would have been obvious to one of ordinary skill in the art before the effective filing date of the invention to utilize the techniques taught by Huawei in order to solve issues for activation and release using DCI when two or more configured grant configurations are active.
2. **Regarding claims 2 and 13**, Kim discloses the method of claim 1/12, further comprising receiving a configuration parameter indicating one or more deactivation states, wherein the first value indicates a first deactivation state corresponding to one or more uplink configured grant configurations comprising the uplink configured grant/downlink SPS configuration. Huawei discloses **2^M states are higher layer configurable, where each state can be mapped to one or multiple configured grant configurations to be released, page 1 and the HPN field can be used to indicate the configuration (index) to released, page 3/proposal 4.**
 3. **Regarding claim 4**, Kim discloses the method of claim 1, wherein: the configuration parameters of the uplink configured grant configuration comprise a first radio network temporary identifier; and the DCI is associated with the first radio network temporary identifier. Kim discloses **the DCI is scrambled by a radio network temporary identifier (RNTI), Para [0018], identifying DCI for activation/release based on different RNTIs, Para [0359] and transmitting preconfigured information via RRC signaling, Para [0353], obvious to one with ordinary skill that RNTI could be information transmitted via RRC signaling.** Huawei discloses **DCI scrambled by RNTI for activation and release of configured grants, page 3.**
 4. **Regarding claims 5 and 14**, Kim discloses the method of claim 4/12, wherein: the DCI further comprises a new data indicator field; and determining that the DCI is a valid activation DCI or a valid release DCI is further based on the DCI being associated with the first radio network temporary identifier and based on a third value of the new data indicator field being zero (**NDI field is fixed to zero in the DCI for activation or release and NDI may be used for validation, Para [0361], the DCI is scrambled by a radio network temporary identifier (RNTI), Para [0018], identifying DCI for activation/release based on different RNTIs, Para [0359]).**

5. **Regarding claims 6 and 15**, Kim discloses the method of claim 1, but not fully wherein: the first value indicates the configuration index of the uplink configured grant/downlink SPS configuration in a plurality of uplink configured grant/SPS configurations; and determining that the DCI is a valid activation DCI or a valid release DCI is based on the one or more second bits and not based on the one or more first bits. Kim does disclose **the HARQ field may not be used for validation if the HARQ field is used to signal number of HARQ process indexes to be configured, Para [0379]**. Huawei discloses **UL configured grant configurations, activating and releasing UL configured grant using DCI fields, page 1, the HPN field can be used to indicate the configuration (index) to activated or released, otherwise it can be used for validation, page 3/proposal 4. In view of the combination the HPN field can be used for indicating configuration index or can be used for validation along with the RV field.**
6. **Regarding claims 7 and 16**, Kim discloses the method of claim 6/15, further comprising receiving second configuration parameters of bandwidth part of a cell, wherein the plurality of uplink configured grant/SPS configurations are for the bandwidth part (**bandwidth part may be signaled through UL-BWP-mu/DL-BWP-mu corresponding to higher layer signaling, Para [0106] and base station can transmit preconfigured information via RRC signaling, Para [0353]**).
7. **Regarding claims 8 and 17**, Kim discloses the method of claim 6/15, but not wherein the configuration parameters of the uplink configured grant/downlink SPS configuration comprise a first parameter indicating the configuration index. Huawei discloses **UL configured grant configurations, activating and releasing UL configured grant using DCI fields, page 1, the HPN field can be used to indicate the configuration (index) to activated or released, page 3/proposal 4.**
8. **Regarding claims 9 and 18**, Kim discloses the method of claim 1/12, but not fully wherein, in response to the first value indicating the configuration index, determining that the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with one or more second predetermined values. Kim does disclose **the HARQ field may not be used for validation if the HARQ field is used to signal number of HARQ process indexes to be configured, Para [0379] and HARQ process number field set to 0s for validation, Para [0379],**

table 8/9 and RV field set to 0s for validation, Para [0380], table 8/9. Huawei discloses **UL configured grant configurations, activating and releasing UL configured grant using DCI fields, page 1, the HPN field can be used to indicate the configuration (index) to activated or released, otherwise it can be used for validation, page 3/proposal 4. In view of the combination the HPN field can be used for indicating configuration index or can be used for validation along with the RV field.**

9. **Regarding claims 10 and 19,** Kim discloses the method of claim 1/12, wherein, in response to the first value not indicating the configuration index, determining that the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with one or more second predetermined values and comparing the one or more first bits with one or more first predetermined values (**HARQ process number field set to 0s for validation, Para [0379], table 8/9 and RV field set to 0s for validation, Para [0380], table 8/9).**
10. **Regarding claims 11 and 20,** Kim discloses the method of claim 10/12, wherein: the one or more first predetermined values are all zeros (**HARQ process number field set to 0s for validation, Para [0379], table 8/9);** and the one or more second predetermined values are all zeros (**RV field set to 0s for validation, Para [0380], table 8/9).**
11. **Regarding claim 12,** Kim discloses a method comprising: receiving, by a wireless device, configuration parameters of a downlink semi-persistent scheduling (SPS) configuration (**base station transmits pre-configuration parameters to the UE for SPS transmission, Para [0353];** receiving a downlink control information (DCI) (**receiving DCI that activates or releases SPS, Para [0359]**) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits (**DCI format includes HARQ process number, Para [0364,367], made up of bits);** and a redundancy version field comprising one or more second bits (**DCI format includes redundancy version, Para [0364, 368], made up of bits);** activating or deactivating a plurality of resources associated with the downlink SPS configuration (**validating and activating or releasing SPS configuration according to DCI, Para [0361];** determining that the DCI is a valid activation DCI or a valid release DCI (**validation method and using fields in the DCI for validation of the activation or release of the uplink transmission in same manner as for SPS activation/release, Para**

[0376]): based on the one or more second bits and the one or more first bits in response to the first value not indicating the configuration index (**both the HARQ process number and redundancy version fields can be used for validation of activation or release of the SPS transmission, Para [0379, 380]/table 8/9**);

but does not explicitly disclose determining whether a first value of the one or more first bits indicates a configuration index of the downlink SPS configuration; nor based on the one or more second bits and not based on the one or more first bits in response to the first value indicating the configuration index. Kim discloses **the validation and activating or releasing of SPS acts in the same manner as in the AUL case, Para [0376] and the HARQ process number field may in one case be used to indicate index instead of being used for validation, Para [0379]**. Huawei discloses **the HPN field can be used to indicate the configuration (index) to activated or released, otherwise it can be used for validation, page 3/proposal 4. In view of the combination activating or releasing resources of the SPS configuration is done in the same manner as in the uplink grant case, where the HPN field can be used to indicate the configuration index or used for validation along with the RV field.**

Claim 3 is rejected under 35 U.S.C. 103 as being unpatentable over Kim, in view of Huawei and in view of Ying et al (US 2018/0199334, hereinafter Ying).

12. **Regarding claim 3**, Kim discloses the method of claim 1, but not explicitly further comprising transmitting a confirmation control element comprising a field with a second value indicating that the DCI indicating activation or deactivation of the uplink configured grant configuration, in a plurality of uplink configured grant confirmations, is received. Ying discloses **the gNB may use DCI to activate or deactivate UL transmission on SPS resource, where the UE can transmit an ACK using MAC CE to confirm activation/deactivation, Para [0085]**. It would have been obvious to one of ordinary skill in the art before the effective filing date of the invention to utilize the techniques taught by Ying in order to improve on existing communication structures to allow for more flexibility and efficiency.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEVIN CUNNINGHAM whose telephone number is (571) 272-1765. The examiner can normally be reached Monday through Thursday 7:30-18:00 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (571) 272-3155. The fax 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.

/KEVIN M CUNNINGHAM/
Primary Examiner, Art Unit 2461

<i>Notice of References Cited</i>	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza	
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461	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-20190208540-A1	07-2019	KIM; Seonwook	H04W74/04	1/1
*	B	US-20180199334-A1	07-2018	Ying; Kai	H04W72/0413	1/1
*	C	US-20200314889-A1	10-2020	Cirik; Ali Cagatay	H04L5/0092	1/1
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	R1-1910071 3GPP TSG RAN WG1 Meeting #98bis Chongqing, China, October 14-20, 2019 Huawei "Enhanced UL configured grant transmission" (Year: 2019)
	V	R1-1910346 3GPP TSG RAN WG1 Meeting #98bis Chongqing, China, October 14-20, 2019 Catt "Discussion on enhanced UL configured grant transmission" (Year: 2019)
	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. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

CPC - Searched*		
Symbol	Date	Examiner
H04L5/0098	11/30/2020	KC

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
Inventor Search	11/30/2020	KC
CPC Search	11/30/2020	KC
Date Search	11/30/2020	KC
Text Search	11/30/2020	KC
Date and Text Search	12/02/2020	KC
NPL Search	12/02/2020	KC

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

/KEVIN M CUNNINGHAM/ Primary Examiner, Art Unit 2461	
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<i>Index of Claims</i> 	Application/Control No. 17/084,933	Applicant(s)/Patent Under Reexamination Babaei, Alireza
	Examiner KEVIN M CUNNINGHAM	Art Unit 2461

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

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	12/02/2020								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
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	14	✓								
	15	✓								
	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	442	alireza near2 babaei.in.	US-PGPUB; USPAT	OR	ON	2020/11/30 13:55
S2	5,213,978	@rlad<"20191105"	US-PGPUB; USPAT	OR	ON	2020/11/30 13:55
S3	2,415	H04L5/0098.cpc.	US-PGPUB; USPAT	OR	ON	2020/11/30 13:56
S4	1	valid near2 activation near2 dci same release near2 dci	US-PGPUB; USPAT	OR	ON	2020/11/30 14:03
S5	10	activation near2 dci same release near2 dci and redundancy near2 field same2 HARQ near2 process	US-PGPUB; USPAT	OR	ON	2020/11/30 14:06
S6	2	activation near5 release near5 dci same redundancy near2 field same HARQ near2 (ID process number)	US-PGPUB; USPAT	OR	ON	2020/11/30 14:11
S7	2	activation near5 release near5 dci same ((RV redundancy) near2 field) same (HPN (HARQ near2 (ID process number)))	US-PGPUB; USPAT	OR	ON	2020/11/30 14:16
S8	14	activation near5 (de\$activation release) near5 dci same ((RV redundancy) near2 field) same (HPN (HARQ near2 (ID process number)))	US-PGPUB; USPAT	OR	ON	2020/11/30 14:17
S9	37	activation near5 (de\$activation release) same ((RV redundancy repetition) near2 field) same (HPN (HARQ near2 (ID process number))) and S2	US-PGPUB; USPAT	OR	ON	2020/11/30 14:21
S10	32	activation near5 (de\$activation release) with (uplink grant SPS) same ((RV redundancy repetition) near2 field) same (HPN (HARQ near2 (ID process number))) and S2	US-PGPUB; USPAT	OR	ON	2020/11/30 15:24
S11	34	activation near5 (de\$activation release) with (uplink grant SPS) same2 ((RV redundancy repetition) near2 field) same (HPN (HARQ near2 (ID process number))) and S2	US-PGPUB; USPAT	OR	ON	2020/11/30 15:24

S12	76	(HPN (HARQ near2 (ID process number))) with index and (redundancy repetition RV) with (activat\$4) near3 (resource uplink grant SPS)	US-PGPUB; USPAT	OR	ON	2020/11/30 15:28
S13	1,752	@rlad<"20191105" and (activat\$4 de\$activat\$4 releas\$3) near5 (SPS grant) same5 valid\$6	US-PGPUB; USPAT	OR	ON	2020/12/02 11:36
S14	68	@rlad<"20191105" and (activat\$4 de\$activat\$4 releas\$3) near5 (SPS grant) same2 valid\$6 same (RV redund\$4)	US-PGPUB; USPAT	OR	ON	2020/12/02 11:49

12/2/2020 5:08:31 PM

C:\Users\kcunningham\Documents\EAST\Workspaces\Cases\case 17084933.wsp

Bibliographic Data

Application No: 17/084,933

Foreign Priority claimed: ☐ Yes ☒ No

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

Verified and Acknowledged: /KEVIN M CUNNINGHAM/

Examiner's Signature

Initials

Title: Scheduling Activation and Release

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/30/2020	370	2461	2019-001Ut
RULE			

APPLICANTS

INVENTORS

Alireza Babaei, Fairfax, VA, UNITED STATES

CONTINUING DATA

This application has PRO of 62931099 11/05/2019

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

11/06/2020

** SMALL ENTITY **

STATE OR COUNTRY

UNITED STATES

ADDRESS

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032
UNITED STATES

FILING FEE RECEIVED

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17084933
	Filing Date	2020-10-30
	First Named Inventor	Alireza Babaei
	Art Unit	2461
	Examiner Name	Kevin Cunningham
	Attorney Docket Number	2019-001Ut

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	Filing Date	2020-10-30
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-001Ut

/K.M.C/	1	3GPP TS 38.211 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation; (Release 15)
/K.M.C/	2	3GPP TS 38.212 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Multiplexing and channel coding; (Release 15)
/K.M.C/	3	3GPP TS 38.213 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control; (Release 15)
/K.M.C/	4	3GPP TS 38.214 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data; (Release 15)
/K.M.C/	5	3GPP TS 38.300 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2; (Release 15)
/K.M.C/	6	3GPP TS 38.321 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol specification; (Release 15)
/K.M.C/	7	3GPP TS 38.331 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio Resource Control (RRC); Protocol specification; (Release 15)
/K.M.C/	8	R1-1911429; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, 14th – 18th October 2019; Source: MCC Support; Title: Final Report of 3GPP TSG RAN WG1 #98 v2.0.0; (Prague, Czech Rep, 26th – 30th August 2019); Document for: Approval
/K.M.C/	9	R1-1908056; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26 – 30, 2019; Agenda Item: 7.2.6.6; Source: Huawei, HiSilicon; Title: Enhanced UL configured grant transmission; Document for: Discussion and Decision
/K.M.C/	10	R1-1908126; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.6; Source: Ericsson; Title: Enhancement of Configured Grant for NR URLLC; Document for: Discussion, Decision
/K.M.C/	11	R1-1908163; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: vivo; Title: Enhanced UL configured grant transmissions for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		17084933
	Filing Date		2020-10-30
	First Named Inventor	Alireza Babaei	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	2019-001Ut	

/K.M.C/	12	R1-1908164; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: vivo; Title: Other issues for URLLC; Agenda Item: 7.2.6.7; Document for: Discussion and Decision	
/K.M.C/	13	R1-1908240; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: ZTE; Title: Enhancements for UL configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	14	R1-1908241; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: ZTE; Title: Other enhancements for Rel-16 URLLC; Agenda Item: 7.2.6.7; Document for: Discussion and Decision	
/K.M.C/	15	R1-1908496; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.7; Source: Samsung; Title: Discussion for enhancements for IIoT; Document for: Discussion and decision	
/K.M.C/	16	R1-1908546; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.2.6; Source: LG Electronics; Title: Enhanced UL configured grant transmission for NR URLLC; Document for: Discussion and decision	
/K.M.C/	17	R1-1908599; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Source: CATT; Title: Discussion on enhanced UL configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and decision	
/K.M.C/	18	R1-1908650; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26th – 30th, 2019; Source: Intel Corporation; Title: Enhanced CG PUSCH transmission; Agenda Item: 7.2.6.6; Document for: Discussion and decision	
/K.M.C/	19	R1-1908651; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26th – 30th, 2019; Source: Intel Corporation; Title: Other aspects of eURLLC; Agenda item: 7.2.6.7; Document for: Discussion and Decision	
/K.M.C/	20	R1-1908672; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: OPPO; Title: Configured grant enhancements for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	21	R1-1908782; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.6; Source: Sony; Title: Enhanced UL configured grant transmission for URLLC; Document for: Discussion / decision	
/K.M.C/	22	R1-1908971; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Agenda item: 7.2.6.6; Source: Nokia, Nokia Shanghai Bell; Title: On Enhanced UL Configured Grant Transmission for NR URLLC and activation/release of multiple SPS configurations; Document for: Discussion and Decision	

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	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-001Ut

/K.M.C/	23	R1-1909198; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: NTT DOCOMO, INC.; Title: Enhanced UL transmission with configured grant for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	24	R1-1909370; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: WILUS Inc.; Title: Discussion on UL configured grant enhancements for NR URLLC; Agenda item: 7.2.6.6; Document for: Discussion/Decision	
/K.M.C/	25	R1-1910105; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: ZTE; Title: Enhancements for UL configured grant transmission; Agenda item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	26	R1-1910226; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: vivo; Title: Enhanced UL configured grant transmissions for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	27	R1-1910346; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 18th, 2019; Source: CATT; Title: Discussion on enhanced UL configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	28	R1-1910488; 3GPP TSG RAN WG1 #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: Samsung; Title: UL configured grants for eURLLC; Document for: Discussion and decision	
/K.M.C/	29	R1-1910550; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: Ericsson; Title: Enhancement of Configured Grant for NR URLLC; Document for: Discussion, Decision	
/K.M.C/	30	R1-1910551; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.7; Source: Ericsson; Title: Other Enhancements to Uplink and Downlink Transmissions for NR URLLC; Document for: Discussion, Decision	
/K.M.C/	31	R1-1910624; 3GPP TSG RAN WG1 #98bis; Chongqing, China, Oct. 14th – 20th, 2019; Source: OPPO; Title: Configured grant enhancements for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	32	R1-1910665; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Source: Intel Corporation; Title: Enhancements to UL configured grant transmission; Agenda item: 7.2.6.6; Document for: Discussion and Decision	
/K.M.C/	33	R1-1910831; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: LG Electronics; Title: Enhanced UL configured grant transmission for NR URLLC; Document for: Discussion and decision	

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	Filing Date	2020-10-30
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	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-001Ut

/K.M.C/	34	R1-1910869; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda item: 7.2.6.6; Source: Nokia, Nokia Shanghai Bell; Title: On Enhanced UL Configured Grant Transmission for NR URLLC and activation/release of multiple SPS configurations; Document for: Discussion and Decision
/K.M.C/	35	R1-1910993; 3GPP TSG RAN WG1 #98bis; Chongqing, China, 14th – 20th October 2019; Source: Panasonic; Title: Discussion on DL SPS enhancement and resource conflicts involving CG PUSCH; Agenda Item: 7.2.6.7; Document for: Discussion
/K.M.C/	36	R1-1911180; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: NTT DOCOMO, INC.; Title: Remaining issues for enhanced configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and Decision
/K.M.C/	37	R1-1911181; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: NTT DOCOMO, INC.; Title: Summary on URLLC enhanced configured grant transmission; Document for: Discussion and decision
/K.M.C/	38	R1-1911319; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: WILUS Inc.; Title: Discussion on UL configured grant enhancements for NR URLLC; Agenda item: 7.2.6.6; Document for: Discussion/ Decision
/K.M.C/	39	R1-1911658; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: NTT DOCOMO, INC.; Title: Offline discussions on URLLC enhanced configured grant transmission; Document for: Discussion and decision
/K.M.C/	40	R1-1911690; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: NTT DOCOMO, INC.; Title: Offline discussions#2 on URLLC enhanced configured grant transmission; Document for: Discussion and decision

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EXAMINER SIGNATURE

Examiner Signature	/KEVIN M CUNNINGHAM/	Date Considered	11/30/2020
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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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17084933
	Filing Date	2020-10-30
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-001Ut

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	/Alireza Babaei/	Date (YYYY-MM-DD)	2020-11-11
Name/Print	Alireza Babaei	Registration Number	75833

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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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.
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	9030
148908	7590	11/19/2020	EXAMINER	
ALIREZA BABAEI 4525 Gilbertson Road Fairfax, VA 22032			ART UNIT	
			2414	
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			11/19/2020	
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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.

<i>Decision Granting Request for Prioritized Examination (Track I)</i>	Application No. 17/084,933	Applicant(s) Babaei, Alireza	
	Examiner CHERYL P GIBSON BAYLOR	Art Unit OPET	AIA (FITF) Status Yes
1. THE REQUEST FILED <u>30 October 2020</u> IS GRANTED . The above-identified application has met the requirements for prioritized examination A. ☒ for an original nonprovisional application (Track I). B. ☐ for an application undergoing continued examination (RCE). 2. The above-identified application will undergo prioritized examination. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs: A. filing a <u>petition for extension of time</u> to extend the time period for filing a reply; B. filing an <u>amendment to amend the application to contain more than four independent claims, more than thirty total claims</u>, or a multiple dependent claim; C. filing a <u>request for continued examination</u> ; D. filing a notice of appeal; E. filing a request for suspension of action; F. mailing of a notice of allowance; G. mailing of a final Office action; H. completion of examination as defined in 37 CFR 41.102; or I. abandonment of the application. Telephone inquiries with regard to this decision should be directed to CHERYL GIBSON BAYLOR at (571)272-3213. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.			
/CHERYL GIBSON BAYLOR/ Paralegal Specialist, OPET			

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17084933
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	Examiner Name	
	Attorney Docket Number	2019-001Ut

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	Examiner Name	
	Attorney Docket Number	2019-001Ut

1	3GPP TS 38.211 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation; (Release 15)
2	3GPP TS 38.212 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Multiplexing and channel coding; (Release 15)
3	3GPP TS 38.213 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control; (Release 15)
4	3GPP TS 38.214 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data; (Release 15)
5	3GPP TS 38.300 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2; (Release 15)
6	3GPP TS 38.321 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Medium Access Control (MAC) protocol specification; (Release 15)
7	3GPP TS 38.331 V15.7.0 (2019-09); Technical Specification; 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Radio Resource Control (RRC); Protocol specification; (Release 15)
8	R1-1911429; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, 14th – 18th October 2019; Source: MCC Support; Title: Final Report of 3GPP TSG RAN WG1 #98 v2.0.0; (Prague, Czech Rep, 26th – 30th August 2019); Document for: Approval
9	R1-1908056; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26 – 30, 2019; Agenda Item: 7.2.6.6; Source: Huawei, HiSilicon; Title: Enhanced UL configured grant transmission; Document for: Discussion and Decision
10	R1-1908126; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.6; Source: Ericsson; Title: Enhancement of Configured Grant for NR URLLC; Document for: Discussion, Decision
11	R1-1908163; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: vivo; Title: Enhanced UL configured grant transmissions for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision

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12	R1-1908164; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: vivo; Title: Other issues for URLLC; Agenda Item: 7.2.6.7; Document for: Discussion and Decision
13	R1-1908240; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: ZTE; Title: Enhancements for UL configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and Decision
14	R1-1908241; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: ZTE; Title: Other enhancements for Rel-16 URLLC; Agenda Item: 7.2.6.7; Document for: Discussion and Decision
15	R1-1908496; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.7; Source: Samsung; Title: Discussion for enhancements for IIoT; Document for: Discussion and decision
16	R1-1908546; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.2.6; Source: LG Electronics; Title: Enhanced UL configured grant transmission for NR URLLC; Document for: Discussion and decision
17	R1-1908599; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Source: CATT; Title: Discussion on enhanced UL configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and decision
18	R1-1908650; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26th – 30th, 2019; Source: Intel Corporation; Title: Enhanced CG PUSCH transmission; Agenda Item: 7.2.6.6; Document for: Discussion and decision
19	R1-1908651; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26th – 30th, 2019; Source: Intel Corporation; Title: Other aspects of eURLLC; Agenda item: 7.2.6.7; Document for: Discussion and Decision
20	R1-1908672; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: OPPO; Title: Configured grant enhancements for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision
21	R1-1908782; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.6; Source: Sony; Title: Enhanced UL configured grant transmission for URLLC; Document for: Discussion / decision
22	R1-1908971; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Agenda item: 7.2.6.6; Source: Nokia, Nokia Shanghai Bell; Title: On Enhanced UL Configured Grant Transmission for NR URLLC and activation/release of multiple SPS configurations; Document for: Discussion and Decision

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23	R1-1909198; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: NTT DOCOMO, INC.; Title: Enhanced UL transmission with configured grant for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
24	R1-1909370; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: WILUS Inc.; Title: Discussion on UL configured grant enhancements for NR URLLC; Agenda item: 7.2.6.6; Document for: Discussion/Decision	
25	R1-1910105; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: ZTE; Title: Enhancements for UL configured grant transmission; Agenda item: 7.2.6.6; Document for: Discussion and Decision	
26	R1-1910226; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: vivo; Title: Enhanced UL configured grant transmissions for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
27	R1-1910346; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 18th, 2019; Source: CATT; Title: Discussion on enhanced UL configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
28	R1-1910488; 3GPP TSG RAN WG1 #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: Samsung; Title: UL configured grants for eURLLC; Document for: Discussion and decision	
29	R1-1910550; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: Ericsson; Title: Enhancement of Configured Grant for NR URLLC; Document for: Discussion, Decision	
30	R1-1910551; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.7; Source: Ericsson; Title: Other Enhancements to Uplink and Downlink Transmissions for NR URLLC; Document for: Discussion, Decision	
31	R1-1910624; 3GPP TSG RAN WG1 #98bis; Chongqing, China, Oct. 14th – 20th, 2019; Source: OPPO; Title: Configured grant enhancements for URLLC; Agenda Item: 7.2.6.6; Document for: Discussion and Decision	
32	R1-1910665; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Source: Intel Corporation; Title: Enhancements to UL configured grant transmission; Agenda item: 7.2.6.6; Document for: Discussion and Decision	
33	R1-1910831; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: LG Electronics; Title: Enhanced UL configured grant transmission for NR URLLC; Document for: Discussion and decision	

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34	R1-1910869; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda item: 7.2.6.6; Source: Nokia, Nokia Shanghai Bell; Title: On Enhanced UL Configured Grant Transmission for NR URLLC and activation/release of multiple SPS configurations; Document for: Discussion and Decision
35	R1-1910993; 3GPP TSG RAN WG1 #98bis; Chongqing, China, 14th – 20th October 2019; Source: Panasonic; Title: Discussion on DL SPS enhancement and resource conflicts involving CG PUSCH; Agenda Item: 7.2.6.7; Document for: Discussion
36	R1-1911180; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: NTT DOCOMO, INC.; Title: Remaining issues for enhanced configured grant transmission; Agenda Item: 7.2.6.6; Document for: Discussion and Decision
37	R1-1911181; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: NTT DOCOMO, INC.; Title: Summary on URLLC enhanced configured grant transmission; Document for: Discussion and decision
38	R1-1911319; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: WILUS Inc.; Title: Discussion on UL configured grant enhancements for NR URLLC; Agenda item: 7.2.6.6; Document for: Discussion/ Decision
39	R1-1911658; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: NTT DOCOMO, INC.; Title: Offline discussions on URLLC enhanced configured grant transmission; Document for: Discussion and decision
40	R1-1911690; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, Oct 14th – 20th, 2019; Agenda Item: 7.2.6.6; Source: NTT DOCOMO, INC.; Title: Offline discussions#2 on URLLC enhanced configured grant transmission; Document for: Discussion and decision

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	Filing Date	2020-10-30
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-001Ut

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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).

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

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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	/Alireza Babaei/	Date (YYYY-MM-DD)	2020-11-11
Name/Print	Alireza Babaei	Registration Number	75833

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EFS ID:	41098240
Application Number:	17084933
International Application Number:	
Confirmation Number:	9030
Title of Invention:	Scheduling Activation and Release
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
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Attorney Docket Number:	2019-001Ut
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Filing Date:	30-OCT-2020
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Application Type:	Utility under 35 USC 111(a)

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

New International Application Filed with the USPTO as a Receiving Office

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



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
17/084,933	10/30/2020	2837	830	2019-001Ut	20	2

CONFIRMATION NO. 9030

FILING RECEIPT



0000000121211559

148908
ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

Date Mailed: 11/09/2020

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

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Alireza Babaei, Fairfax, VA;

Applicant(s)

Alireza Babaei, Fairfax, VA;

Power of Attorney: The patent practitioners associated with Customer Number 148908

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/931,099 11/05/2019

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: 11/06/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/084,933**

Projected Publication Date: 05/06/2021

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

Scheduling Activation and Release

Preliminary Class

181

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).

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 17/084,933			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	80		N/A			
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	350		N/A			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	400		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *	x 50 =	0.00					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *	x 240 =	0.00					
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00					
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00					
			TOTAL	830		TOTAL			
* If the difference in column 1 is less than zero, enter "0" in column 2.									
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	x	=		x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	x	=		x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
				TOTAL ADD'L FEE			TOTAL ADD'L FEE		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	x	=		x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	x	=		x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
				TOTAL ADD'L FEE			TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE	REQUEST ID
17/084,933	10/30/2020	Alireza Babaei	2019-001Ut	124530

Acknowledgement of Change to Small Entity Status

The entity status change request below filed through Private PAIR on 10/30/2020 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

☒ Applicant asserting small entity status. See 37 CFR 1.27.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

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

Signature:	/Alireza Babaei/
Name:	Alireza Babaei
Registration Number:	75833

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/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	October 30, 2020
First Named Inventor	Alireza Babaei
Title	Scheduling Activation and Release
Art Unit	
Examiner Name	
Attorney Docket Number	2019-001Ut

SIGNATURE of Applicant or Patent Practitioner

Signature	/Alireza Babaei/	Date (Optional)	
Name	Alireza Babaei	Registration Number	75,833
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 1 forms are submitted.

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

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

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:

148908

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):



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

/Alireza Babaei/

Date (Optional)

Name

Alireza Babaei

Title

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 1 forms are submitted.

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

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

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		Scheduling Activation and Release		
First Named Inventor/Applicant Name:		Alireza Babaei		
Filer:		Alireza Babaei		
Attorney Docket Number:		2019-001Ut		
Filed as Small Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	80	80
UTILITY SEARCH FEE	2111	1	350	350
UTILITY EXAMINATION FEE	2311	1	400	400
REQUEST FOR PRIORITIZED EXAMINATION	2817	1	2100	2100
Pages:				
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				3000

Electronic Acknowledgement Receipt	
EFS ID:	40994222
Application Number:	17084933
International Application Number:	
Confirmation Number:	9030
Title of Invention:	Scheduling Activation and Release
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
Filer Authorized By:	
Attorney Docket Number:	2019-001Ut
Receipt Date:	30-OCT-2020
Filing Date:	
Time Stamp:	12:13:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 3000
RAM confirmation Number	E20200TC17075437
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	2019-001Ut_Track1Req.pdf	140295	no	2
			539ef8c0be2792bffe25f4e8b04bf8687bc25be9		
Warnings:					
Information:					
2	Application Data Sheet	2019-001Ut_ADS.pdf	1255718	no	8
			f7b354f697cb742cfd7e4c99a6f3c19fa564a904		
Warnings:					
Information:					
3	Specification	2019-001Ut_Specifications.pdf	415354	no	84
			110c3334d1a6e0d7fce1af5af38df63d9a3e1565		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	2019-001Ut_Drawings.pdf	219861	no	42
			bc21f4937aaf910431f4f1d7fe1a962928245fb8		
Warnings:					
Information:					
5	Claims	2019-001Ut_Claims.pdf	24678	no	4
			61083f30d9a6a824ff0dbfa0c156ad37b008ef03		
Warnings:					
Information:					
6	Abstract	2019-001Ut_Abstract.pdf	11715	no	1
			ac101be701b94b7afd9623d5358716902ae38bfa		
Warnings:					
Information:					

7	Oath or Declaration filed	2019-001Ut_Declaration.pdf	190707	no	2
			70c5f1b0b9bbae66b4c7c48b0621c441989 adc01		
Warnings:					
Information:					
8	Power of Attorney	2019-001Ut_PoA.pdf	242007	no	2
			c804771b134fe8b23ff410c6ea7a82c25a66 1012		
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	40154	no	2
			f53b51ad1d73b64c6826a1b3efceb83b311 b772		
Warnings:					
Information:					
Total Files Size (in bytes):			2540489		
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.					

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)			
First Named Inventor:	Alireza Babaei	Nonprovisional Application Number (if known):	
Title of Invention:	Scheduling Activation and Release		
APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.			
1. The processing fee set forth in 37 CFR 1.17(i), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, examination fee, and any required excess claims and application size fees are filed with the request or have been already been paid. 2. The application contains or is amended to contain no more than four independent claims and no more than thirty total claims, and no multiple dependent claims. 3. The applicable box is checked below: I. ☒ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1) i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web. ---OR--- (b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper. ii. An executed oath or declaration under 37 CFR 1.63 is filed with the application. II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2) i. A request for continued examination has been filed with, or prior to, this form. ii. If the application is a utility application, this certification and request is being filed via EFS-Web. iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371. iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination. v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).			
Signature <u>/Alireza Babaei/</u>		Date <u>10/30/2020</u>	
Name (Print/Typed) <u>Alireza Babaei</u>		Practitioner Registration Number <u>75,833</u>	
Note: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below*.			
☒ *Total of <u>1</u> forms are submitted.			

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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

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

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		
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		
	Alireza		Babaei			
Residence Information (Select One) • US Residency Non US Residency Active US Military Service						
City	Fairfax	State/Province	VA	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	4525 Gilbertson Road					
Address 2						
City	Fairfax	State/Province	VA			
Postal Code	22032	Country	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						
Add						

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	148908		
Email Address	ar.babaei@gmail.com	Add Email	Remove Email

Application Information:

Title of the Invention	Scheduling Activation and Release		
Attorney Docket Number	2019-001Ut	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	42	Suggested Figure for Publication (if any)	27

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	148908		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62931099	2019-11-05
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		

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)	Access Code ⁱ (if applicable)	Remove

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	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		

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.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		

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
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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. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Applicant:

Address 1			
Address 2			
City		State/Province	
Country		Postal Code	
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.

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

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

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

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

Signature	/Alireza Babaei/		Date (YYYY-MM-DD)	2020-10-30
First Name	Alireza	Last Name	Babaei	Registration Number
				75833
Additional Signature may be generated within this form by selecting the Add button.				Add

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	2019-001Ut
		Application Number	
Title of Invention	Scheduling Activation and Release		

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.

SCHEDULING ACTIVATION AND RELEASE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/931,099, filed November 5, 2019, which is hereby incorporated by reference in its entirety.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0002] FIG. 1A and FIG. 1B show examples of mobile communications systems in accordance with several of various embodiments of the present disclosure.
- [0003] FIG. 2A and FIG. 2B show examples of user plane and control plane protocol layers in accordance with several of various embodiments of the present disclosure.
- [0004] FIG. 3 shows example functions and services offered by protocol layers in a user plane protocol stack in accordance with several of various embodiments of the present disclosure.
- [0005] FIG. 4 shows example flow of packets through the protocol layers in accordance with several of various embodiments of the present disclosure.
- [0006] FIG. 5A shows example mapping of channels between layers of the protocol stack and different physical signals in downlink in accordance with several of various embodiments of the present disclosure.
- [0007] FIG. 5B shows example mapping of channels between layers of the protocol stack and different physical signals in uplink in accordance with several of various embodiments of the present disclosure.
- [0008] FIG. 6 shows example physical layer processes for signal transmission in accordance with several of various embodiments of the present disclosure.
- [0009] FIG. 7 shows examples of RRC states and RRC state transitions in accordance with several of various embodiments of the present disclosure.
- [0010] FIG. 8 shows an example time domain transmission structure in NR by grouping OFDM symbols into slots, subframes and frames in accordance with several of various embodiments of the present disclosure.
- [0011] FIG. 9 shows an example of time-frequency resource grid in accordance with several of various embodiments of the present disclosure.
- [0012] FIG. 10 shows example adaptation and switching of bandwidth parts in accordance with several of various embodiments of the present disclosure.

- [0013] FIG. 11A shows example arrangements of carriers in carrier aggregation in accordance with several of various embodiments of the present disclosure.
- [0014] FIG. 11B shows examples of uplink control channel groups in accordance with several of various embodiments of the present disclosure.
- [0015] FIG. 12A, FIG. 12B and FIG. 12C show example random access processes in accordance with several of various embodiments of the present disclosure.
- [0016] FIG. 13A shows example time and frequency structure of SSBs and their associations with beams in accordance with several of various embodiments of the present disclosure.
- [0017] FIG. 13B shows example time and frequency structure of CSI-RSs and their association with beams in accordance with several of various embodiments of the present disclosure.
- [0018] FIG. 14A, FIG. 14B and FIG. 14C show example beam management processes in accordance with several of various embodiments of the present disclosure.
- [0019] FIG. 15 shows example components of a wireless device and a base station that are in communication via an air interface in accordance with several of various embodiments of the present disclosure.
- [0020] FIG. 16 is an example flow diagram for PDCCH validation in accordance with several of various embodiments of the present disclosure.
- [0021] FIG. 17 shows an example process in accordance with several of various embodiments of the present disclosure.
- [0022] FIG. 18 shows example values of a HARQ process number field of a downlink control information in accordance with several of various embodiments of the present disclosure.
- [0023] FIG. 19 shows an example process in accordance with several of various embodiments of the present disclosure.
- [0024] FIG. 20 shows an example process in accordance with several of various embodiments of the present disclosure.
- [0025] FIG. 21 shows example values of a HARQ process number field of a downlink control information in accordance with several of various embodiments of the present disclosure.
- [0026] FIG. 22 shows an example process in accordance with several of various embodiments of the present disclosure.
- [0027] FIG. 23A, FIG. 23B and FIG. 23C show example MAC subheaders in accordance with several of various embodiments of the present disclosure.

- [0028] FIG. 24 shows an example MAC protocol data unit (MAC PDU) in accordance with several of various embodiments of the present disclosure.
- [0029] FIG. 25 shows an example confirmation MAC control element (MAC CE) in accordance with several of various embodiments of the present disclosure.
- [0030] FIG. 26 shows an example confirmation MAC control element (MAC CE) in accordance with several of various embodiments of the present disclosure.
- [0031] FIG. 27 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0032] FIG. 28 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0033] FIG. 29 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0034] FIG. 30 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0035] FIG. 31 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0036] FIG. 32 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0037] FIG. 33 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0038] FIG. 34 shows an example scheduling activation or release process in accordance with several of various embodiments of the present disclosure.
- [0039] FIG. 35 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.
- [0040] FIG. 36 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.
- [0041] FIG. 37 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.
- [0042] FIG. 38 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

[0043] FIG. 39 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

[0044] FIG. 40 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

[0045] FIG. 41 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

[0046] FIG. 42 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

DETAILED DESCRIPTION

[0047] The exemplary embodiments of the disclosed technology enable semi-persistent scheduling and/or configured grants operation in a wireless device and/or one or more base stations. The exemplary disclosed embodiments may be implemented in the technical field of wireless communication systems. More particularly, the embodiment of the disclosed technology may relate to scheduling activation or scheduling release of semi-persistent or configured grants.

[0048] The devices and/or nodes of the mobile communications system disclosed herein may be implemented based on various technologies and/or various releases/versions/amendments of a technology. The various technologies include various releases of long-term evolution (LTE) technologies, various releases of 5G new radio (NR) technologies, various wireless local area networks technologies and/or a combination thereof and/or alike. For example, a base station may support a given technology and may communicate with wireless devices with different characteristics. The wireless devices may have different categories that define their capabilities in terms of supporting various features. The wireless device with the same category may have different capabilities. The wireless devices may support various technologies such as various releases of LTE technologies, various releases of 5G NR technologies and/or a combination thereof and/or alike. At least some of the wireless devices in the mobile communications system of the present disclosure may be stationary or almost stationary. In this disclosure, the terms “mobile communications system” and “wireless communications system” may be used interchangeably.

[0049] FIG. 1A shows an example of a mobile communications system 100 in accordance with several of various embodiments of the present disclosure. The mobile communications system 100

may be, for example, run by a mobile network operator (MNO) or a mobile virtual network operator (MVNO). The mobile communications system 100 may be a public land mobile network (PLMN) run by a network operator providing a variety of service including voice, data, short messaging service (SMS), multimedia messaging service (MMS), emergency calls, etc. The mobile communications system 100 includes a core network (CN) 106, a radio access network (RAN) 104 and at least one wireless device 102.

[0050] The CN 106 connects the RAN 104 to one or more external networks (e.g., one or more data networks such as the Internet) and is responsible for functions such as authentication, charging and end-to-end connection establishment. Several radio access technologies (RATs) may be served by the same CN 106.

[0051] The RAN 104 may implement a RAT and may operate between the at least one wireless device 102 and the CN 106. The RAN 104 may handle radio related functionalities such as scheduling, radio resource control, modulation and coding, multi-antenna transmissions and retransmission protocols. The wireless device and the RAN may share a portion of the radio spectrum by separating transmissions from the wireless device to the RAN and the transmissions from the RAN to the wireless device. The direction of the transmissions from the wireless device to the RAN is known as the uplink and the direction of the transmissions from the RAN to the wireless device is known as the downlink. The separation of uplink and downlink transmissions may be achieved by employing a duplexing technique. Example duplexing techniques include frequency division duplexing (FDD), time division duplexing (TDD) or a combination of FDD and TDD.

[0052] In this disclosure, the term wireless device may refer to a device that communicates with a network entity or another device using wireless communication techniques. The wireless device may be a mobile device or a non-mobile (e.g., fixed) device. Examples of the wireless device include cellular phone, smart phone, tablet, laptop computer, wearable device (e.g., smart watch, smart shoe, fitness trackers, smart clothing, etc.), wireless sensor, wireless meter, extended reality (XR) devices including augmented reality (AR) and virtual reality (VR) devices, Internet of Things (IoT) device, vehicle to vehicle communications device, road-side units (RSU), automobile, relay node or any combination thereof. In some examples, the wireless device (e.g., a smart phone, tablet, etc.) may have an interface (e.g., a graphical user interface (GUI)) for configuration by an end user. In some examples, the wireless device (e.g., a wireless sensor device, etc.) may not have an

interface for configuration by an end user. The wireless device may be referred to as a user equipment (UE), a mobile station (MS), a subscriber unit, a handset, an access terminal, a user terminal, a wireless transmit and receive unit (WTRU) and/or other terminology.

[0053] The at least one wireless device may communicate with at least one base station in the RAN 104. In this disclosure, the term base station may encompass terminologies associated with various RATs. For example, a base station may be referred to as a Node B in a 3G cellular system such as Universal Mobile Telecommunication Systems (UMTS), an evolved Node B (eNB) in a 4G cellular system such as evolved universal terrestrial radio access (E-UTRA), a next generation eNB (ng-eNB), a Next Generation Node B (gNB) in NR and/or a 5G system, an access point (AP) in Wi-Fi and/or other wireless local area networks. A base station may be referred to as a remote radio head (RRH), a baseband unit (BBU) in connection with one or more RRHs, a repeater or relay for coverage extension and/or any combination thereof. In some examples, all protocol layers of a base station may be implemented in one unit. In some example, some of the protocol layers (e.g., upper layers) of the base station may be implemented in a first unit (e.g., a central unit (CU)) and some other protocol layer (e.g., lower layers) may be implemented in one or more second units (e.g., distributed units (DUs)).

[0054] A base station in the RAN 104 includes one or more antennas to communicate with the at least one wireless device. The base station may communicate with the at least one wireless device using radio frequency (RF) transmissions and receptions via RF transceivers. The base station antennas may control one or more cells (or sectors). The size and/or radio coverage area of a cell may depend on the range that transmissions by a wireless device can be successfully received by the base station when the wireless device transmits using the RF frequency of the cell. The base station may be associated with cells of various sizes. At a given location, the wireless device may be in coverage area of a first cell of the base station and may not be in coverage area of a second cell of the base station depending on the sizes of the first cell and the second cell.

[0055] A base station in the RAN 104 may have various implementations. For example, a base station may be implemented by connecting a BBU (or a BBU pool) coupled to one or more RRHs and/or one or more relay nodes to extend the cell coverage. The BBU pool may be located at a centralized site like a cloud or data center. The BBU pool may be connected to a plurality of RRHs that control a plurality of cells. The combination of BBU with the one or more RRHs may be referred to as a centralized or cloud RAN (C-RAN) architecture. In some implementations, the

BBU functions may be implemented on virtual machines (VMs) on servers at a centralized location. This architecture may be referred to as virtual RAN (vRAN). All, most or a portion of the protocol layer functions (e.g., all or portions of physical layer, medium access control (MAC) layer and/or higher layers) may be implemented at the BBU pool and the processed data may be transmitted to the RRHs for further processing and/or RF transmission. The links between the BBU pool and the RRHs may be referred to as fronthaul.

[0056] In some deployment scenarios, the RAN 104 may include macrocell base stations with high transmission power levels and large coverage areas. In other deployment scenarios, the RAN 104 may include base stations that employ different transmission power levels and/or have cells with different coverage areas. For example, some base station may be macrocell base stations with high transmission powers and /or large coverage areas and other base station may be small cell base stations with comparatively smaller transmission powers and/or coverage areas. In some deployment scenarios, a small cell base station may have coverage that is within or has overlap with coverage area of a macrocell base station. A wireless device may communicate with the macrocell base station while within the coverage area of the macrocell base station. For additional capacity, the wireless device may communicate with both the macrocell base station and the small cell base station while in the overlapped coverage area of the macrocell base station and the small cell base station. Depending on their coverage areas, a small cell base station may be referred to as a microcell base station, a picocell base station, a femtocell base station or a home base station.

[0057] Different standard development organizations (SDOs) have specified, or may specify in future, mobile communications systems that have similar characteristics as the mobile communications system 100 of FIG. 1A. For example, the Third-Generation Partnership Project (3GPP) is a group of SDOs that provides specifications that define 3GPP technologies for mobile communications systems that are akin to the mobile communications system 100. The 3GPP has developed specifications for third generation (3G) mobile networks, fourth generation (4G) mobile networks and fifth generation (5G) mobile networks. The 3G, 4G and 5G networks are also known as Universal Mobile Telecommunications System (UMTS), Long Term Evolution (LTE) and 5G system (5GS), respectively. In this disclosure, embodiments are described with respect to the RAN implemented in a 3GPP 5G mobile network that is also referred to as next generation RAN (NG-RAN). The embodiments may also be implemented in other mobile communications systems such as 3G or 4G mobile networks or mobile networks that may be standardized in future such as sixth

generation (6G) mobile networks or mobile networks that are implemented by standards bodies other than 3GPP. The NG-RAN may be based on a new RAT known as new radio (NR) and/or other radio access technologies such as LTE and/or non-3GPP RATs.

[0058] FIG. 1B shows an example of a mobile communications system 110 in accordance with several of various embodiments of the present disclosure. The mobile communications system 110 of FIG. 1B is an example of a 5G mobile network and includes a 5G CN (5G-CN) 130, an NG-RAN 120 and UEs (collectively 112 and individually UE 112A and UE 112B). The 5G-CN 130, the NG-RAN 120 and the UEs 112 of FIG. 1B operate substantially alike the CN 106, the RAN 104 and the at least one wireless device 102, respectively, as described for FIG. 1A.

[0059] The 5G-CN 130 of FIG. 1B connects the NG-RAN 120 to one or more external networks (e.g., one or more data networks such as the Internet) and is responsible for functions such as authentication, charging and end-to-end connection establishment. The 5G-CN has new enhancements compared to previous generations of CNs (e.g., evolved packet core (EPC) in the 4G networks) including service-based architecture, support for network slicing and control plane/user plane split. The service-based architecture of the 5G-CN provides a modular framework based on service and functionalities provided by the core network wherein a set of network functions are connected via service-based interfaces. The network slicing enables multiplexing of independent logical networks (e.g., network slices) on the same physical network infrastructure. For example, a network slice may be for mobile broadband applications with full mobility support and a different network slice may be for non-mobile latency-critical applications such as industry automation. The control plane/user plane split enables independent scaling of the control plane and the user plane. For example, the control plane capacity may be increased without affecting the user plane of the network.

[0060] The 5G-CN 130 of FIG. 1B includes an access and mobility management function (AMF) 132 and a user plane function (UPF) 134. The AMF 132 may support termination of non-access stratum (NAS) signaling, NAS signaling security such as ciphering and integrity protection, inter-3GPP access network mobility, registration management, connection management, mobility management, access authentication and authorization and security context management. The NAS is a functional layer between a UE and the CN and the access stratum (AS) is a functional layer between the UE and the RAN. The UPF 134 may serve as an interconnect point between the NG-RAN and an external data network. The UPF may support packet routing and forwarding, packet

inspection and Quality of Service (QoS) handling and packet filtering. The UPF may further act as a Protocol Data Unit (PDU) session anchor point for mobility within and between RATs.

[0061] The 5G-CN 130 may include additional network functions (not shown in FIG. 1B) such as one or more Session Management Functions (SMFs), a Policy Control Function (PCF), a Network Exposure Function (NEF), a Unified Data Management (UDM), an Application Function (AF), and/or an Authentication Server Function (AUSF). These network functions along with the AMF 132 and UPF 134 enable a service-based architecture for the 5G-CN.

[0062] The NG-RAN 120 may operate between the UEs 112 and the 5G-CN 130 and may implement one or more RATs. The NG-RAN 120 may include one or more gNBs (e.g., gNB 122A or gNB 122B or collectively gNBs 122) and/or one or more ng-eNBs (e.g., ng-eNB 124A or ng-eNB 124B or collectively ng-eNBs 124). The general terminology for gNBs 122 and/or an ng-eNBs 124 is a base station and may be used interchangeably in this disclosure. The gNBs 122 and the ng-eNBs 124 may include one or more antennas to communicate with the UEs 112. The one or more antennas of the gNBs 122 or ng-eNBs 124 may control one or more cells (or sectors) that provide radio coverage for the UEs 112.

[0063] A gNB and/or an ng-eNB of FIG. 1B may be connected to the 5G-CN 130 using an NG interface. A gNB and/or an ng-eNB may be connected with other gNBs and/or ng-eNBs using an Xn interface. The NG or the Xn interfaces are logical connections that may be established using an underlying transport network. The interface between a UE and a gNB or between a UE and an ng-eNBs may be referred to as the Uu interface. An interface (e.g., Uu, NG or Xn) may be established by using a protocol stack that enables data and control signaling exchange between entities in the mobile communications system of FIG. 1B. When a protocol stack is used for transmission of user data, the protocol stack may be referred to as user plane protocol stack. When a protocol stack is used for transmission of control signaling, the protocol stack may be referred to as control plane protocol stack. Some protocol layer may be used in both of the user plane protocol stack and the control plane protocol stack while other protocol layers may be specific to the user plane or control plane.

[0064] The NG interface of FIG. 1B may include an NG-User plane (NG-U) interface between a gNB and the UPF 134 (or an ng-eNB and the UPF 134) and an NG-Control plane (NG-C) interface between a gNB and the AMF 132 (or an ng-eNB and the AMF 132). The NG-U interface may provide non-guaranteed delivery of user plane PDUs between a gNB and the UPF or an ng-eNB

and the UPF. The NG-C interface may provide services such as NG interface management, UE context management, UE mobility management, transport of NAS messages, paging, PDU session management, configuration transfer and/or warning message transmission.

[0065] The UEs 112 and a gNB may be connected using the Uu interface and using the NR user plane and control plane protocol stack. The UEs 112 and an ng-eNB may be connected using the Uu interface using the LTE user plane and control plane protocol stack.

[0066] In the example mobile communications system of FIG. 1B, a 5G-CN is connected to a RAN comprised of 4G LTE and/or 5G NR RATs. In other example mobile communications systems, a RAN based on the 5G NR RAT may be connected to a 4G CN (e.g., EPC). For example, earlier releases of 5G standards may support a non-standalone mode of operation where a NR based RAN is connected to the 4G EPC. In an example non-standalone mode, a UE may be connected to both a 5G NR gNB and a 4G LTE eNB (e.g., a ng-eNB) and the control plane functionalities (such as initial access, paging and mobility) may be provided through the 4G LTE eNB. In a standalone of operation, the 5G NR gNB is connected to a 5G-CN and the user plane and the control plane functionalities are provided by the 5G NR gNB.

[0067] FIG. 2A shows an example of the protocol stack for the user plan of an NR Uu interface in accordance with several of various embodiments of the present disclosure. The user plane protocol stack comprises five protocol layers that terminate at the UE 200 and the gNB 210. The five protocol layers, as shown in FIG. 2A, include physical (PHY) layer referred to as PHY 201 at the UE 200 and PHY 211 at the gNB 210, medium access control (MAC) layer referred to as MAC 202 at the UE 200 and MAC 212 at the gNB 210, radio link control (RLC) layer referred to as RLC 203 at the UE 200 and RLC 213 at the gNB 210, packet data convergence protocol (PDCP) layer referred to as PDCP 204 at the UE 200 and PDCP 214 at the gNB 210, and service data application protocol (SDAP) layer referred to as SDAP 205 at the UE 200 and SDAP 215 at the gNB 210. The PHY layer, also known as layer 1 (L1), offers transport services to higher layers. The other four layers of the protocol stack (MAC, RLC, PDCP and SDAP) are collectively known as layer 2 (L2).

[0068] FIG. 2B shows an example of the protocol stack for the control plan of an NR Uu interface in accordance with several of various embodiments of the present disclosure. Some of the protocol layers (PHY, MAC, RLC and PDCP) are common between the user plane protocol stack shown in FIG. 2A and the control plan protocol stack. The control plane protocol stack also includes the RRC layer, referred to RRC 206 at the UE 200 and RRC 216 at the gNB 210, that also terminates at

the UE 200 and the gNB 210. In addition, the control plane protocol stack includes the NAS layer that terminates at the UE 200 and the AMF 220. In FIG. 2B, the NAS layer is referred to as NAS 207 at the UE 200 and NAS 227 at the AMF 220.

[0069] FIG. 3 shows example functions and services offered to other layers by a layer in the NR user plane protocol stack of FIG. 2A in accordance with several of various embodiments of the present disclosure. For example, the SDAP layer of FIG. 3 (shown in FIG. 2A as SDAP 205 at the UE side and SDAP 215 at the gNB side) may perform mapping and de-mapping of QoS flows to data radio bearers. The mapping and de-mapping may be based on QoS (e.g., delay, throughput, jitter, error rate, etc.) associated with a QoS flow. A QoS flow may be a QoS differentiation granularity for a PDU session which is a logical connection between a UE 200 and a data network. A PDU session may contain one or more QoS flows. The functions and services of the SDAP layer include mapping and de-mapping between one or more QoS flows and one or more data radio bearers. The SDAP layer may also mark the uplink and/or downlink packets with a QoS flow ID (QFI).

[0070] The PDCP layer of FIG. 3 (shown in FIG. 2A as PDCP 204 at the UE side and PDCP 214 at the gNB side) may perform header compression and decompression (e.g., using Robust Header Compression (ROHC) protocol) to reduce the protocol header overhead, ciphering and deciphering and integrity protection and verification to enhance the security over the air interface, reordering and in-order delivery of packets and discarding of duplicate packets. A UE may be configured with one PDCP entity per bearer.

[0071] In an example scenario not shown in FIG. 3, a UE may be configured with dual connectivity and may connect to two different cell groups provided by two different base stations. For example, a base station of the two base stations may be referred to as a master base station and a cell group provided by the master base station may be referred to as a master cell group (MCG). The other base station of the two base stations may be referred to as a secondary base station and the cell group provided by the secondary base station may be referred to as a secondary cell group (SCG). A bearer may be configured for the UE as a split bearer that may be handled by the two different cell groups. The PDCP layer may perform routing of packets corresponding to a split bearer to and/or from RLC channels associated with the cell groups.

[0072] In an example scenario not shown in FIG. 3, a bearer of the UE may be configured (e.g., with control signaling) with PDCP packet duplication. A bearer configured with PDCP duplication

may be mapped to a plurality of RLC channels each corresponding to different one or more cells. The PDCP layer may duplicate packets of the bearer configured with PDCP duplication and the duplicated packets may be mapped to the different RLC channels. With PDCP packet duplication, the likelihood of correct reception of packets increases thereby enabling higher reliability.

[0073] The RLC layer of FIG. 3 (shown in FIG. 2A as RLC 203 at the UE side and RLC 213 at the gNB side) provides service to upper layers in the form of RLC channels. The RLC layer may include three transmission modes: transparent mode (TM), Unacknowledged mode (UM) and Acknowledged mode (AM). The RLC layer may perform error correction through automatic repeat request (ARQ) for the AM transmission mode, segmentation of RLC service data units (SDUs) for the AM and UM transmission modes and re-segmentation of RLC SDUs for AM transmission mode, duplicate detection for the AM transmission mode, RLC SDU discard for the AM and UM transmission modes, etc. The UE may be configured with one RLC entity per RLC channel.

[0074] The MAC layer of FIG. 3 (shown in FIG. 2A as MAC 202 at the UE side and MAC 212 at the gNB side) provides services to the RLC layer in form of logical channels. The MAC layer may perform mapping between logical channels and transport channels, multiplexing/demultiplexing of MAC SDUs belonging to one or more logical channels into/from transport blocks (TBs) delivered to/from the physical layer on transport channels, reporting of scheduling information, error correction through hybrid automatic repeat request (HARQ), priority handling between UEs by means of dynamic scheduling, priority handling between logical channels of one UE by means of logical channel prioritization and/or padding. In case of carrier aggregation, a MAC entity may comprise one HARQ entity per cell. A MAC entity may support multiple numerologies, transmission timings and cells. The control signaling may configure logical channels with mapping restrictions. The mapping restrictions in logical channel prioritization may control the numerology(ies), cell(s), and/or transmission timing(s)/duration(s) that a logical channel may use.

[0075] The PHY layer of FIG. 3 (shown in FIG. 2A as PHY 201 at the UE side and PHY 211 at the gNB side) provides transport services to the MAC layer in form of transport channels. The physical layer may handle coding/decoding, HARQ soft combining, rate matching of a coded transport channel to physical channels, mapping of coded transport channels to physical channels, modulation and demodulation of physical channels, frequency and time synchronization, radio characteristics measurements and indication to higher layers, RF processing, and mapping to antennas and radio resources.

[0076] FIG. 4 shows example processing of packets at different protocol layers in accordance with several of various embodiments of the present disclosure. In this example, three Internet Protocol (IP) packets that are processed by the different layers of the NR protocol stack. The term SDU shown in FIG. 4 is the data unit that is entered from/to a higher layer. In contrast, a protocol data unit (PDU) is the data unit that is entered to/from a lower layer. The flow of packets in FIG. 4 is for downlink. An uplink data flow through layers of the NR protocol stack is similar to FIG. 4. In this example, the two leftmost IP packets are mapped by the SDAP layer (shown as SDAP 205 and SDAP 215 in FIG. 2A) to radio bearer 402 and the rightmost packet is mapped by the SDAP layer to the radio bearer 404. The SDAP layer adds SDAP headers to the IP packets which are entered into the PDCP layer as PDCP SDUs. The PDCP layer is shown as PDCP 204 and PDCP 214 in FIG. 2A. The PDCP layer adds the PDCP headers to the PDCP SDUs which are entered into the RLC layer as RLC SDUs. The RLC layer is shown as RLC 203 and RLC 213 in FIG. 2A. An RLC SDU may be segmented at the RLC layer. The RLC layer adds RLC headers to the RLC SDUs after segmentation (if segmented) which are entered into the MAC layer as MAC SDUs. The MAC layer adds the MAC headers to the MAC SDUs and multiplexes one or more MAC SDUs to form a PHY SDU (also referred to as a transport block (TB) or a MAC PDU).

[0077] In FIG. 4, the MAC SDUs are multiplexed to form a transport block. The MAC layer may multiplex one or more MAC control elements (MAC CEs) with zero or more MAC SDUs to form a transport block. The MAC CEs may also be referred to as MAC commands or MAC layer control signaling and may be used for in-band control signaling. The MAC CEs may be transmitted by a base station to a UE (e.g., downlink MAC CEs) or by a UE to a base station (e.g., uplink MAC CEs). The MAC CEs may be used for transmission of information useful by a gNB for scheduling (e.g., buffer status report (BSR) or power headroom report (PHR)), activation/deactivation of one or more cells, activation/deactivation of configured radio resources for one or more processes, activation/deactivation of one or more processes, indication of parameters used in one or more processes, etc.

[0078] FIG. 5A and FIG. 5B show example mapping between logical channels, transport channels and physical channels for downlink and uplink, respectively in accordance with several of various embodiments of the present disclosure. As discussed before, the MAC layer provides services to higher layer in the form of logical channels. A logical channel may be classified as a control channel, if used for transmission of control and/or configuration information, or a traffic channel if

used for transmission of user data. Example logical channels in NR include Broadcast Control Channel (BCCH) used for transmission of broadcast system control information, Paging Control Channel (PCCH) used for carrying paging messages for wireless devices with unknown locations, Common Control Channel (CCCH) used for transmission of control information between UEs and network and for UEs that have no RRC connection with the network, Dedicated Control Channel (DCCH) which is a point-to-point bi-directional channel for transmission of dedicated control information between a UE that has an RRC connection and the network and Dedicated Traffic Channel (DTCH) which is point-to-point channel, dedicated to one UE, for the transfer of user information and may exist in both uplink and downlink.

[0079] As discussed before, the PHY layer provides services to the MAC layer and higher layers in the form of transport channels. Example transport channels in NR include Broadcast Channel (BCH) used for transmission of part of the BCCH referred to as master information block (MIB), Downlink Shared Channel (DL-SCH) used for transmission of data (e.g., from DTCH in downlink) and various control information (e.g., from DCCH and CCCH in downlink and part of the BCCH that is not mapped to the BCH), Uplink Shared Channel (UL-SCH) used for transmission of uplink data (e.g., from DTCH in uplink) and control information (e.g., from CCCH and DCCH in uplink) and Paging Channel (PCH) used for transmission of paging information from the PCCH. In addition, Random Access Channel (RACH) is a transport channel used for transmission of random access preambles. The RACH does not carry a transport block. Data on a transport channel (except RACH) may be organized in transport blocks, wherein One or more transport blocks may be transmitted in a transmission time interval (TTI).

[0080] The PHY layer may map the transport channels to physical channels. A physical channel may correspond to time-frequency resources that are used for transmission of information from one or more transport channels. In addition to mapping transport channels to physical channels, the physical layer may generate control information (e.g., downlink control information (DCI) or uplink control information (UCI)) that may be carried by the physical channels. Example DCI include scheduling information (e.g., downlink assignments and uplink grants), request for channel state information report, power control command, etc. Example UCI include HARQ feedback indicating correct or incorrect reception of downlink transport blocks, channel state information report, scheduling request, etc. Example physical channels in NR include a Physical Broadcast Channel (PBCH) for carrying information from the BCH, a Physical Downlink Shared Channel

(PDSCH) for carrying information from the PCH and the DL-SCH, a Physical Downlink Control Channel (PDCCH) for carrying DCI, a Physical Uplink Shared Channel (PUSCH) for carrying information from the UL-SCH and/or UCI, a Physical Uplink Control Channel (PUCCH) for carrying UCI and Physical Random Access Channel (PRACH) for transmission of RACH (e.g., random access preamble).

[0081] The PHY layer may also generate physical signals that are not originated from higher layers. As shown in FIG. 5A, example downlink physical signals include Demodulation Reference Signal (DM-RS), Phase Tracking Reference Signal (PT-RS), Channel State Information Reference Signal (CSI-RS), Primary Synchronization Signal (PSS) and Secondary Synchronization Signal (SSS). As shown in FIG. 5B, example uplink physical signals include DM-RS, PT-RS and sounding reference signal (SRS).

[0082] As indicated earlier, some of the protocol layers (PHY, MAC, RLC and PDCP) of the control plane of an NR Uu interface, are common between the user plane protocol stack (as shown in FIG. 2A) and the control plane protocol stack (as shown in FIG. 2B). In addition to PHY, MAC, RLC and PDCP, the control plane protocol stack includes the RRC protocol layer and the NAS protocol layer.

[0083] The NAS layer, as shown in FIG. 2B, terminates at the UE 200 and the AMF 220 entity of the 5G-C 130. The NAS layer is used for core network related functions and signaling including registration, authentication, location update and session management. The NAS layer uses services from the AS of the Uu interface to transmit the NAS messages.

[0084] The RRC layer, as shown in FIG. 2B, operates between the UE 200 and the gNB 210 (more generally NG-RAN 120) and may provide services and functions such as broadcast of system information (SI) related to AS and NAS as well as paging initiated by the 5G-C 130 or NG-RAN 120. In addition, the RRC layer is responsible for establishment, maintenance and release of an RRC connection between the UE 200 and the NG-RAN 120, carrier aggregation configuration (e.g., addition, modification and release), dual connectivity configuration (e.g., addition, modification and release), security related functions, radio bearer configuration/maintenance and release, mobility management (e.g., maintenance and context transfer), UE cell selection and reselection, inter-RAT mobility, QoS management functions, UE measurement reporting and control, radio link failure (RLF) detection and NAS message transfer. The RRC layer uses services from PHY, MAC, RLC and PDCP layers to transmit RRC messages using signaling radio bearers

(SRBs). The SRBs are mapped to CCCH logical channel during connection establishment and to DCCH logical channel after connection establishment.

[0085] FIG. 6 shows example physical layer processes for signal transmission in accordance with several of various embodiments of the present disclosure. Data and/or control streams from MAC layer may be encoded/decoded to offer transport and control services over the radio transmission link. For example, one or more (e.g., two as shown in FIG. 6) transport blocks may be received from the MAC layer for transmission via a physical channel (e.g., a physical downlink shared channel or a physical uplink shared channel). A cyclic redundancy check (CRC) may be calculated and attached to a transport block in the physical layer. The CRC calculation may be based on one or more cyclic generator polynomials. The CRC may be used by the receiver for error detection. Following the transport block CRC attachment, a low-density parity check (LDPC) base graph selection may be performed. In example embodiments, two LDPC base graphs may be used wherein a first LDPC base graph may be optimized for small transport blocks and a second LDPC base graph may be optimized for comparatively larger transport blocks.

[0086] The transport block may be segmented into code blocks and code block CRC may be calculated and attached to a code block. A code block may be LDPC coded and the LDPC coded blocks may be individually rate matched. The code blocks may be concatenated to create one or more codewords. The contents of a codeword may be scrambled and modulated to generate a block of complex-valued modulation symbols. The modulation symbols may be mapped to a plurality of transmission layers (e.g., multiple-input multiple-output (MIMO) layers) and the transmission layers may be subject to transform precoding and/or precoding. The precoded complex-valued symbols may be mapped to radio resources (e.g., resource elements). The signal generator block may create a baseband signal and up-convert the baseband signal to a carrier frequency for transmission via antenna ports. The signal generator block may employ mixers, filters and/or other radio frequency (RF) components prior to transmission via the antennas. The functions and blocks in FIG. 6 are illustrated as examples and other mechanisms may be implemented in various embodiments.

[0087] FIG. 7 shows examples of RRC states and RRC state transitions at a UE in accordance with several of various embodiments of the present disclosure. A UE may be in one of three RRC states: RRC_IDLE 702, RRC_INACTIVE 704 and RRC_CONNECTED 706. In RRC_IDLE 702 state, no RRC context (e.g., parameters needed for communications between the UE and the network) may

be established for the UE in the RAN. In RRC_IDLE 702 state, no data transfer between the UE and the network may take place and uplink synchronization is not maintained. The wireless device may sleep most of the time and may wake up periodically to receive paging messages. The uplink transmission of the UE may be based on a random access process and to enable transition to the RRC_CONNECTED 706 state. The mobility in RRC_IDLE 702 state is through a cell reselection procedure where the UE camps on a cell based on one or more criteria including signal strength that is determined based on the UE measurements.

[0088] In RRC_CONNECTED 706 state, the RRC context is established and both the UE and the RAN have necessary parameters to enable communications between the UE and the network. In the RRC_CONNECTED 706 state, the UE is configured with an identity known as a Cell Radio Network Temporary Identifier (C-RNTI) that is used for signaling purposes (e.g., uplink and downlink scheduling, etc.) between the UE and the RAN. The wireless device mobility in the RRC_CONNECTED 706 state is managed by the RAN. The wireless device provides neighboring cells and/or current serving cell measurements to the network and the network may make hand over decisions. Based on the wireless device measurements, the current serving base station may send a handover request message to a neighboring base station and may send a handover command to the wireless device to handover to a cell of the neighboring base station. The transition of the wireless device from the RRC_IDLE 702 state to the RRC_CONNECTED 706 state or from the RRC_CONNECTED 706 state to the RRC_IDLE 702 state may be based on connection establishment and connection release procedures (shown collectively as connection establishment/release 710 in FIG. 7).

[0089] To enable a faster transition to the RRC_CONNECTED 706 state (e.g., compared to transition from RRC_IDLE 702 state to RRC_CONNECTED 706 state), an RRC_INACTIVE 704 state is used for an NR UE wherein, the RRC context is kept at the UE and the RAN. The transition from the RRC_INACTIVE 704 state to the RRC_CONNECTED 706 state is handled by RAN without CN signaling. Similar to the RRC_IDLE 702 state, the mobility in RRC_INACTIVE 704 state is based on a cell reselection procedure without involvement from the network. The transition of the wireless device from the RRC_INACTIVE 704 state to the RRC_CONNECTED 706 state or from the RRC_CONNECTED 706 state to the RRC_INACTIVE 704 state may be based on connection resume and connection inactivation procedures (shown collectively as connection resume/inactivation 712 in FIG. 7). The transition of the wireless device from the

RRC_INACTIVE 704 state to the RRC_IDLE 702 state may be based on a connection release 714 procedure as shown in FIG. 7.

[0090] In NR, Orthogonal Frequency Division Multiplexing (OFDM), also called cyclic prefix OFDM (CP-OFDM), is the baseline transmission scheme in both downlink and uplink of NR and the Discrete Fourier Transform (DFT) spread OFDM (DFT-s-OFDM) is a complementary uplink transmission in addition to the baseline OFDM scheme. OFDM is multi-carrier transmission scheme wherein the transmission bandwidth may be composed of several narrowband sub-carriers. The subcarriers are modulated by the complex valued OFDM modulation symbols resulting in an OFDM signal. The complex valued OFDM modulation symbols are obtained by mapping, by a modulation mapper, the input data (e.g., binary digits) to different points of a modulation constellation diagram. The modulation constellation diagram depends on the modulation scheme. NR may use different types of modulation schemes including Binary Phase Shift Keying (BPSK), $\pi/2$ -BPSK, Quadrature Phase Shift Keying (QPSK), 16 Quadrature Amplitude Modulation (16QAM), 64QAM and 256QAM. Different and/or higher order modulation schemes (e.g., M-QAM in general) may be used. An OFDM signal with N subcarriers may be generated by processing N subcarriers in parallel for example by using Inverse Fast Fourier Transform (IFFT) processing. The OFDM receiver may use FFT processing to recover the transmitted OFDM modulation symbols. The subcarrier spacing of subcarriers in an OFDM signal is inversely proportional to an OFDM modulation symbol duration. For example, for a 15 KHz subcarrier spacing, duration of an OFDM signal is nearly 66.7 μ s. To enhance the robustness of OFDM transmission in time dispersive channels, a cyclic prefix (CP) may be inserted at the beginning of an OFDM symbol. For example, the last part of an OFDM symbol may be copied and inserted at the beginning of an OFDM symbol. The CP insertion enhanced the OFDM transmission scheme by preserving subcarrier orthogonality in time dispersive channels.

[0091] In NR, different numerologies may be used for OFDM transmission. A numerology of OFDM transmission may indicate a subcarrier spacing and a CP duration for the OFDM transmission. For example, a subcarrier spacing in NR may generally be a multiple of 15 KHz and expressed as $\Delta f = 2^\mu \cdot 15 \text{ KHz}$ ($\mu=0, 1, 2, \dots$). Example subcarrier spacings used in NR include 15KHz ($\mu=0$), 30KHz ($\mu=1$), 60 KHz ($\mu=2$), 120 KHz ($\mu=3$) and 240 KHz ($\mu=4$). As discussed before, a duration of OFDM symbol is inversely proportional to the subcarrier spacing and therefor OFDM symbol duration may depend on the numerology (e.g. the μ value).

[0092] FIG. 8 shows an example time domain transmission structure in NR wherein OFDM symbols are grouped into slots, subframes and frames in accordance with several of various embodiments of the present disclosure. A slot is a group of N_{symb}^{slot} OFDM symbols, wherein the N_{symb}^{slot} may have a constant value (e.g., 14). Since different numerologies results in different OFDM symbol durations, duration of a slot may also depend on the numerology and may be variable. A subframe may have a duration of 1 ms and may be composed of one or more slots, the number of which may depend on the slot duration. The number of slots per subframe is therefore a function of μ and may generally expressed as $N_{slot}^{subframe,\mu}$ and the number of symbols per subframe may be expressed as $N_{symb}^{subframe,\mu} = N_{symb}^{slot} N_{slot}^{subframe,\mu}$. A frame may have a duration of 10 ms and may consist of 10 subframes. The number of slots per frame may depend on the numerology and therefore may be variable. The number of slots per frame may generally be expressed as $N_{slot}^{frame,\mu}$.

[0093] An antenna port may be defined as a logical entity such that channel characteristics over which a symbol on the antenna port is conveyed may be inferred from the channel characteristics over which another symbol on the same antenna port is conveyed. For example, for DM-RS associated with a PDSCH, the channel over which a PDSCH symbol on an antenna port is conveyed may be inferred from the channel over which a DM-RS symbol on the same antenna port is conveyed, for example, if the two symbols are within the same resource as the scheduled PDSCH and/or in the same slot and/or in the same precoding resource block group (PRG). For example, for DM-RS associated with a PDCCH, the channel over which a PDCCH symbol on an antenna port is conveyed may be inferred from the channel over which a DM-RS symbol on the same antenna port is conveyed if, for example, the two symbols are within resources for which the UE may assume the same precoding being used. For example, for DM-RS associated with a PBCH, the channel over which a PBCH symbol on one antenna port is conveyed may be inferred from the channel over which a DM-RS symbol on the same antenna port is conveyed if, for example, the two symbols are within a SS/PBCH block transmitted within the same slot, and with the same block index. The antenna port may be different from a physical antenna. An antenna port may be associated with an antenna port number and different physical channels may correspond to different ranges of antenna port numbers.

[0094] FIG. 9 shows an example of time-frequency resource grid in accordance with several of various embodiments of the present disclosure. The number of subcarriers in a carrier bandwidth may be based on the numerology of OFDM transmissions in the carrier. A resource element, corresponding to one symbol duration and one subcarrier, may be the smallest physical resource in the time-frequency grid. A resource element (RE) for antenna port p and subcarrier spacing configuration μ may be uniquely identified by $(k, l)_{p,\mu}$ where k is the index of a subcarrier in the frequency domain and l may refer to the symbol position in the time domain relative to some reference point. A resource block may be defined as $N_{SC}^{RB} = 12$ subcarriers. Since subcarrier spacing depends on the numerology of OFDM transmission, the frequency domain span of a resource block may be variable and may depend on the numerology. For example, for a subcarrier spacing of 15 KHz (e.g., $\mu=0$), a resource block may be 180 KHz and for a subcarrier spacing of 30 KHz (e.g., $\mu=1$), a resource block may be 360 KHz.

[0095] With large carrier bandwidths defined in NR and due to limited capabilities for some UEs (e.g., due to hardware limitations), a UE may not support an entire carrier bandwidth. Receiving on the full carrier bandwidth may imply high energy consumption. For example, transmitting downlink control channels on the full downlink carrier bandwidth may result in high power consumption for wide carrier bandwidths. NR may use a bandwidth adaptation procedure to dynamically adapt the transmit and receive bandwidths. The transmit and receive bandwidth of a UE on a cell may be smaller than the bandwidth of the cell and may be adjusted. For example, the width of the transmit and/or receive bandwidth may change (e.g. shrink during period of low activity to save power); the location of the transmit and/or receive bandwidth may move in the frequency domain (e.g. to increase scheduling flexibility); and the subcarrier spacing of the transmit or receive bandwidth may change (e.g. to allow different services). A subset of the cell bandwidth may be referred to as a Bandwidth Part (BWP) and bandwidth adaptation may be achieved by configuring the UE with one or more BWPs. The base station may configure a UE with a set of downlink BWPs and a set of uplink BWPs. A BWP may be characterized by a numerology (e.g., subcarrier spacing and cyclic prefix) and a set of consecutive resource blocks in the numerology of the BWP. One or more first BWPs of the one or more BWPs of the cell may be active at a time. An active BWP may be an active downlink BWP or an active uplink BWP.

[0096] FIG. 10 shows an example of bandwidth part adaptation and switching. In this example, three BWPs (BWP₁ 1004, BWP₂ 1006 and BWP₃ 1008) are configured for a UE on a carrier

bandwidth. The BWP₁ is configured with a bandwidth of 40 MHz and a numerology with subcarrier spacing of 15 KHz, the BWP₂ is configured with a bandwidth of 10 MHz and a numerology with subcarrier spacing of 15 KHz and the BWP₃ is configured with a bandwidth of 20 MHz and a subcarrier spacing of 60 KHz. The wireless device may switch from a first BWP (e.g., BWP₁) to a second BWP (e.g., BWP₂). An active BWP of the cell may change from the first BWP to the second BWP in response to the BWP switching.

[0097] The BWP switching (e.g., BWP switching 1010, BWP switching 1012, BWP switching 1014, or BWP switching 1016 in FIG. 10) may be based on a command from the base station. The command may be a DCI comprising scheduling information for the UE in the second BWP. In case of uplink BWP switching, the first BWP and the second BWP may be uplink BWPs and the scheduling information may be an uplink grant for uplink transmission via the second BWP. In case of downlink BWP switching, the first BWP and the second BWP may be downlink BWPs and the scheduling information may be a downlink assignment for downlink reception via the second BWP.

[0098] The BWP switching (e.g., BWP switching 1010, BWP switching 1012, BWP switching 1014, or BWP switching 1016 in FIG. 10) may be based on an expiry of a timer. The base station may configure a wireless device with a BWP inactivity timer and the wireless device may switch to a default BWP (e.g., default downlink BWP) based on the expiry of the BWP inactivity timer. The expiry of the BWP inactivity timer may be an indication of low activity on the current active downlink BWP. The base station may configure the wireless device with the default downlink BWP. If the base station does not configure the wireless device with the default BWP, the default BWP may be an initial downlink BWP. The initial active BWP may be the BWP that the wireless device receives scheduling information for remaining system information upon transition to an RRC_CONNECTED state.

[0099] A wireless device may monitor a downlink control channel of a downlink BWP. For example, the UE may monitor a set of PDCCH candidates in configured monitoring occasions in one or more configured Control Resource Sets (CORESETs) according to the corresponding search space configurations. A search space configuration may define how/where to search for PDCCH candidates. For example, the search space configuration parameters may comprise a monitoring periodicity and offset parameter indicating the slots for monitoring the PDCCH candidates. The search space configuration parameters may further comprise a parameter indicating a first symbol with a slot within the slots determined for monitoring PDCCH candidates. A search

space may be associated with one or more CORESETs and the search space configuration may indicate one or more identifiers of the one or more CORESETs. The search space configuration parameters may further indicate that whether the search space is a common search space or a UE-specific search space. A common search space may be monitored by a plurality of wireless devices and a UE-specific search space may be dedicated to a specific UE.

[0100] FIG. 11A shows example arrangements of carriers in carrier aggregation in accordance with several of various embodiments of the present disclosure. With carrier aggregation, multiple NR component carriers (CCs) may be aggregated. Downlink transmissions to a wireless device may take place simultaneously on the aggregated downlink CCs resulting in higher downlink data rates. Uplink transmissions from a wireless device may take place simultaneously on the aggregated uplink CCs resulting in higher uplink data rates. The component carriers in carrier aggregation may be on the same frequency band (e.g., intra-band carrier aggregation) or on different frequency bands (e.g., inter-band carrier aggregation). The component carriers may also be contiguous or non-contiguous. This results in three possible carrier aggregation scenarios, intra-band contiguous CA 1102, intra-band non-contiguous CA 1104 and inter-band CA 1106 as shown in FIG. 11A. Depending on the UE capability for carrier aggregation, a UE may transmit and/or receive on multiple carriers or for a UE that is not capable of carrier aggregation, the UE may transmit and/or receive on one component carrier at a time. In this disclosure, the carrier aggregation is described using the term cell and a carrier aggregation capable UE may transmit and/or receive via multiple cells.

[0101] In carrier aggregation, a UE may be configured with multiple cells. A cell of the multiple cells configured for the UE may be referred to as a Primary Cell (PCell). The PCell may be the first cell that the UE is initially connected to. One or more other cells configured for the UE may be referred to as Secondary Cells (SCells). The base station may configure a UE with multiple SCells. The configured SCells may be deactivated upon configuration and the base station may dynamically activate or deactivate one or more of the configured SCells based on traffic and/or channel conditions. The base station may activate or deactivate configured SCells using a SCell Activation/Deactivation MAC CE. The SCell Activation/Deactivation MAC CE may comprise a bitmap, wherein each bit in the bitmap may correspond to a SCell and the value of the bit indicates an activation status or deactivation status of the SCell.

[0102] An SCell may also be deactivated in response to expiry of a SCell deactivation timer of the SCell. The expiry of an SCell deactivation timer of an SCell may be an indication of low activity (e.g., low transmission or reception activity) on the SCell. The base station may configure the SCell with an SCell deactivation timer. The base station may not configure an SCell deactivation timer for an SCell that is configured with PUCCH (also referred to as a PUCCH SCell). The configuration of the SCell deactivation timer may be per configured SCell and different SCells may be configured with different SCell deactivation timer values. The SCell deactivation timer may be restarted based on one or more criteria including reception of downlink control information on the SCell indicating uplink grant or downlink assignment for the SCell or reception of downlink control information on a scheduling cell indicating uplink grant or downlink assignment for the SCell or transmission of a MAC PDU based on a configured uplink grant or reception of a configured downlink assignment.

[0103] A PCell for a UE may be an SCell for another UE and a SCell for a UE may be PCell for another UE. The configuration of PCell may be UE-specific. One or more SCells of the multiple SCells configured for a UE may be configured as downlink-only SCells, e.g., may only be used for downlink reception and may not be used for uplink transmission. In case of self-scheduling, the base station may transmit signaling for uplink grants and/or downlink assignments on the same cell that the corresponding uplink or downlink transmission takes place. In case of cross-carrier scheduling, the base station may transmit signaling for uplink grants and/or downlink assignments on a cell different from the cell that the corresponding uplink or downlink transmission takes place.

[0104] FIG. 11B shows examples of uplink control channel groups in accordance with several of various embodiments of the present disclosure. A base station may configure a UE with multiple PUCCH groups wherein a PUCCH group comprises one or more cells. For example, as shown in FIG. 11B, the base station may configure a UE with a primary PUCCH group 1114 and a secondary PUCCH group 1116. The primary PUCCH group may comprise the PCell 1110 and one or more first SCells. First UCI corresponding to the PCell and the one or more first SCells of the primary PUCCH group may be transmitted by the PUCCH of the PCell. The first UCI may be, for example, HARQ feedback for downlink transmissions via downlink CCs of the PCell and the one or more first SCells. The secondary PUCCH group may comprise a PUCCH SCell and one or more second SCells. Second UCI corresponding to the PUCCH SCell and the one or more second SCells of the secondary PUCCH group may be transmitted by the PUCCH of the PUCCH SCell. The

second UCI may be, for example, HARQ feedback for downlink transmissions via downlink CCs of the PUCCH SCell and the one or more second SCells.

[0105] FIG. 12A, FIG. 12B and FIG. 12C show example random access processes in accordance with several of various embodiments of the present disclosure. FIG. 12A shows an example of four step contention-based random access (CBRA) procedure. The four-step CBRA procedure includes exchanging four messages between a UE and a base station. Msg1 may be for transmission (or retransmission) of a random access preamble by the wireless device to the base station. Msg2 may be the random access response (RAR) by the base station to the wireless device. Msg3 is the scheduled transmission based on an uplink grant indicated in Msg2 and Msg4 may be for contention resolution.

[0106] The base station may transmit one or more RRC messages comprising configuration parameters of the random access parameters. The random access parameters may indicate radio resources (e.g., time-frequency resources) for transmission of the random access preamble (e.g., Msg1), configuration index, one or more parameters for determining the power of the random access preamble (e.g., a power ramping parameter, a preamble received target power, etc.), a parameter indicating maximum number of preamble transmission, RAR window for monitoring RAR, cell-specific random access parameters and UE specific random access parameters. The UE-specific random access parameters may indicate one or more PRACH occasions for random access preamble (e.g., Msg1) transmissions. The random access parameters may indicate association between the PRACH occasions and one or more reference signals (e.g., SSB or CSI-RS). The random access parameters may further indicate association between the random access preambles and one or more reference signals (e.g., SSB or CSI-RS). The UE may use one or more reference signals (e.g., SSB(s) or CSI-RS(s)) and may determine a random access preamble to use for Msg1 transmission based on the association between the random access preambles and the one or more reference signals. The UE may use one or more reference signals (e.g., SSB(s) or CSI-RS(s)) and may determine the PRACH occasion to use for Msg1 transmission based on the association between the PRACH occasions and the reference signals. The UE may perform a retransmission of the random access preamble if no response is received with the RAR window following the transmission of the preamble. UE may use a higher transmission power for retransmission of the preamble. UE may determine the higher transmission power of the preamble based on the power ramping parameter.

[0107] Msg2 is for transmission of RAR by the base station. Msg2 may comprise a plurality of RARs corresponding to a plurality of random access preambles transmitted by a plurality of UEs. Msg2 may be associated with a random access temporary radio identifier (RA-RNTI) and may be received in a common search space of the UE. The RA-RNTI may be based on the PRACH occasion (e.g., time and frequency resources of a PRACH) in which a random access preamble is transmitted. RAR may comprise a timing advance command for uplink timing adjustment at the UE, an uplink grant for transmission of Msg3 and a temporary C-RNTI. In response to the successful reception of Msg2, the UE may transmit the Msg3. Msg3 and Msg4 may enable contention resolution in case of CBRA. In a CBRA, a plurality of UEs may transmit the same random access preamble and may consider the same RAR as being corresponding to them. UE may include a device identifier in Msg3 (e.g., a C-RNTI, temporary C-RNTI or other UE identity). Base station may transmit the Msg4 with a PDSCH and UE may assume that the contention resolution is successful in response to the PDSCH used for transmission of Msg4 being associated with the UE identifier included in Msg3.

[0108] FIG. 12B shows an example of a contention-free random access (CFRA) process. Msg 1 (random access preamble) and Msg 2 (random access response) in FIG. 12B for CFRA may be analogous to Msg 1 and Msg 2 in FIG. 12A for CBRA. In an example, the CFRA procedure may be initiated in response to a PDCCH order from a base station. The PDCCH order for initiating the CFRA procedure by the wireless device may be based on a DCI having a first format (e.g., format 1_0). The DCI for the PDCCH order may comprise a random access preamble index, an UL/SUL indicator indicating an uplink carrier of a cell (e.g., normal uplink carrier or supplementary uplink carrier) for transmission of the random access preamble, a SS/PBCH index indicating the SS/PBCH that may be used to determine a RACH occasion for PRACH transmission, a PRACH mask index indicating the RACH occasion associated with the SS/PBCH indicated by the SS/PBCH index for PRACH transmission, etc. In an example, the CFRA process may be started in response to a beam failure recovery process. The wireless device may start the CFRA for the beam failure recovery without a command (e.g., PDCCH order) from the base station and by using the wireless device dedicated resources.

[0109] FIG. 12C shows an example of a two-step random access process comprising two messages exchanged between a wireless device and a base station. Msg A may be transmitted by the wireless device to the base station and may comprise one or more transmissions of a preamble and/or one or

more transmissions of a transport block. The transport block in Msg A and Msg 3 in FIG. 12A may have similar and/or equivalent contents. The transport block of Msg A may comprise data and control information (e.g., SR, HARQ feedback, etc.). In response to the transmission of Msg A, the wireless device may receive Msg B from the base station. Msg B in FIG. 12C and Msg 2 (e.g., RAR) illustrated in FIGS. 12A and 12B may have similar and/or equivalent content.

[0110] The base station may periodically transmit synchronization signals (SSs), e.g., primary SS (PSS) and secondary SS (SSS) along with PBCH on each NR cell. The PSS/SSS together with PBCH is jointly referred to as a SS/PBCH block. The SS/PBCH block enables a wireless device to find a cell when entering to the mobile communications network or find new cells when moving within the network. The SS/PBCH block spans four OFDM symbols in time domain. The PSS is transmitted in the first symbol and occupies 127 subcarriers in frequency domain. The SSS is transmitted in the third OFDM symbol and occupies the same 127 subcarriers as the PSS. There are eight and nine empty subcarriers on each side of the SSS. The PBCH is transmitted on the second OFDM symbol occupying 240 subcarriers, the third OFDM symbol occupying 48 subcarriers on each side of the SSS, and on the fourth OFDM symbol occupying 240 subcarriers. Some of the PBCH resources indicated above may be used for transmission of the demodulation reference signal (DMRS) for coherent demodulation of the PBCH. The SS/PBCH block is transmitted periodically with a period ranging from 5 ms to 160 ms. For initial cell search or for cell search during inactive/idle state, a wireless device may assume that the SS/PBCH block is repeated at least every 20 ms.

[0111] In NR, transmissions using of antenna arrays, with many antenna elements, and beamforming plays an important role specially in higher frequency bands. Beamforming enables higher capacity by increasing the signal strength (e.g., by focusing the signal energy in a specific direction) and by lowering the amount interference received at the wireless devices. The beamforming techniques may generally be divided to analog beamforming and digital beamforming techniques. With digital beamforming, signal processing for beamforming is carried out in the digital domain before digital-to-analog conversion and detailed control of both amplitude and phase of different antenna elements may be possible. With analog beamforming, the signal processing for beamforming is carried out in the analog domain and after the digital to analog conversion. The beamformed transmissions may be in one direction at a time. For example, the wireless devices that are in different directions relative to the base station may receive their downlink transmissions at

different times. For analog receiver-side beamforming, the receiver may focus its receiver beam in one direction at a time.

[0112] In NR, the base station may use beam sweeping for transmission of SS/PBCH blocks. The SS/PBCH blocks may be transmitted in different beams using time multiplexing. The set of SS/PBCH blocks that are transmitted in one beam sweep may be referred to as a SS/PBCH block set. The period of PBCH/SSB block transmission may be a time duration between a SS/PBCH block transmission in a beam and the next SS/PBCH block transmission in the same beam. The period of SS/PBCH block is, therefore, also the period of the SS/PBCH block set.

[0113] FIG. 13A shows example time and frequency structure of SS/PBCH blocks and their associations with beams in accordance with several of various embodiments of the present disclosure. In this example, a SS/PBCH block (also referred to as SSB) set comprise L SSBs wherein an SSB in the SSB set is associated with (e.g., transmitted in) one of L beams of a cell. The transmission of SSBs of an SSB set may be confined within a 5ms interval, either in a first half-frame or a second half-frame of a 10ms frame. The number of SSBs in an SSB set may depend on the frequency band of operation. For example, the number of SSBs in a SSB set may be up to four SSBs in frequency bands below 3GHz enabling beam sweeping of up to four beams, up to eight SSBs in frequency bands between 3 GHz and 6 GHz enabling beam sweeping of up to eight beams, and up to sixty four SSBs in higher frequency bands enabling beam sweeping of up to sixty four beams. The SSs of an SSB may depend on a physical cell identity (PCI) of the cell and may be independent of which beam of the cell is used for transmission of the SSB. The PBCH of an SSB may indicate a time index parameter and the wireless device may determine the relative position of the SSB within the SSB set using the time index parameter. The wireless device may use the relative position of the SSB within an SSB set for determining the frame timing and/or determining RACH occasions for a random access process.

[0114] A wireless device entering the mobile communications network may first search for the PSS. After detecting the PSS, the wireless device may determine the synchronization up to the periodicity of the PSS. By detecting the PSS, the wireless device may determine the transmission timing of the SSS. The wireless device may determine the PCI of the cell after detecting the SSS. The PBCH of a SS/PBCH block is a downlink physical channel that carries the MIB. The MIB may be used by the wireless device to obtain remaining system information (RMSI) that is broadcast by

the network. The RMSI may include System Information Block 1 (SIB1) that contains information required for the wireless device to access the cell.

[0115] As discussed earlier, the wireless device may determine a time index parameter from the SSB. The PBCH comprises a half-frame parameter indicating whether the SSB is in the first 5ms half or the second 5ms half of a 10ms frame. The wireless device may determine the frame boundary using the time index parameter and the half-frame parameter. In addition, the PBCH may comprise a parameter indicating the system frame number (SFN) of the cell.

[0116] The base station may transmit CSI-RS and a UE may measure the CSI-RS to obtain channel state information (CSI). The base station may configure the CSI-RS in a UE-specific manner. In some scenarios, same set of CSI-RS resources may be configured for multiple UEs and one or more resource elements of a CSI-RS resource may be shared among multiple UEs. A CSI-RS resource may be configured such that it does not collide with a CORESET configured for the wireless device and/or with a DMRS of a PDSCH scheduled for the wireless device and/or transmitted SSBs. The UE may measure one or more CSI-RSs configured for the UE and may generate a CSI report based on the CSI-RS measurements and may transmit the CSI report to the base station for scheduling, link adaptation and/or other purposes.

[0117] NR supports flexible CSI-RS configurations. A CSI-RS resource may be configured with single or multiple antenna ports and with configurable density. Based on the number of configured antenna ports, a CSI-RS resource may span different number of OFDM symbols (e.g., 1, 2, and 4 symbols). The CSI-RS may be configured for a downlink BWP and may use the numerology of the downlink BWP. The CSI-RS may be configured to cover the full bandwidth of the downlink BWP or a portion of the downlink BWP. In some case, the CSI-RS may be repeated in every resource block of the CSI-RS bandwidth, referred to as CSI-RS with density equal to one. In some cases, the CSI-RS may be configured to be repeated in every other resource block of the CSI-RS bandwidth. CSI-RS may be non-zero power (NZP) CSI-RS or zero-power (ZP) CSI-RS.

[0118] The base station may configure a wireless device with one or more sets of NZP CSI-RS resources. The base station may configure the wireless device with a NZP CSI-RS resource set using an RRC information element (IE) NZP-CSI-RS-ResourceSet indicating a NZP CSI-RS resource set identifier (ID) and parameters specific to the NZP CSI-RS resource set. An NZP CSI-RS resource set may comprise one or more CSI-RS resources. An NZP CSI-RS resource set may be configured as part of the CSI measurement configuration.

- [0119] The CSI-RS may be configured for periodic, semi-persistent or aperiodic transmission. In case of the periodic and semi-persistent CSI-RS configurations, the wireless device may be configured with a CSI resource periodicity and offset parameter that indicate a periodicity and corresponding offset in terms of number of slots. The wireless device may determine the slots that the CSI-RSs are transmitted. For semi-persistent CSI-RS, the CSI-RS resources for CSI-RS transmissions may be activated and deactivated by using a semi-persistent (SP) CSI-CSI Resource Set Activation/Deactivation MAC CE. In response to receiving a MAC CE indicating activation of semi-persistent CSI-RS resources, the wireless device may assume that the CSI-RS transmissions will continue until the CSI-RS resources for CSI-RS transmissions are activated.
- [0120] As discussed before, CSI-RS may be configured for a wireless device as NZP CSI-RS or ZP CSI-RS. The configuration of the ZP CSI-RS may be similar to the NZP CSI-RS with the difference that the wireless device may not carry out measurements for the ZP CSI-RS. By configuring ZP CSI-RS, the wireless device may assume that a scheduled PDSCH that includes resource elements from the ZP CSI-RS is rate matched around those ZP CSI-RS resources. For example, a ZP CSI-RS resource configured for a wireless device may be an NZP CSI-RS resource for another wireless device. For example, by configuring ZP CSI-RS resources for the wireless device, the base station may indicate to the wireless device that the PDSCH scheduled for the wireless device is rate matched around the ZP CSI-RS resources.
- [0121] A base station may configure a wireless device with channel state information interference measurement (CSI-IM) resources. Similar to the CSI-RS configuration, configuration of locations and density of CSI-IM resources may be flexible. The CSI-IM resources may be periodic (configured with a periodicity), semi-persistent (configured with a periodicity and activated and deactivated by MAC CE) or aperiodic (triggered by a DCI).
- [0122] Tracking reference signals (TRSs) may be configured for a wireless device as a set of sparse reference signals to assist the wireless in time and frequency tracking and compensating time and frequency variations in its local oscillator. The wireless device may further use the TRSs for estimating channel characteristics such as delay spread or doppler frequency. The base station may use a CSI-RS configuration for configuring TRS for the wireless device. The TRS may be configured as a resource set comprising multiple periodic NZP CSI-RS resources.
- [0123] A base station may configure a UE and the UE may transmit sounding reference signals (SRSs) to enable uplink channel sounding/estimation at the base station. The SRS may support up

to four antenna ports and may be designed with low cubic metric enabling efficient operation of the wireless device amplifier. The SRS may span one or more (e.g., one, two or four) consecutive OFDM symbols in time domain and may be located within the last n (e.g., six) symbols of a slot. In the frequency domain, the SRS may have a structure that is referred to as a comb structure and may be transmitted on every N th subcarrier. Different SRS transmissions from different wireless devices may have different comb structures and may be multiplexed in frequency domain.

[0124] A base station may configure a wireless device with one or more SRS resource sets and an SRS resource set may comprise one or more SRS resources. The SRS resources in an SRS resources set may be configured for periodic, semi-persistent or aperiodic transmission. The periodic SRS and the semi-persistent SRS resources may be configured with periodicity and offset parameters. The Semi-persistent SRS resources of a configured semi-persistent SRS resource set may be activated or deactivated by a semi-persistent (SP) SRS Activation/Deactivation MAC CE. The set of SRS resources included in an aperiodic SRS resource set may be activated by a DCI. A value of a field (e.g., an SRS request field) in the DCI may indicate activation of resources in an aperiodic SRS resource set from a plurality of SRS resource sets configured for the wireless device.

[0125] An antenna port may be associated with one or more reference signals. The receiver may assume that the one or more reference signals, associated with the antenna port, may be used for estimating channel corresponding to the antenna port. The reference signals may be used to derive channel state information related to the antenna port. Two antenna ports may be referred to as quasi co-located if characteristics (e.g., large-scale properties) of the channel over which a symbol is conveyed on one antenna port may be inferred from the channel over which a symbol is conveyed from another antenna port. For example, a UE may assume that radio channels corresponding to two different antenna ports have the same large-scale properties if the antenna ports are specified as quasi co-located. In some cases, the UE may assume that two antenna ports are quasi co-located based on signaling received from the base station. Spatial quasi-colocation (QCL) between two signals may be, for example, due to the two signals being transmitted from the same location and in the same beam. If a receive beam is good for a signal in a group of signals that are spatially quasi co-located, it may be assumed also be good for the other signals in the group of signals.

[0126] The CSI-RS in the downlink and the SRS in uplink may serve as quasi-location (QCL) reference for other physical downlink channels and physical uplink channels, respectively. For example, a downlink physical channel (e.g., PDSCH or PDCCH) may be spatially quasi co-located

with a downlink reference signal (e.g., CSI-RS or SSB). The wireless device may determine a receive beam based on measurement on the downlink reference signal and may assume that the determined received beam is also good for reception of the physical channels (e.g., PDSCH or PDCCH) that are spatially quasi co-located with the downlink reference signal. Similarly, an uplink physical channel (e.g., PUSCH or PUCCH) may be spatially quasi co-located with an uplink reference signal (e.g., SRS). The base station may determine a receive beam based on measurement on the uplink reference signal and may assume that the determined received beam is also good for reception of the physical channels (e.g., PUSCH or PUCCH) that are spatially quasi co-located with the uplink reference signal.

[0127] The Demodulation Reference Signals (DM-RSs) enables channel estimation for coherent demodulation of downlink physical channels (e.g., PDSCH, PDCCH and PBH) and uplink physical channels (e.g., PUSCH and PUCCH). The DM-RS may be located early in the transmission (e.g., front-loaded DM-RS) and may enable the receiver to obtain the channel estimate early and reduce the latency. The time-domain structure of the DM-RS (e.g., symbols wherein the DM-RS are located in a slot) may be based on different mapping types.

[0128] The Phase Tracking Reference Signals (PT-RSs) enables tracking and compensation of phase variations across the transmission duration. The phase variations may be, for example, due to oscillator phase noise. The oscillator phase noise may become more severe in higher frequencies (e.g., mmWave frequency bands). The base station may configure the PT-RS for uplink and/or downlink. The PT-RS configuration parameters may indicate frequency and time density of PT-RS, maximum number of ports (e.g., uplink ports), resource element offset, configuration of uplink PT-RS without transform precoder (e.g., CP-OFDM) or with transform precoder (e.g., DFT-s-OFDM), etc. The subcarrier number and/or resource blocks used for PT-RS transmission may be based on the C-RNTI of the wireless device to reduce risk of collisions between PT-RSs of wireless devices scheduled on overlapping frequency domain resources.

[0129] FIG. 13B shows example time and frequency structure of CSI-RSs and their association with beams in accordance with several of various embodiments of the present disclosure. A beam of the L beams shown in FIG. 13B may be associated with a corresponding CSI-RS resource. The base station may transmit the CSI-RSs using the configured CSI-RS resources and a UE may measure the CSI-RSs (e.g., received signal received power (RSRP) of the CSI-RSs) and report the CSI-RS measurements to the base station based on a reporting configuration. For example, the base

station may determine one or more transmission configuration indication (TCI) states and may indicate the one or more TCI states to the UE (e.g., using RRC signaling, a MAC CE and/or a DCI). Based on the one or more TCI states indicated to the UE, the UE may determine a downlink receive beam and receive downlink transmissions using the receive beam. In case of a beam correspondence, the UE may determine a spatial domain filter of a transmit beam based on spatial domain filter of a corresponding receive beam. Otherwise, the UE may perform an uplink beam selection procedure to determine the spatial domain filter of the transmit beam. The UE may transmit one or more SRSs using the SRS resources configured for the UE and the base station may measure the SRSs and determine/select the transmit beam for the UE based the SRS measurements. The base station may indicate the selected beam to the UE. The CSI-RS resources shown in FIG. 13B may be for one UE. The base station may configure different CSI-RS resources associated with a given beam for different UEs by using frequency division multiplexing.

[0130] A base station and a wireless device may perform beam management procedures to establish beam pairs (e.g., transmit and receive beams) that jointly provide good connectivity. For example, in the downlink direction, the UE may perform measurements for a beam pair and estimate channel quality for a transmit beam by the base station (or a transmission reception point (TRP) more generally) and the receive beam by the UE. The UE may transmit a report indicating beam pair quality parameters. The report may comprise one or more parameters indicating one or more beams (e.g., a beam index, an identifier of reference signal associated with a beam, etc.), one or more measurement parameters (e.g., RSRP), a precoding matrix indicator (PMI), a channel quality indicator (CQI), and/or a rank indicator (RI).

[0131] FIG. 14A, FIG. 14B and FIG. 14C show example beam management processes (referred to as P1, P2 and P3, respectively) in accordance with several of various embodiments of the present disclosure. The P1 process shown in FIG. 14A may enable, based on UE measurements, selection of a base station (or TRP more generally) transmit beam and/or a wireless device receive beam. The TRP may perform a beam sweeping procedure where the TRP may sequentially transmit reference signals (e.g., SSB and/or CSI-RS) on a set of beams and the UE may select a beam from the set of beams and may report the selected beam to the TRP. The P2 procedure as shown in FIG. 14B may be a beam refinement procedure. The selection of the TRP transmit beam and the UE receive beam may be regularly reevaluated due to movements and/or rotations of the UE or movement of other objects. In an example, the base station may perform the beam sweeping procedure over a smaller

set of beams and the UE may select the best beam over the smaller set. In an example, the beam shape may be narrower compared to beam selected based on the P1 procedure. Using the P3 procedure as shown in FIG. 14C, the TRP may fix its transmit beam and the UE may refine its receive beam.

[0132] A wireless device may receive one or more messages from a base station. The one or more messages may comprise one or more RRC messages. The one or more messages may comprise configuration parameters of a plurality of cells for the wireless device. The plurality of cells may comprise a primary cell and one or more secondary cells. For example, the plurality of cells may be provided by a base station and the wireless device may communicate with the base station using the plurality of cells. For example, the plurality of cells may be provided by multiple base station (e.g., in case of dual and/or multi-connectivity). The wireless device may communicate with a first base station, of the multiple base stations, using one or more first cells of the plurality of cells. The wireless device may communicate with a second base station of the multiple base stations using one or more second cells of the plurality of cells.

[0133] The one or more messages may comprise configuration parameters used for processes in physical, MAC, RLC, PCDP, SDAP, and/or RRC layers of the wireless device. For example, the configuration parameters may include values of timers used in physical, MAC, RLC, PCDP, SDAP, and/or RRC layers. For example, the configuration parameters may include parameters for configuring different channels (e.g., physical layer channel, logical channels, RLC channels, etc.) and/or signals (e.g., CSI-RS, SRS, etc.).

[0134] Upon starting a timer, the timer may start running until the timer is stopped or until the timer expires. A timer may be restarted if it is running. A timer may be started if it is not running (e.g., after the timer is stopped or after the timer expires). A timer may be configured with or may be associated with a value (e.g., an initial value). The timer may be started or restarted with the value of the timer. The value of the timer may indicate a time duration that the timer may be running upon being started or restarted and until the timer expires. The duration of a timer may not be updated until the timer is stopped or expires (e.g., due to BWP switching). This specification may disclose a process that includes one or more timers. The one or more timers may be implemented in multiple ways. For example, a timer may be used by the wireless device and/or base station to determine a time window $[t_1, t_2]$, wherein the timer is started at time t_1 and expires at time t_2 and the wireless device and/or the base station may be interested in and/or monitor the

time window [t1, t2], for example to receive a specific signaling. Other examples of implementation of a timer may be provided.

[0135] FIG. 15 shows example components of a wireless device and a base station that are in communication via an air interface in accordance with several of various embodiments of the present disclosure. The wireless device 1502 may communicate with the base station 1542 over the air interface 1532. The wireless device 1502 may include a plurality of antennas. The base station 1542 may include a plurality of antennas. The plurality of antennas at the wireless device 1502 and/or the base station 1542 enables different types of multiple antenna techniques such as beamforming, single-user and/or multi-user MIMO, etc.

[0136] The wireless device 1502 and the base station 1542 may have one or more of a plurality of modules/blocks, for example RF front end (e.g., RF front end 1530 at the wireless device 1502 and RF front end 1570 at the base station 1542), Data Processing System (e.g., Data Processing System 1524 at the wireless device 1502 and Data Processing System 1564 at the base station 1542), Memory (e.g., Memory 1512 at the wireless device 1502 and Memory 1542 at the base station 1542). Additionally, the wireless device 1502 and the base station 1542 may have other modules/blocks such as GPS (e.g., GPS 1514 at the wireless device 1502 and GPS 1554 at the base station 1542).

[0137] An RF front end module/block may include circuitry between antennas and a Data Processing System for proper conversion of signals between these two modules/blocks. An RF front end may include one or more filters (e.g., Filter(s) 1526 at RF front end 1530 or Filter(s) 1566 at the RF front end 1570), one or more amplifiers (e.g., Amplifier(s) 1528 at the RF front end 1530 and Amplifier(s) 1568 at the RF front end 1570). The Amplifier(s) may comprise power amplifier(s) for transmission and low-noise amplifier(s) (LNA(s)) for reception.

[0138] The Data Processing System 1524 and the Data Processing System 1564 may process the data to be transmitted or the received signals by implementing functions at different layers of the protocol stack such as PHY, MAC, RLC, etc. Example PHY layer functions that may be implemented by the Data Processing System 1524 and/or 1564 may include forward error correction, interleaving, rate matching, modulation, precoding, resource mapping, MIMO processing, etc. Similarly, one or more functions of the MAC layer, RLC layer and/or other layers may be implemented by the Data Processing System 1524 and/or the Data Processing System 1564. One or more processes described in the present disclosure may be implemented by the Data

Processing System1524 and/or the Data Processing System1564. A Data Processing System may include an RF module (RF module 1516 at the Data Processing System1524 and RF module 1556 at the Data Processing System1564) and/or a TX/RX processor (e.g., TX/RX processor 1518 at the Data Processing System1524 and TX/RX processor 1558 at the Data Processing System1566) and/or a central processing unit (CPU) (e.g., CPU 1520 at the Data Processing System1524 and CPU 1560 at the Data Processing System1564) and/or a graphical processing unit (GPU) (e.g., GPU 1522 at the Data Processing System1524 and GPU 1562 at the Data Processing System1564).

[0139] The Memory 1512 may have interfaces with the Data Processing System 1524 and the Memory 1552 may have interfaces with Data Processing System1564, respectively. The Memory 1512 or the Memory 1552 may include non-transitory computer readable mediums (e.g., Storage Medium 1510 at the Memory 1512 and Storage Medium 1550 at the Memory 1552) that may store software code or instructions that may be executed by the Data Processing System1524 and Data Processing System1564, respectively, to implement the processes described in the present disclosure. The Memory 1512 or the Memory 1552 may include random-access memory (RAM) (e.g., RAM 1506 at the Memory 1512 or RAM 1546 at the Memory 1552) or read-only memory (ROM) (e.g., ROM 1508 at the Memory 1512 or ROM 1548 at the Memory 1552) to store data and/or software codes.

[0140] The Data Processing System1524 and/or the Data Processing System1564 may be connected to other components such as a GPS module 1514 and a GPS module 1554, respectively, wherein the GPS module 1514 and a GPS module 1554 may enable delivery of location information of the wireless device 1502 to the Data Processing System1524 and location information of the base station 1542 to the Data Processing System1564. One or more other peripheral components (e.g., Peripheral Component(s) 1504 or Peripheral Component(s) 1544) may be configured and connected to the data Processing System1524 and data Processing System1564, respectively.

[0141] In example embodiments, a wireless device may be configured with parameters and/or configuration arrangements. For example, the configuration of the wireless device with parameters and/or configuration arrangements may be based on one or more control messages that may be used to configure the wireless device to implement processes and/or actions. The wireless device may be configured with the parameters and/or the configuration arrangements regardless of the wireless device being in operation or not in operation. For example, software, firmware, memory, hardware

and/or a combination thereof and/or alike may be configured in a wireless device regardless of the wireless device being in operation or not operation. The configured parameters and/or settings may influence the actions and/or processes performed by the wireless device when in operation.

[0142] In example embodiments, a wireless device may receive one or more message comprising configuration parameters. For example, the one or more messages may comprise radio resource control (RRC) messages. A parameter of the configuration parameters may be in at least one of the one or more messages. The one or more messages may comprise information element (IEs). An information element may be a structural element that includes single or multiple fields. The fields in an IE may be individual contents of the IE. The terms configuration parameter, IE and field may be used equally in this disclosure. The IEs may be implemented using a nested structure, wherein an IE may include one or more other IEs and an IE of the one or more other IEs may include one or more additional IEs. With this structure, a parent IE contains all the offspring IEs as well. For example, a first IE containing a second IE, the second IE containing a third IE, and the third IE containing a fourth IE may imply that the first IE contains the third IE and the fourth IE.

[0143] In an example, a wireless device may receive one or more RRC messages comprising configuration parameters of downlink semi-Persistent Scheduling (SPS). The DL SPS configuration may be per Serving Cell and/or per BWP. In some examples, the base station may activate and/or deactivate/release the DL SPS and the activation or the deactivation/release of DL SPS may be independent among the Serving Cells. For the DL SPS, a wireless device may receive a DL assignment by PDCCH, which may be stored or may be cleared based on L1 signaling indicating SPS activation or deactivation.

[0144] In an example, the wireless device may receive RRC configuration parameters comprising: cs-RNTI: CS-RNTI for activation, deactivation, and retransmission; nrofHARQ-Processes: the number of configured HARQ processes for DL SPS; and periodicity: periodicity of configured downlink assignment for SPS. When SPS is released by upper layers, the corresponding configurations may be released.

[0145] In an example, after a downlink assignment is configured for SPS, the MAC entity may consider sequentially that the Nth downlink assignment occurs in the slot for which:

$$(\text{numberOfSlotsPerFrame} \times \text{SFN} + \text{slot number in the frame}) = [(\text{numberOfSlotsPerFrame} \times \text{SFN}(\text{start time}) + \text{slot}(\text{start time})) + N \times \text{periodicity} \times \text{numberOfSlotsPerFrame} / 10] \text{ modulo } (1024 \times \text{numberOfSlotsPerFrame})$$

where SFN(start time) and slot(start time) may be the SFN and slot, respectively, of the first transmission of PDSCH where the configured downlink assignment was (re-)initialized.

[0146] In an example, different types of transmission without dynamic grant may be configured for a wireless device in uplink. For a first type configured grant (e.g., configured grant Type 1), an uplink grant may be provided by RRC and stored as configured uplink grant. For a second type configured grant (e.g., configured grant Type 2), an uplink grant may be indicated by PDCCH, and stored or cleared as configured uplink grant based on L1 signaling indicating configured uplink grant activation or deactivation.

[0147] The configured grants Type 1 and Type 2 may be configured by RRC per Serving Cell and per BWP. In an example, multiple configurations may be active simultaneously. In an example, activation and deactivation of configured grant Type 2 may be independent among the Serving Cells.

[0148] A wireless device may receive RRC configuration parameters for configured grant Type 1 comprising: cs-RNTI: indicating CS-RNTI for retransmission; periodicity: indicating periodicity of the configured grant Type 1; timeDomainOffset: indicating an offset of a resource with respect to SFN = 0 in time domain; timeDomainAllocation: indicating allocation of configured uplink grant in time domain which contains startSymbolAndLength (e.g., SLIV); nrofHARQ-Processes: indicating the number of HARQ processes for configured grant.

[0149] In an example, a wireless device may receive RRC configuration parameters for configured grant Type 2 comprising: cs-RNTI: indicating CS-RNTI for activation, deactivation, and retransmission; periodicity: indicating periodicity of the configured grant Type 2; nrofHARQ-Processes: indicating the number of HARQ processes for configured grant.

[0150] In an example, upon configuration of a configured grant Type 1 for a Serving Cell by upper layers, the MAC entity may: store the uplink grant provided by upper layers as a configured uplink grant for the indicated Serving Cell; initialize or re-initialize the configured uplink grant to start in the symbol according to timeDomainOffset and S (derived from SLIV), and to reoccur with periodicity.

[0151] In an example, after an uplink grant is configured for a configured grant Type 1, the MAC entity may consider that the uplink grant recurs associated with each symbol for which:

$$[(\text{SFN} \times \text{numberOfSlotsPerFrame} \times \text{numberOfSymbolsPerSlot}) + (\text{slot number in the frame} \times \text{numberOfSymbolsPerSlot}) + \text{symbol number in the slot}] = (\text{timeDomainOffset} \times$$

$\text{numberOfSymbolsPerSlot} + S + N \times \text{periodicity}) \bmod (1024 \times \text{numberOfSlotsPerFrame} \times \text{numberOfSymbolsPerSlot})$, for all $N \geq 0$.

[0152] In an example, after an uplink grant is configured for a configured grant Type 2, the MAC entity may consider that the uplink grant recurs associated with each symbol for which:

$$[(\text{SFN} \times \text{numberOfSlotsPerFrame} \times \text{numberOfSymbolsPerSlot}) + (\text{slot number in the frame} \times \text{numberOfSymbolsPerSlot}) + \text{symbol number in the slot}] = [(\text{SFN}(\text{start time}) \times \text{numberOfSlotsPerFrame} \times \text{numberOfSymbolsPerSlot} + \text{slot}(\text{start time}) \times \text{numberOfSymbolsPerSlot} + \text{symbol}(\text{start time})) + N \times \text{periodicity}] \bmod (1024 \times \text{numberOfSlotsPerFrame} \times \text{numberOfSymbolsPerSlot})$$
, for all $N \geq 0$.

where $\text{SFN}(\text{start time})$, $\text{slot}(\text{start time})$, and $\text{symbol}(\text{start time})$ may be the SFN, slot, and symbol, respectively, of the first transmission opportunity of PUSCH where the configured uplink grant was (re-)initialized.

[0153] When a configured uplink grant is released by upper layers, all the corresponding configurations may be released, and all corresponding uplink grants may be cleared.

[0154] In an example, if the configured uplink grant confirmation has been triggered and not cancelled; and if the MAC entity has UL resources allocated for new transmission: the MAC entity may instruct the Multiplexing and Assembly procedure to generate a Configured Grant Confirmation MAC CE; and cancel the triggered configured uplink grant confirmation.

[0155] In an example, for a configured grant Type 2, the MAC entity may clear the configured uplink grant after first transmission of Configured Grant Confirmation MAC CE triggered by the configured uplink grant deactivation. In an example, retransmissions except for repetition of configured uplink grants use uplink grants addressed to CS-RNTI.

[0156] In an example, the IE ConfiguredGrantConfig may be used to configure uplink transmission without dynamic grant according to two possible schemes. The actual uplink grant may be configured via RRC (type1) or provided via the PDCCH (addressed to CS-RNTI) (type2). The ConfiguredGrantConfig IE may comprise a subset of the following parameters: an antennaPort parameter indicating the antenna port(s) to be used for this configuration; a cg-DMRS-Configuration parameter indicating the DMRS configuration; a configuredGrantTimer parameter indicating an initial value of a configured grant timer; a dmrs-SeqInitialization parameter if transformPrecoder is disabled; a frequencyDomainAllocation parameter indicating the frequency domain resource allocation; a frequencyHopping parameter wherein a value intraSlot may enable

'Intra-slot frequency hopping' and a value `interSlot` may enable 'Inter-slot frequency hopping'; a `frequencyHoppingOffset` parameter indicating a frequency hopping offset used when frequency hopping is enabled; an `mcs-Table` parameter indicating the mcs-Table the UE may use for PUSCH without transform precoding; an `mcs-TableTransformPrecoder` parameter indicating the MCS table the UE may use for PUSCH with transform precoding; an `mcsAndTBS` parameter indicating a modulation order, target code rate and TB size; a `nrofHARQ-Processes` parameter indicating a number of HARQ processes configured; a `periodicity` parameter indicating a periodicity for UL transmission without UL grant for type 1 and type 2; a `powerControlLoopToUse` parameter indicating a closed control loop to apply; an `rbg-Size` parameter indicating a selection between configuration 1 and configuration 2 for RBG size for PUSCH; a `repK-RV` parameter indicating a redundancy version (RV) sequence to use; a `repK` parameter indicating a number of repetitions of K; a `resourceAllocation` parameter indicating configuration of resource allocation type0 and resource allocation type 1; a `rrc-ConfiguredUplinkGrant` indicating configuration for "configured grant" transmission with fully RRC-configured UL grant (Type1) and if this field is absent the UE may use UL grant configured by DCI addressed to CS-RNTI (Type2); an `srsResourceIndicator` parameter indicating an SRS resource to be used; a `timeDomainAllocation` parameter indicating a combination of start symbol and length and PUSCH mapping type; a `timeDomainOffset` parameter indicating an offset with respect to SFN=0; a `transformPrecoder` parameter enabling or disabling transform precoding; and a `uci-OnPUSCH` parameter indicating a selection between and configuration of dynamic and semi-static beta-offset, wherein for Type 1 UL data transmission without grant, `uci-OnPUSCH` may be set to `semiStatic`.

[0157] In an example, the IE SPS-Config may be used to configure downlink semi-persistent transmission. Downlink SPS may be configured on the SpCell as well as on SCells. The IE SPS-Config may comprise one or more of a `mcs-Table` parameter indicating a MCS table the UE may use for DL SPS; an `n1PUCCH-AN` parameter indicating a HARQ resource for PUCCH for DL SPS, a `nrofHARQ-Processes` parameter indicating a number of configured HARQ processes for SPS DL; and a `periodicity` parameter indicating a periodicity for DL SPS.

[0158] In an example, a MAC entity may be configured with CS-RNTI. The MAC entity may receive an uplink grant for a PDCCH occasion for a Serving Cell belonging to a TAG that has a running `timeAlignmentTimer`. The uplink grant for this PDCCH occasion may have been received for the Serving Cell on the PDCCH for the MAC entity's CS-RNTI.

[0159] In an example, if the NDI in the received HARQ information is 1: the MAC entity may consider the NDI for the corresponding HARQ process not to have been toggled; the MAC entity may start or restart a configuredGrantTimer for the corresponding HARQ process, if configured; and the MAC entity may deliver the uplink grant and the associated HARQ information to the HARQ entity.

[0160] In an example, if the NDI in the received HARQ information is 0 and if PDCCH contents indicate configured grant Type 2 deactivation, the MAC entity may trigger configured uplink grant confirmation.

[0161] In an example, if the NDI in the received HARQ information is 0 and if PDCCH contents indicate configured grant Type 2 activation, the MAC entity may trigger configured uplink grant confirmation; the MAC entity may store the uplink grant for this Serving Cell and the associated HARQ information as configured uplink grant; the MAC entity may initialize or re-initialize the configured uplink grant for this Serving Cell to start in the associated PUSCH duration and to recur according to rules; and the MAC entity may stop the configuredGrantTimer for the corresponding HARQ process, if running.

[0162] In an example, higher layer configured parameters repK and repK-RV may define the K repetitions to be applied to the transmitted transport block, and the redundancy version pattern to be applied to the repetitions. If the parameter repK-RV is not provided in the configuredGrantConfig, the redundancy version for uplink transmissions with a configured grant may be set to 0. Otherwise, for the nth transmission occasion among K repetitions, $n=1, 2, \dots, K$, it may be associated with $(\text{mod}(n-1,4)+1)$ th value in the configured RV sequence.

[0163] In an example, the initial transmission of a transport block may start at the first transmission occasion of the K repetitions if the configured RV sequence is {0,2,3,1}. The initial transmission of a transport block may start at any of the transmission occasions of the K repetitions that are associated with RV=0 if the configured RV sequence is {0,3,0,3}. The initial transmission of a transport block may start at any of the transmission occasions of the K repetitions if the configured RV sequence is {0,0,0,0}, except the last transmission occasion when $K=8$.

[0164] In an example, for any RV sequence, the repetitions may be terminated after transmitting K repetitions, or at the last transmission occasion among the K repetitions within the period P, or from the starting symbol of the repetition that overlaps with a PUSCH with the same HARQ process scheduled by DCI format 0_0 or 0_1, whichever is reached first. In an example, the UE may not be

expected to be configured with the time duration for the transmission of K repetitions larger than the time duration derived by the periodicity P . If the UE determines that, for a transmission occasion, the number of symbols available for the PUSCH transmission in a slot is smaller than transmission duration L , the UE may not transmit the PUSCH in the transmission occasion.

[0165] In an example, for Type 1 and Type 2 PUSCH transmissions with a configured grant, when the UE is configured with $\text{rep}K > 1$, the UE may repeat the TB across the $\text{rep}K$ consecutive slots applying the same symbol allocation in each slot. A Type 1 or Type 2 PUSCH transmission with a configured grant in a slot may be omitted according to the conditions.

[0166] In an example, a wireless device may receive configuration parameters of a plurality of configured grant configurations for a BWP of a serving cell. The wireless device may be configured with separate RRC parameters for different configured grant configurations (for type 1 and/or type 2 configured grants) for a given BWP of a serving cell. In an example, some parameters may be common among different configured grant configurations.

[0167] In an example, different configured grant Type 2 configurations for a given BWP of a serving cell may be separately activated. In an example, a DCI may jointly activate two or more configured grant Type 2 configurations. In an example, different configured grant Type 2 configurations for a given BWP of a serving cell may be separately released/deactivated. In an example, a DCI may jointly deactivate/release two or more configured grant Type 2 configurations.

[0168] In an example, one or multiple Type 1 configured grant configuration(s) and/or one or multiple Type 2 configured grant configuration(s) may be simultaneously active for a given BWP of a serving cell. In an example, same Type of multiple configured grant configurations may be simultaneously active for a given BWP of a serving cell.

[0169] In an example, $M \leq 4$ bits indication in a Release/deactivation DCI may be used for indicating which configured grant configuration(s) is/are released. The association between each state indicated by the indication and the configured grant configuration(s) may be configurable by RRC. In an example, up to 2^M states may be configurable by RRC, where each of the states may be mapped to a single or multiple configured grant configurations to be released. In an example, in case of no RRC configured state(s), separate release may be used where the release corresponds to the configured grant configuration index indicated by the indication. In an example, for activation and release of UL configured grant configuration, same field(s) may be used in a DCI format.

- [0170] In an example, $M \leq 4$ bits indication in a Release/deactivation DCI may be used for indicating which DL SPS configuration(s) is/are released. The association between each state indicated by the indication and the DL SPS configuration(s) may be configurable by RRC. In an example, up to 2^M states may be configurable by RRC, where each of the states may be mapped to a single or multiple DL SPS configurations to be released. In an example, in case of no RRC configured state(s), separate release may be used where the release corresponds to the DL SPS configuration index indicated by the indication. In an example, for activation and release of DL SPS configuration, same field(s) may be used in a DCI format.
- [0171] In an example, DCI format 0_0, DCI format 0_1 and/or a new DCI format may be used for scheduling PUSCH for Type 2 configured grant activation. In an example, DCI format 0_0, DCI format 0_1 and/or a new DCI format may be used for Type 2 configured grant deactivation/release.
- [0172] In an example, M ($M \leq 4$) least significant bits of HARQ Process Number (HPN) field in DCI format 0_0 with CRC scrambled by CS-RNTI may be used to indicate which configuration is to be activated and which configuration(s) is/are to be released. In an example, ($M \leq 4$) least significant bits of HPN field in DCI format 0_1 with CRC scrambled by CS-RNTI may be used to indicate which configuration is to be activated. In an example, M ($M \leq 4$) least significant bits of HPN field in DCI format 0_1 with CRC scrambled by CS-RNTI may be used to indicate which configuration(s) are to be released. In an example, the M for activation (e.g., M_a) and M for deactivation/release (e.g., M_r) may be different.
- [0173] In an example, at least HPN field in a new UL DCI format may be used to indicate which configuration is to be activated and/or which configuration(s) is/are to be released. In an example, other field(s) may be used with or in place of the HPN field if the number of bits for HPN field is smaller than M .
- [0174] In an example, a UE may validate, for scheduling activation or scheduling release, a DL SPS assignment PDCCH or configured UL grant Type 2 PDCCH if the CRC of a corresponding DCI format is scrambled with a CS-RNTI provided by cs-RNTI, and the new data indicator field for the enabled transport block is set to '0'. An example flow diagram for PDCCH validation for configured grant and/or DL SPS activation and/or deactivation/release is shown in FIG. 16. The validation of the DCI format may be achieved if one or more fields for the DCI format are set according to first (e.g., pre-defined values). If validation is achieved, the UE may consider the information in the DCI format as a valid activation or valid release/deactivation of DL SPS or

configured UL grant Type 2. If validation is not achieved, the UE may discard the information in the DCI format.

[0175] When a wireless device receives a DCI for activation or deactivation/release of one or more uplink configured grant configurations or one or more DL SPS configurations, a validation process may be an important process prior to the activation or deactivation/release by the wireless device. The PDCCH carrying the DCI may be validated for scheduling activation or deactivation/release. Existing validation mechanisms leads to inefficient configured grant or SPS performance when DCI carries information required for identification of configured grants or SPS. There is a need to enhance the existing validation processes to improve the SPS and configured grants performance. Example embodiments enhance the validation process for configured grant and DL SPS.

[0176] In an example embodiment as shown in FIG. 17, a wireless device may receive one or more messages comprising configuration parameters. The one or more messages may comprise one or more RRC messages. The one or more messages may comprise configuration parameters of a first configured grant configuration. The configuration parameters of the first configured grant configuration may comprise a periodicity, a number of HARQ processes for the configured grant configuration, a configuration index/identifier of the configured grant configuration or a group of configured grant configurations comprising the configured grant configuration, one or more power control parameters, one or more parameters for repetition if configured, etc. The first configured grant configuration may be for a Type 2 configured grant, wherein a plurality of resources may be activated based on the receiving the configuration parameters and receiving an activation DCI indicating activation of the configured grant configuration. A Type 2 configured grant configuration may be deactivated/released based on receiving a DCI indicating the deactivation of the configured grant configuration. The wireless device may validate an activation DCI and the wireless device may activate the first configured grant configuration based on the validation being successful (achieved). The wireless device may validate a deactivation/release DCI and the wireless device may deactivate the first configured grant configuration based on the validation being successful (achieved).

[0177] In an example, the wireless device may receive a downlink control information (DCI) via a downlink control channel (e.g., PDCCH). The DCI may indicate scheduling activation of the first configured grant configuration.

[0178] In an example, the wireless device may receive a downlink control information (DCI) via a downlink control channel (e.g., PDCCH). The DCI may indicate scheduling deactivation/release of the first configured grant configuration.

[0179] The DCI may have one of a plurality of formats (e.g., an uplink DCI format such as format 0_0, format 0_1, a new format, etc.) and may comprise a plurality of fields. The plurality of fields may comprise a HARQ process number (HPN) field. An example is shown in FIG. 18. The HPN field may comprise first bits wherein the number of the first bits may be a first number. The first number (e.g., bitwidth of the HPN field) may be pre-defined or may be a configurable parameter (e.g., based on an RRC parameter). The first bits may comprise one or more second bits and one or more third bits. The number of the one or more second bits may be a second number and the number of the one or more third bits may be a third number. The first bits may comprise one or more second bits and one or more third bits. The one or more third bits may indicate the configuration index of the first configured grant configuration. In an example, the one or more third bits may indicate a group of one or more configured grant configurations comprising the first configured grant configuration. In an example, by determining the one or more third bits, the wireless device may determine the one or more second bits from the first bits and the one or more third bits. In an example, the third number of the one or more third bits may be configurable (e.g., the one or more messages may indicate the third number) and the wireless device may determine the one or more third bits based on the first bits and the third number and the position of the one or more third bits.

[0180] In an example as shown in FIG. 17, the wireless device may validate the downlink control channel for scheduling activation. In an example, the wireless device may validate the downlink control for scheduling deactivation/release. The wireless device may validate the DCI (for scheduling activation or for scheduling deactivation/release) based on the one or more second bits of the one or more first bits of the HPN field. In an example, the validation (for scheduling activation or for scheduling deactivation/release) may be based on comparing a value of the one or more second bits with first value. In an example, the first value may be pre-determined, for example, all zeros. In an example, the first value may be configurable (e.g., with RRC configuration). The one or more messages may comprise a parameter indicating the first value for comparison and validation.

[0181] In an example, the validation (for scheduling activation or deactivation/release) may further comprises comparing a second field of the downlink control information with a second sequence of one or more second bits. For example, the second field may be a redundancy version (RV) field. The second sequence of the one or more second bits may be predetermined. For example, the second sequence of the one or more second bits may be all zeros. In an example, the second sequence of the one or more second bits may be configurable (e.g., with RRC configuration). The one or more messages may comprise a parameter indicating the value of the one or more second bits for comparison and validation.

[0182] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation may be based on (e.g., in response to) a new data indicator field of the downlink control information having a first value. The first value may be zero. The wireless device may validate the downlink control for activation and/or for release/deactivation based on the new data indicator having a value of zero, otherwise the wireless device may not validate the downlink control information (control channel carrying the downlink control information).

[0183] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation may be based on (e.g., in response to) the downlink control information being associated with a first RNTI. The first RNTI may be a CS-RNTI. The wireless device may validate the downlink control for activation and/or for release/deactivation based on the radio network temporary identifier associated with the downlink control information being the first RNTI, otherwise the wireless device may not validate the downlink control information (control channel carrying the downlink control information).

[0184] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation may be based on (e.g., in response to) a radio network temporary identifier of the downlink control information being associated with a first RNTI and a new data indicator field of the downlink control information being a first value. The first RNTI may be a CS-RNTI and the first value may be zero. The wireless device may validate the downlink control for activation and/or for release/deactivation based on the radio network temporary identifier associated with the downlink control information being the first RNTI and the new data indicator field of the downlink control information being zero, otherwise

the wireless device may not validate the downlink control information (control channel carrying the downlink control information).

[0185] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation based on the HPN field (or the one or more second bits of the HPN field) may be in response to the downlink control information having one of a plurality of formats (e.g., format 0_0 or format 0_1). In response to the downlink control information not having one of the plurality of formats, the validation may not be based on the HPN field.

[0186] In an example, based on the validation for scheduling activation being successful, the wireless device may activate the configured grant configuration. The activating the configured grant configuration may comprise activating a plurality of resources based on the configured grant configuration. The wireless device may determine the plurality of resources based on one or more configuration parameters (e.g., periodicity) of the configured grant configuration and one or more parameters (e.g., resource allocation parameters) indicated by the downlink control information.

[0187] In an example, based on the validation for scheduling deactivation/release being successful, the wireless device may deactivate/release the configured grant configuration. The deactivating the configured grant configuration may comprise deactivating a plurality of resources associated with the configured grant configuration. The deactivating the plurality of resources may release the plurality of resources and the plurality of resources may be available for scheduling for the wireless device or other wireless devices. The deactivating the plurality of resources may be a physical layer deactivation and the configured grant configuration parameters (e.g., RRC configurations) may be still available for the wireless device. The wireless device may receive a new activation command indicating activation of new radio resources based on the configured grant configuration parameters.

[0188] In an example embodiment, a wireless device may receive from a base station, one or more messages comprising first configuration parameters of a first configured grant configuration. The wireless device may receive, via a downlink control channel, a downlink control information indicating scheduling activation of the first configured grant configuration, wherein the downlink control information comprises a hybrid automatic repeat request process number field comprising first bits. The wireless device may validate, for scheduling activation, the downlink control channel

based on one or more second bits of the first bits. The wireless device may activate the configured grant configuration for scheduling based on the validating being successful.

[0189] In an example, the one or more third bits may be used to identify one or more configured grant configurations. The one or more third bits may indicate a single configured grant configuration index or an identifier of a group of one or more configured grant configurations. In an example, the group of one or more configured grant configurations may be for one cell (or a BWP of one cell). In an example, the group of configured grant configurations may be for one or more cells (or one or more BWPs of one or more cells). In an example, the one or more messages may comprise a parameter indicating whether the wireless device may interpret the one or more third bits as a configuration index of a single configured grant configuration or an identifier of a group of one or more configured grant configurations. In an example, the wireless device may determine whether the wireless device may interpret the one or more third bits as a configuration index of a single configured grant configuration or an identifier of a group of one or more configured grant configurations based on a value of a second field in the DCI. A value of the second field may be an explicit indication (e.g., a flag) indicating whether the wireless device may interpret the one or more third bits as a configuration index of a single configured grant configuration or an identifier of a group of one or more configured grant configurations. In an example, a value of the second field may implicitly indicate whether the wireless device may interpret the one or more third bits as a configuration index of a single configured grant configuration or an identifier of a group of one or more configured grant configurations.

[0190] In an example, the third number may be separately configured for activation and for deactivation/release. For example, the one or more third bits may indicate a configuration index/identifier of a single configured grant configuration in case of activation and may indicate an identifier of a single or a group of one or more configured grant configurations in case of release/deactivation. The third number for activation may be smaller than the third number for deactivation/release. The wireless device may receive separate configuration parameters of the third number for activation and for deactivation/release.

[0191] In an example, the wireless device may determine the third number (at least for configured grant configuration activation) based on a number of configured grant configurations configured for the wireless device. For example, for N configured grant configurations, the third number may be logarithm of N in base 2 (e.g., $\log_2(N)$). For example, for N configured grant configurations, the

third number may be floor of logarithm of N in base 2 plus one (e.g., $\lceil \log_2(N) \rceil + 1$). For example, for N configured grant configurations, the third number may be the smallest number that can indicate N different configured grant configurations.

[0192] In an example, the wireless device may determine the third number for release/deactivation based on the third number for activation plus an offset. The offset may be configurable (e.g., as an RRC parameter or based on an RRC parameter) or may be a pre-defined value.

[0193] In an example, the third number may be based on values of one or more fields of a downlink control information (e.g., the downlink control information for scheduling activation or scheduling deactivation/release).

[0194] In an example, the wireless device may determine the one or more third bits based on the first bits of the HPN field and the third number. The one or more third bits may be third number least significant bits of the first bits. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 1110 and the third number is 2, the one or more third bits is the two least significant bits of 1110 or 10. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 0111 and the third number is 3, the one or more third bits is the three least significant bits of 0111 or 111.

[0195] The wireless device may determine the one or more second bits based on the first bits of the HPN field and the one or more third bits. For example, the one or more second bits may be remaining bits of the first bits after determining the one or more third bits. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 1110 and the one or more third bits are 10, the one or more second bits are 11. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 0111 and the one or more third bits are 111, the one or more second bits is 0.

[0196] In an example, the wireless device may determine the one or more second bits as the second number most significant bits of the first bits. The wireless device may determine the second number based on the first number and the third number. The first number may a fixed number (e.g., the HPN field may have 4 bitwidth) or may be configurable (e.g., the HPN field may have a configurable bitwidth indicated by an RRC parameter). For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 1110 and the second number is 2, the one or more second bits are 11. For example, if the HPN field of the activation or

deactivation/release DCI (e.g., the first bits) has a value of 0111 and the second number is 1, the one or more second bits are 0.

[0197] In an example embodiment as shown in FIG. 22, the wireless device may trigger a confirmation MAC control element based on the validating for scheduling activation or the validating for scheduling release/deactivation being successful. The wireless may create the confirmation MAC CE and multiplex the confirmation MAC CE in a transport block (e.g., multiplex with data of logical channels or other MAC CEs) and may transmit the transport block using an uplink resource. The reception of the MAC CE by the base station may indicate a confirmation that the wireless device received the DCI and validated the DCI for activation and/or release/deactivation.

[0198] In an example embodiment as shown in FIG. 19, a wireless device may receive one or more messages comprising configuration parameters of a plurality of configured grant configurations comprising a first configured grant configuration and a second configured grant configuration.

[0199] A plurality of DCI formats may be used for activation and/or release/deactivation of a configured grant configuration. The wireless device may receive a first downlink control information via a downlink control channel, wherein the first downlink control information is of a first format and the first downlink control information indicates scheduling activation of the first configured grant configuration. The wireless device may receive a second downlink control information via the downlink control channel, wherein the second downlink control information is of a second format and the second downlink control information indicates scheduling activation of the second configured grant configuration. The first downlink control information may comprise a first HPN field and the second downlink control information may comprise a second HPN field.

[0200] In an example, the wireless device may receive a first downlink control information via a downlink control channel, wherein the first downlink control information is of a first format and the first downlink control information indicates scheduling deactivation/release of the first configured grant configuration. The wireless device may receive a second downlink control information via the downlink control channel, wherein the second downlink control information is of a second format and the second downlink control information indicates scheduling deactivation/release of the second configured grant configuration. The first downlink control information may comprise a first HPN field and the second downlink control information may comprise a second HPN field.

[0201] Based on the first downlink control information having the first format, the wireless device may validate the downlink control channel for scheduling activation of the first configured grant configuration employing a value of the first HPN field. For example, the wireless device may validate the downlink control channel for scheduling activation of the first configured grant configuration based on value of one or more bits of the first bits of the HPN field.

[0202] In an example, based on the first downlink control information having the first format, the wireless device may validate the downlink control channel for scheduling deactivation/release of the first configured grant configuration employing a value of the first HPN field. For example, the wireless device may validate the downlink control channel for scheduling deactivation/release of the first configured grant configuration based on value of one or more bits of the first bits of the HPN field.

[0203] Based on the second downlink control information having the second format, the wireless device may validate the downlink control channel for scheduling activation of the second configured grant configuration without employing a value of the second HPN field. The wireless device may employ one or more values of one or more other fields of the second downlink control information for validating the downlink control channel for scheduling activation of the second configured grant configuration.

[0204] In an example, based on the second downlink control information having the second format, the wireless device may validate the downlink control channel for scheduling deactivation/release of the second configured grant configuration without employing a value of the second HPN field. The wireless device may employ one or more values of one or more other fields of the second downlink control information for validating the downlink control channel for scheduling deactivation/release of the second configured grant configuration.

[0205] In an example embodiment, a wireless device may receive one or more messages comprising configuration parameters of a configured grant configuration. The wireless device may receive a downlink control information via a downlink control channel, wherein the downlink control information comprises an HPN field.

[0206] Based on the downlink control information having one or more first formats, the wireless device may validate the downlink control channel for scheduling activation of first configured grant configuration employing a value of the HPN field. For example, the wireless device may validate

the downlink control channel for scheduling activation of the configured grant configuration based on value of one or more bits of the first bits of the HPN field.

[0207] In an example, based on the downlink control information having one or more first formats, the wireless device may validate the downlink control channel for scheduling deactivation/release of the configured grant configuration employing a value of the HPN field. For example, the wireless device may validate the downlink control channel for scheduling deactivation/release of the configured grant configuration based on value of one or more bits of the first bits of the HPN field.

[0208] Based on the downlink control information having one or more second formats, the wireless device may validate the downlink control channel for scheduling activation of the configured grant configuration without employing a value of the HPN field. The wireless device may employ one or more values of one or more other fields of the downlink control information for validating the downlink control channel for scheduling activation of the configured grant configuration.

[0209] In an example, based on the second downlink control information having one or more second formats, the wireless device may validate the downlink control channel for scheduling deactivation/release of the configured grant configuration without employing a value of the HPN field. The wireless device may employ one or more values of one or more other fields of the downlink control information for validating the downlink control channel for scheduling deactivation/release of the configured grant configuration.

[0210] A MAC PDU may comprise of one or more MAC subPDUs. A MAC subPDU may comprise of one of the following: a MAC subheader only (including padding); a MAC subheader and a MAC SDU; a MAC subheader and a MAC CE; a MAC subheader and padding. The MAC SDUs may be of variable sizes. A MAC subheader may correspond to either a MAC SDU, a MAC CE, or padding. A MAC subheader except for fixed sized MAC CE, padding, and a MAC SDU containing UL CCCH may comprise of the four header fields R/F/LCID/L. A MAC subheader for fixed sized MAC CE, padding, and a MAC SDU containing UL CCCH may comprise of the two header fields R/LCID. FIG. 23A, FIG. 23B and FIG. 23C show example MAC subheaders. For example, FIG. 23A shows an example R/F/LCID/L MAC subheader with 8-bit L field. FIG. 23B shows an example R/F/LCID/L MAC subheader with 16-bit L field and FIG. 23C shows an example R/LCID MAC subheader. MAC CEs may be placed together. DL MAC subPDU(s) with MAC CE(s) may be placed before a MAC subPDU with MAC SDU and MAC subPDU with

padding. The UL MAC subPDU(s) with MAC CE(s) may be placed after the MAC subPDU(s) with MAC SDU and before the MAC subPDU with padding in the MAC PDU. The size of padding may be zero.

[0211] FIG. 24 shows an example uplink MAC PDU (transport block) comprising a plurality of MAC subPDUs, wherein a MAC subPDU may comprise a subheader and MAC SDU (e.g. data from one or more logicals) or a MAC subPDU may comprise a subheader and a MAC control element (MAC CE). A MAC CE may be a fixed-size MAC CE wherein the length of the MAC CE may be a fixed value or may be a variable-sized MAC CE wherein the length of the MAC CE may be variable.

[0212] The subheader of a MAC subPDU may comprise a logical channel identifier (LCID). The LCID field may identify the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE or padding. In an example, a MAC subheader may comprise one LCID field. The LCID field size may be 6 bits. One or more first LCIDs (e.g., LCIDs for MAC CEs included in MAC subPDUs) may have pre-defined values and one or more second LCIDs (e.g., LCIDs for MAC SDUs included in subPDUs) may be configured for a logical channel/bearer, the data of which is included in the MAC subPDU. For example, an RRC parameter `logicalchannelidentity` may indicate an LCID of a logical channel.

[0213] When a MAC subPDU comprises a MAC SDU or a variable-sized MAC CE, the subheader contained in the MAC subPDU may have a length field. The Length field may indicate the length of the corresponding MAC SDU or variable-sized MAC CE in bytes. There may be one L field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. The size of the L field may be indicated by the F field.

[0214] The F field (Format field) may indicate the size of the Length field. There may be one F field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. The size of the F field may be 1 bit. The value 0 may indicate 8 bits of the Length field. The value 1 may indicate 16 bits of the Length field.

[0215] A wireless device may trigger and transmit a confirmation MAC CE based on receiving and validating DCI for activation or release/deactivation of a configured grant configuration. The transmission of confirmation MAC CE is important so that the base station may determine that an activation or deactivation/release DCI is received correctly and validated by the wireless device. When an activation or deactivation/release DCI indicates activation or deactivation/release of one

or a group of configured grant configurations, existing confirmation mechanisms lead to inefficient configured grants operation for the wireless device. There is a need to enhance the confirmation process for configured grants. Example embodiments enhance the confirmation process for configured grants.

[0216] In an example embodiment as shown in FIG. 22, the wireless device may transmit a confirmation MAC control element based on a successful validation of a downlink control channel for scheduling activation or scheduling deactivation/release of a configured grant configuration.

[0217] In an example embodiment as shown in FIG. 25, the confirmation MAC CE may be a fixed-size MAC CE. The confirmation MAC CE may have a field comprising a plurality of bits, wherein the size of the field may be fixed and the number of the plurality of bits may be a fixed number. The plurality of bits in the confirmation MAC CE field may comprise the one or more third bits that are indicated as part of the HPN field of the activation or deactivation/release DCI. The one or more third bits of the HPN field indicate the one or more configured grant configurations that are indicated for activation or deactivation/release. The one or more third bits in the MAC CE field indicate that the wireless device received the activation or deactivation/release DCI and successfully validated the activation or the deactivation/release DCI. In an example, the confirmation MAC CE may be a fixed-size MAC CE and may be included in a MAC subPDU for multiplexing in a MAC PDU (transport block) and transmission via an uplink resource.

[0218] In an example, the one or more third bits may be included as the least significant bits of the fixed-size MAC CE field. The fixed-size MAC CE field may have a size of one octet and the third number of the one or more third bits may be 3. The one or more third bits may be included as the rightmost (least significant) three bits of the MAC CE field.

[0219] In an example, the one or more third bits may be the most significant bits of the fixed-size MAC CE field. The fixed-size MAC CE field may have a size of one octet and the third number of the one or more third bits may be 3. The one or more third bits may be included as the leftmost (most significant) three bits of the MAC CE field.

[0220] In an example embodiment as shown in FIG. 26, the confirmation MAC CE may be a variable-size MAC CE. The confirmation MAC CE may have a field comprising a plurality of bits, wherein the size of the field may be variable and the number of the plurality of bits may be the third number of the one or more third bits. The plurality of bits in the confirmation MAC CE field may be the one or more third bits that are indicated as part of the HPN field of the activation or

deactivation/release DCI. The one or more third bits of the HPN field indicate the one or more configured grant configurations that are indicated for activation or deactivation/release. The one or more third bits in the MAC CE field indicate that the wireless device received the activation or deactivation/release DCI and successfully validated the activation or the deactivation/release DCI. In an example, the confirmation MAC CE may be a variable-size MAC CE and may be included in a MAC subPDU for multiplexing in a MAC PDU (transport block) and transmission via an uplink resource. A MAC subheader in the MAC subPDU may comprise a length field indicating the length of the confirmation MAC CE.

[0221] In an example embodiment as shown in FIG. 20, a wireless device may receive one or more messages comprising configuration parameters. The one or more messages may comprise one or more RRC messages. The one or more messages may comprise configuration parameters of a first downlink semi-persistent scheduling (DL SPS) configuration. The configuration parameters of the first DL SPS configuration may comprise a periodicity, a number of HARQ processes for the DL SPS configuration, a configuration index/identifier of the DL SPS configuration or a group of DL SPS configurations comprising the DL SPS configuration, one or more power control parameters, one or more parameters for repetition if configured, etc. A plurality of resources may be activated based on the receiving the configuration parameters and receiving an activation DCI indicating activation of the first DL SPS configuration. The first DL SPS configuration may be deactivated/released based on receiving a DCI indicating the deactivation of the DL SPS configuration. The wireless device may validate an activation DCI and the wireless device may activate the first DL SPS configuration based on the validation being successful (achieved). The wireless device may validate a deactivation/release DCI and the wireless device may deactivate the first DL SPS configuration based on the validation being successful (achieved).

[0222] In an example, the wireless device may receive a downlink control information (DCI) via a downlink control channel (e.g., PDCCH). The DCI may indicate scheduling activation of the first DL SPS configuration.

[0223] In an example, the wireless device may receive a downlink control information (DCI) via a downlink control channel (e.g., PDCCH). The DCI may indicate scheduling deactivation/release of the first DL SPS configuration.

[0224] The DCI may have one of a plurality of formats (e.g., a downlink DCI format such as format 1_0, format 1_1, a new format, etc.) and may comprise a plurality of fields. The plurality of

fields may comprise a HARQ process number (HPN) field. An example is shown in FIG. 21. The HPN field may comprise first bits wherein the number of the first bits may be a first number. The first number (e.g., bitwidth of the HPN field) may be pre-defined or may be a configurable parameter (e.g., based on an RRC parameter). The first bits may comprise one or more second bits and one or more third bits. The number of the one or more second bits may be a second number and the number of the one or more third bits may be a third number. The one or more third bits may indicate the configuration index of the first DL SPS configuration. In an example, the one or more third bits may indicate a group of one or more DL SPS configurations comprising the first DL SPS configuration. In an example, by determining the one or more third bits, the wireless device may determine the one or more second bits from the first bits and the one or more third bits. In an example, the third number of the one or more third bits may be configurable (e.g., the one or more messages may indicate the third number) and the wireless device may determine the one or more third bits based on the first bits and the third number and the position of the one or more third bits.

[0225] In an example as shown in FIG. 20, the wireless device may validate the downlink control channel for scheduling activation. In an example, the wireless device may validate the downlink control for scheduling deactivation/release. The wireless device may validate the DCI (for scheduling activation or for scheduling deactivation/release) based on the one or more second bits of the one or more first bits of the HPN field. In an example, the validation (for scheduling activation or for scheduling deactivation/release) may be based on comparing a value of the one or more second bits with first value. In an example, the first value may be pre-determined, for example, all zeros. In an example, the first value may be configurable (e.g., with RRC configuration). The one or more messages may comprise a parameter indicating the first value for comparison and validation.

[0226] In an example, the validation (for scheduling activation or deactivation/release) may further comprises comparing a second field of the downlink control information with a second sequence of one or more second bits. For example, the second field may be a redundancy version (RV) field. The second sequence of the one or more second bits may be predetermined. For example, the second sequence of the one or more second bits may be all zeros. In an example, the second sequence of the one or more second bits may be configurable (e.g., with RRC configuration). The one or more messages may comprise a parameter indicating the value of the one or more second bits for comparison and validation.

[0227] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation may be based on (e.g., in response to) a new data indicator field of the downlink control information having a first value. The first value may be zero. The wireless device may validate the downlink control for activation and/or for release/deactivation based on the new data indicator having a value of zero, otherwise the wireless device may not validate the downlink control information (control channel carrying the downlink control information).

[0228] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation may be based on (e.g., in response to) the downlink control information being associated with a first RNTI. The first RNTI may be a CS-RNTI. The wireless device may validate the downlink control for activation and/or for release/deactivation based on the radio network temporary identifier associated with the downlink control information being the first RNTI, otherwise the wireless device may not validate the downlink control information (control channel carrying the downlink control information).

[0229] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation may be based on (e.g., in response to) a radio network temporary identifier of the downlink control information being associated with a first RNTI and a new data indicator field of the downlink control information being a first value. The first RNTI may be a CS-RNTI and the first value may be zero. The wireless device may validate the downlink control for activation and/or for release/deactivation based on the radio network temporary identifier associated with the downlink control information being the first RNTI and the new data indicator field of the downlink control information being zero, otherwise the wireless device may not validate the downlink control information (control channel carrying the downlink control information).

[0230] In an example, the validating the downlink control channel (control channel carrying the downlink control information) for activation and/or for release/deactivation based on the HPN field (or the one or more second bits of the HPN field) may be in response to the downlink control information having one of a plurality of formats (e.g., format 1_0 or format 1_1). In response to the downlink control information not having one of the plurality of formats, the validation may not be based on the HPN field.

[0231] In an example, based on the validation for scheduling activation being successful, the wireless device may activate the DL SPS configuration. The activating the DL SPS configuration may comprise activating a plurality of resources based on the DL SPS configuration. The wireless device may determine the plurality of resources based on one or more configuration parameters (e.g., periodicity) of the configured grant configuration and one or more parameters (e.g., resource allocation parameters) indicated by the downlink control information.

[0232] In an example, based on the validation for scheduling deactivation/release being successful, the wireless device may deactivate/release the DL SPS configuration. The deactivating the DL SPS configuration may comprise deactivating a plurality of resources associated with the DL SPS configuration. The deactivating the plurality of resources may release the plurality of resources and the plurality of resources may be available for scheduling for the wireless device or other wireless devices. The deactivating the plurality of resources may be a physical layer deactivation and the DL SPS configuration parameters (e.g., RRC configurations) may be still available for the wireless device. The wireless device may receive a new activation command indicating activation of new radio resources based on the DL SPS configuration parameters.

[0233] In an example embodiment, a wireless device may receive from a base station, one or more messages comprising first configuration parameters of a first DL SPS configuration. The wireless device may receive, via a downlink control channel, a downlink control information indicating scheduling activation of the first DL SPS configuration, wherein the downlink control information comprises a hybrid automatic repeat request process number field comprising first bits. The wireless device may validate, for scheduling activation, the downlink control channel based on one or more second bits of the first bits. The wireless device may activate the DL SPS configuration for scheduling based on the validating being successful.

[0234] In an example, the one or more third bits may be used to identify one or more DL SPS configurations. The one or more third bits may indicate a single DL SPS configuration index or an identifier of a group of one or more DL SPS configurations. In an example, the group of one or more DL SPS configurations may be for one cell (or a BWP of one cell). In an example, the group of DL SPS configurations may be for one or more cells (or one or more BWPs of one or more cells). In an example, the one or more messages may comprise a parameter indicating whether the wireless device may interpret the one or more third bits as a configuration index of a single DL SPS configuration or an identifier of a group of one or more DL SPS configurations. In an example, the

wireless device may determine whether the wireless device may interpret the one or more third bits as a configuration index of a single DL SPS configuration or an identifier of a group of one or more DL SPS configurations based on a value of a second field in the DCI. A value of the second field may be an explicit indication (e.g., a flag) indicating whether the wireless device may interpret the one or more third bits as a configuration index of a single DL SPS configuration or an identifier of a group of one or more DL SPS configurations. In an example, a value of the second field may implicitly indicate whether the wireless device may interpret the one or more third bits as a configuration index of a single DL SPS configuration or an identifier of a group of one or more DL SPS configurations.

[0235] In an example, the third number may be separately configured for activation and for deactivation/release. For example, the one or more third bits may indicate a configuration index/identifier of a single DL SPS configuration in case of activation and may indicate an identifier of a single or a group of one or more DL SPS configurations in case of release/deactivation. The third number for activation may be smaller than the third number for deactivation/release. The wireless device may receive separate configuration parameters of the third number for activation and for deactivation/release.

[0236] In an example, the wireless device may determine the third number (at least for DL SPS configuration activation) based on a number of DL SPS configurations configured for the wireless device. For example, for N DL SPS configurations, the third number may be logarithm of N in base 2. For example, for N DL SPS configurations, the third number may be floor of logarithm of N in base 2 plus one. For example, for N DL SPS configurations, the third number may be the smallest number that can indicate N different DL SPS configurations.

[0237] In an example, the wireless device may determine the third number for release/deactivation based on the third number for activation plus an offset. The offset may be configurable (e.g., as an RRC parameter or based on an RRC parameter) or may be a pre-defined value.

[0238] In an example, the third number may be based on values of one or more fields of a downlink control information (e.g., the downlink control information for scheduling activation or scheduling deactivation/release).

[0239] In an example, the wireless device may determine the one or more third bits based on the first bits of the HPN field and the third number. The one or more third bits may be third number least significant bits of the first bits. For example, if the HPN field of the activation or

deactivation/release DCI (e.g., the first bits) has a value of 1110 and the third number is 2, the one or more third bits is the two least significant bits of 1110 or 10. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 0111 and the third number is 3, the one or more third bits is the three least significant bits of 0111 or 111.

[0240] The wireless device may determine the one or more second bits based on the first bits of the HPN field and the one or more third bits. For example, the one or more second bits may be remaining bits of the first bits after determining the one or more third bits. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 1110 and the one or more third bits are 10, the one or more second bits are 11. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 0111 and the one or more third bits are 111, the one or more second bits is 0.

[0241] In an example, the wireless device may determine the one or more second bits as the second number most significant bits of the first bits. The wireless device may determine the second number based on the first number and the third number. The first number may a fixed number (e.g., the HPN field may have 4 bitwidth) or may be configurable (e.g., the HPN field may have a configurable bitwidth indicated by an RRC parameter). For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 1110 and the second number is 2, the one or more second bits are 11. For example, if the HPN field of the activation or deactivation/release DCI (e.g., the first bits) has a value of 0111 and the second number is 1, the one or more second bits are 0.

[0242] In an example embodiment, a wireless device may receive from a base station, one or more messages comprising first configuration parameters of a first configured grant configuration. The wireless device may receive, via a downlink control channel, a downlink control information indicating scheduling release/deactivation of the first configured grant configuration, wherein the downlink control information comprises a hybrid automatic repeat request process number field comprising first bits. The wireless device may validate, for scheduling release/deactivation, the downlink control channel based on one or more second bits of the first bits. The wireless device may release/deactivate the configured grant configuration for scheduling based on the validating being successful.

[0243] In an example embodiment, a wireless device may receive from a base station, one or more messages comprising first configuration parameters of a first downlink semi-persistent scheduling

(DL SPS) configuration. The wireless device may receive, via a downlink control channel, a downlink control information indicating scheduling activation of the first DL SPS configuration, wherein the downlink control information comprises a hybrid automatic repeat request process number field comprising first bits. The wireless device may validate, for scheduling activation, the downlink control channel based on one or more second bits of the first bits. The wireless device may activate the DL SPS configuration for scheduling based on the validating being successful.

[0244] In an example embodiment, a wireless device may receive from a base station, one or more messages comprising first configuration parameters of a first DL SPS configuration. The wireless device may receive, via a downlink control channel, a downlink control information indicating scheduling release/deactivation of the first DL SPS configuration, wherein the downlink control information comprises a hybrid automatic repeat request process number field comprising first bits. The wireless device may validate, for scheduling release/deactivation, the downlink control channel based on one or more second bits of the first bits. The wireless device may release/deactivate the DL SPS configuration for scheduling based on the validating being successful.

[0245] In an example, the first bits comprise the one or more second bits and one or more third bits. In an example, the one or more messages further comprise a parameter indicating a third number of the one or more third bits. In an example, the third number may be separately configured for scheduling activation and scheduling release/deactivation. In an example, the third number for scheduling release/deactivation may be larger than the third number of scheduling activation.

[0246] In an example, the third number of the one or more third bits may be based on a fourth number of a plurality of configured grant configurations comprising the first configured grant configuration.

[0247] In an example, the third number of the one or more third bits may be based on a fourth number of a plurality of DL SPS configurations comprising the first DL SPS configuration.

[0248] In an example, the third number of the one or more third bits may be logarithm (base 2) of the fourth number. In an example, the third number of the one or more third bits may be larger than or equal to the logarithm (base 2) of the fourth number. The one or more messages may comprise configuration parameters of the plurality of configured grants. The one or more messages may comprise configuration parameters of the plurality of DL SPSs.

[0249] In an example, the third number of the one or more third bits may be a configurable parameter. In an example, the first configuration parameters may comprise a parameter indicating

the third number of the one or more third bits. In an example, the first configuration parameters may comprise a first parameter indicating the third number of the one or more third bits for activation and a second parameter indicating the third number of the one or more third bits for release/deactivation. In an example, the third number of the one or more third bits may be determined based on one or more second fields in the activation DCI. In an example, the third number of the one or more third bits may be determined based on one or more second field in the release/deactivation DCI.

[0250] In an example, the wireless device may determine the one or more third bits as a third number least significant bits of the first bits. For example, if the first bits are 1110 and the third number is 2, the one or more third bits may be 10.

[0251] In an example, the wireless device may determine the one or more second bits based on the first bits and the one or more third bits. For example, if the first bits are 1110 and the one or more third bits are 10, the wireless device may determine the one or more second bits to be 11.

[0252] In an example, the wireless device may determine the one or more second bits as second number most significant bits of the first bits. In an example, the wireless device may determine the second number of the one or more second bits based on the first of the first bits and the third number of the one or more third bits. The wireless device may determine the second number as the first number of the first bits minus the third number of the one or more third bits. For example, the first number may be 4 and the third number may be 2 (e.g., the third number may be indicated to the wireless device as 2). The wireless device may determine the second number to be 2. The wireless device may determine the one or more second bits as 2 most significant bits of the first bits. For example, if the first bits are 1110, the wireless device may determine the second bits as 11.

[0253] In an example, the one or more messages may comprise configuration parameters of a plurality of configured grants. The plurality of configured grant configurations may comprise the first configured grant configuration. In an example, the plurality of configured grants may be for a first BWP (UL BWP) of a cell.

[0254] In an example, the one or more messages may comprise configuration parameters of a plurality of DL SPSs. The plurality of DL SPSs may comprise the first DL SPS. In an example, the plurality of DL SPSs may be for a first BWP (DL BWP) of a cell.

[0255] In an example, the first configuration parameters may comprise a first identifier of the first configured grant configuration; and the one or more third bits may indicate the first identifier.

[0256] In an example, the first configuration parameters may comprise a first identifier of the first DL SPS configuration; and the one or more third bits may indicate the first identifier.

[0257] In an example, the first configuration parameters comprise a first identifier of the first configured grant configuration; and the one or more third bits indicate one or more identifiers comprising the first identifier.

[0258] In an example, the first configuration parameters comprise a first identifier of the first DL SPS configuration; and the one or more third bits indicate one or more identifiers comprising the first identifier.

[0259] In an example, the wireless device may determine the first configured grant configuration of a plurality of configured grant configurations based on the one or more third bits.

[0260] In an example, the wireless device may determine the first DL SPS configuration of a plurality of DL SPS configurations based on the one or more third bits.

[0261] In an example, the wireless device may determine one or more configured grant configurations, comprising the first configured grant configuration, of a plurality of configured grant configurations based on the one or more third bits.

[0262] In an example, the wireless device may determine one or more DL SPS configurations, comprising the first DL SPS configuration, of a plurality of DL SPS configurations based on the one or more third bits.

[0263] In an example, the validating for scheduling activation or the validating for scheduling deactivation/release may comprise comparing the second bits with a sequence of one or more bits. In an example, the sequence of one or more bits may be pre-determined. In an example, the pre-determined sequence of the one or more bits may be a sequence of all zeros. In an example, the sequence of the one or more bits may be configured by RRC. In an example, the first configuration parameters may indicate the sequence of one or more bits.

[0264] In an example, the validating may further comprise comparing a second field of the downlink control information with a sequence of one or more second bits. In an example, the sequence of one or more second bits may be pre-determined. In an example, the second field may be a redundancy version field; and the predetermined sequence of one or more second bits may be a sequence of one or more zeros.

[0265] In an example, the validating the downlink control channel may be based on (e.g., in response to) a new data indicator field of the downlink control information having a first value. In an example, the first value may be zero.

[0266] In an example, the validating the downlink control channel may be based on (e.g., in response to) a radio network temporary identifier associated with the downlink control information being a first radio network temporary identifier (e.g., cs-RNTI or a new RNTI for a new DCI format).

[0267] In an example, the validating the downlink control channel for scheduling activation may be based on one or more second bits of the first bits in response to the downlink control information having one of a plurality of formats (e.g., a format 0_1 or 0_1). In response to the DCI format not having one of the plurality of formats, the validating may not be based on the one or more second bits of the first bits or may not be based on the HARQ process number field.

[0268] In an example, the validating the downlink control channel for scheduling release/deactivation may be based on one or more second bits of the first bits in response to the downlink control information having one of a plurality of formats (e.g., format 0_1 or 0_1). In response to the DCI format not having one of the plurality of formats, the validating may not be based on the one or more second bits of the first bits or may not be based on the HARQ process number field.

[0269] In an example, the wireless device may determine a plurality of resources based on a periodicity parameter, wherein the first configuration parameters comprise the periodicity parameter. In an example, the wireless device may activate the plurality of resources based on the determining the plurality of resources.

[0270] In an example, the wireless device may transmit a confirmation MAC control element based on the activating or releasing/deactivating being successful.

[0271] In an example embodiment, a wireless device may receive from a base station, one or more messages comprising configuration parameters of a first configured grant configuration and a second configured grant configuration. The wireless device may receive, via a downlink control channel, a first downlink control information of a first format indicating scheduling activation of the first configured grant configuration, wherein the first downlink control information comprises a first hybrid automatic repeat request process number field. The wireless device may receive, via a downlink control channel, a second downlink control information of a second format indicating

scheduling activation of the second configured grant configuration, wherein the second downlink control information comprises a second hybrid automatic repeat request process number field. Based on the first downlink control information being of the first format, the wireless device may validate the downlink control channel for scheduling activation of the first configured grant configuration employing a value of the first hybrid automatic repeat request field. Based on the second downlink control information being of the second format, the wireless device may validate the downlink control channel for scheduling activation of the second configured grant configuration without employing a value of the second hybrid automatic repeat request field. The wireless device may activate the first configured grant configuration for scheduling activation of the first configured grant configuration based on the validating the downlink control channel for scheduling activation of the first configured grant configuration being successful. The wireless device may activate the second configured grant configuration for scheduling activation of the second configured grant configuration based on the validating the downlink control channel for scheduling activation of the second configured grant configuration being successful.

[0272] In an example embodiment, the wireless device may receive from a base station, one or more messages comprising configuration parameters of a configured grant configuration. The wireless device may receive, via a downlink control channel, a downlink control information scheduling activation of the configured grant configuration, wherein the downlink control information comprises a hybrid automatic repeat request process number field. Based on the downlink control information being of one or more first formats, the wireless device may validate the downlink control channel for scheduling activation of the configured grant configuration, based on the hybrid automatic repeat request process number field. Based on the downlink control information being of one or more second formats, the wireless device may validate the downlink control channel for scheduling activation of the configured grant configuration not based on the hybrid automatic repeat request process number field. The wireless device may activate the configured grant configuration for scheduling activation of the configured grant configuration based on the validating being successful.

[0273] In an example, based on the downlink control information being of the one or more first formats, the validating the downlink control channel for scheduling activation of the configured grant configuration may be based on values of one or more bits of the hybrid automatic repeat request process number field.

[0274] In an example, the MAC control element comprises a field comprising a plurality of bits. A fifth number of the plurality of bits may be a fixed number. The plurality of bits may comprise the one or more third bits.

[0275] In an example, the MAC control element is a fixed-size MAC control element; and the MAC control element is in a MAC subPDU multiplexed in a MAC PDU.

[0276] In an example, the one or more third bits may be the least significant bits of the plurality of bits.

[0277] In an example, the MAC control element comprises a field comprising a plurality of bits; a fifth number of the plurality of bits may be the third number of the one or more third bits; and the plurality of bits may be the one or more third bits.

[0278] In an example, the MAC control element is a variable-size MAC control element; the MAC control element is in a MAC subPDU multiplexed in a MAC PDU; and a MAC subheader in the MAC subPDU comprises a length field indicating a length of the MAC control element.

[0279] A wireless device may be configured with periodic resources in uplink (e.g., based on uplink configured grants) or downlink (e.g., based on downlink semi-persistent scheduling (SPS)). The wireless device may be configured with one or multiple uplink configured grant (e.g., Type 2 configured grant) configurations and/or one or multiple downlink SPS configurations. An uplink configured grant (e.g., Type 2 configured grant) configuration or a downlink SPS configuration may be activated or deactivated based on physical layer signaling and using an activation downlink control information (DCI) or a deactivation DCI. The wireless device may perform a validation process for a DCI in response to the DCI being associated with configured scheduling (e.g., in response to a CRC of the DCI being scrambled with a configured scheduling RNTI) and in response to an NDI field of the DCI having a value of zero. The existing validation processes for a DCI that activates or deactivates/releases an uplink configured configuration or a downlink SPS configuration is inefficient when the wireless device is configured with multiple uplink configured grant configurations and/or multiple downlink SPS configurations and leads to inefficient DCI validation, improper scheduling of periodic resources and degraded wireless device and network performance. There is a need to enhance the validation process for an activation DCI or a deactivation/release DCI that activates or deactivates/releases an uplink configured grant configuration or a downlink SPS configuration. Example embodiments enhance the validation

process for a DCI that activates or deactivates/releases an uplink configured grant configuration or a downlink SPS configuration.

[0280] In example embodiments for example as shown in FIG. 27, FIG. 28, FIG. 29 and FIG. 33, a wireless device may receive one or more messages comprising configuration parameters. The one or more messages may comprise one or more RRC messages. The one or more messages may comprise configuration parameters of one or more cells. The one or more messages may comprise configuration parameters of one or more bandwidth parts (BWPs) of a cell in the one or more cells. The one or more messages may comprise configuration parameters of one or more uplink configured grant configurations comprising an uplink configured grant configuration. The one or more uplink configured grant configurations, including the uplink configured grant configuration, may be configured for the cell of the one or more cells. The one or more uplink configured grant configurations, including the uplink configured grant configuration, may be configured for a BWP of the one or more BWPs of the cell. The uplink configured grant configuration may be a Type 2 configured grant configuration wherein the uplink configured grant configuration may be activated in response to receiving an activation DCI and the uplink configured grant configuration may be deactivated in response to receiving a deactivation DCI. The wireless device may first validate a received DCI as a valid activation DCI or a valid deactivation DCI and may activate the uplink configured grant configuration or deactivate the uplink configured grant configuration based on the DCI and based on validating the DCI as a valid activation DCI or a valid deactivation DCI.

[0281] The configuration parameters of the one or more uplink configured grant configurations may comprise an RNTI that may be used for activation or deactivation of an uplink configured grant configuration or for retransmission of a TB transmitted via a configured grant resource associated with the uplink configured grant retransmission. A DCI that may be used for activation or deactivation of the uplink configured grant configuration or for scheduling retransmission of TB that was transmitted via a configured grant resource may be associated with the RNTI. The RNTI may be a configured scheduling RNTI (CS-RNTI).

[0282] In an example when a plurality of configured grant configurations are configured, configuration parameters of an uplink configured grant configuration may comprise an identifier (e.g., a configuration index) for the uplink configured grant configuration (e.g., a separate configuration index for each of the plurality of configured grant configurations). The configuration parameters of an uplink configured grant configuration may further include a periodicity (e.g., in

terms of number of symbols) that may indicate a separation between consecutive resources associated with the uplink configured grant configuration. The configuration parameters of an uplink configured grant configuration may further include a number of HARQ processes associated with the uplink configured grant configuration, one or more parameters for determining resources associated with the uplink configured grant configurations in the time domain and/or the frequency domain, one or more power control parameters, one or more repetition parameters, etc.

[0283] The wireless device may receive a DCI associated with the RNTI (e.g., CS-RNTI) that is used for activation and/or deactivation/release of a configured grant configuration. The DCI may comprise a plurality of fields including a HARQ process number field, a new data indicator (NDI) field, a redundancy version (RV) field. The wireless device may determine, based on a validation process, whether the DCI is a valid activation DCI or a valid release DCI for the uplink configured grant configuration. The wireless device may perform the validation process for the DCI based on the DCI being associated with the CS-RNTI and based on a value of the NDI field of the DCI being zero. In an example, the wireless device may be configured with multiple configured grant configurations and a value of the HARQ process number field in a DCI may indicate an activation or a deactivation for a corresponding UL configured grant configuration (e.g., configured grant Type 2 configuration) with a same value as provided by Configuredgrantconfig-index. In an example, the wireless device may be configured with multiple configured grant configurations, including the uplink configured grant configuration, and one or more first bits of the HARQ process number field of the DCI may indicate a configuration index of the uplink configured grant configuration. In an example, the wireless device may be configured with a single configured grant configurations, e.g., the uplink configured grant configuration, and one or more bits of the HARQ process number field of the DCI may not be used for indication of a configuration index of the uplink configured grant configuration. The DCI may further comprise a redundancy version (RV) field comprising one or more second bits.

[0284] The wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI. The validation process to determine that the DCI is a valid activation DCI or a valid deactivation/release DCI may be based on whether the HARQ process number field is used for indication of the configuration index of the uplink configured grant configuration. The HARQ process number field of the DCI may comprise one or more first bits and the RV field of the DCI may comprise one or more second bits. The wireless device may determine that the DCI is a

valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field of the DCI, for example by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros). In an example embodiment as shown in FIG. 27, the wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) further based on the one or more first bits of the HARQ process number field of the DCI (e.g., by comparing values of the one or more first bits with one or more first predetermined values (e.g., all zeros)) in response to the one or more first bits of the HARQ process number field of the DCI not indicating (e.g., not being used for indication of) the configuration index of the uplink configured grant configuration. The wireless device may determine whether the one or more first bits of the HARQ process number field indicates (e.g., is used for indication of) the configuration index of the uplink configured grant configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more first bits of the HARQ process number field (e.g., by comparing values of the one or more first bits with one or more first predetermined values (e.g., all zeros)) and the one or more second bits of the RV field (e.g., by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros)) in response to the determination that the one or more first bits of the HARQ process number field of the DCI not indicating (e.g., not being used for indication of) the configuration index of the uplink configured grant configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field and not based on the one or more first bits of the HARQ process number field in response to the determination that the one or more first bits of the HARQ process number field of the DCI indicates (e.g., used for indication of) the configuration index of the uplink configured grant configuration. In an example embodiment as shown in FIG. 28, in response to the one or more first bits of the HARQ process number field of the DCI not indicating (e.g., not being used for indication) of the configuration index of the uplink configured grant, the wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field of the DCI (e.g., by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros)) and based on the one or more first bits of the HARQ process number field of the DCI (e.g., by comparing values of the one or more first bits with one or

more first predetermined values (e.g., all zeros)). In an example embodiment as shown in FIG. 29, in response to the one or more first bits of the HARQ process number field of the DCI indicating (e.g., being used for indication) of the configuration index of the uplink configured grant, the wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field of the DCI (e.g., by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros)) and not based on the one or more first bits of the HARQ process number field of the DCI.

[0285] In an example embodiment as shown in FIG. 33, the wireless device may determine that the wireless device is a valid activation DCI or a valid release/deactivation DCI. The validation process for the received DCI (e.g., the determination that the DCI is a valid activation DCI or a valid release/deactivation DCI) at the wireless device may or may not be based on one or more bits of the HARQ process number field of the received DCI. The determination that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on whether one or more bits of the HARQ process field of the DCI are used for indication of a configuration index of the uplink configured grant configuration.

[0286] In an example, the DCI may be used for deactivation/release of multiple uplink configured grant configurations. The wireless device may receive a configuration parameter indicating a deactivation state list. The deactivation state list may comprise a plurality of deactivation states wherein each deactivation state, in the plurality of deactivation states, may indicate one or more configuration indexes of one or more uplink configured grant configurations. A value of the HARQ process number field of DCI may indicate a deactivation state that indicates one or more configuration indexes of one or more configured grant configurations including a configuration index of the uplink configured grant configuration. The wireless device may determine that the DCI is a valid deactivation/release DCI based on the one or more second bits of the RV field of the DCI and not based on the one or more first bits of the HARQ process number field of the DCI in response to determining that the HARQ process number field of the DCI is used for indication of the deactivation state which indicates the one or more configuration indexes of the one or more uplink configured grant configurations including the configuration index of the uplink configured grant configuration.

[0287] In an example, the wireless device may transmit a confirmation control element (e.g., a confirmation MAC CE). The wireless device may transmit the confirmation control element in response to determining that the DCI is a valid activation or valid release DCI (e.g., in response to validating the DCI or the validation of the DCI being successful). In an example that the wireless device is configured with a plurality of configured grant configurations, the confirmation control element may indicate the uplink configured grant configuration in the plurality of uplink configured grant configurations. In an example, the confirmation control element may indicate that the DCI, indicating activation or deactivation of the uplink configured grant configuration in the plurality of uplink configured grant configurations, is received.

[0288] The wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration based on determining that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., based on the validation of the DCI being successful). For example, in case of the DCI being an activation DCI, the plurality of resources may be determined based on the activation DCI and the configuration parameters of the uplink configured grant configuration. For example, in case of the DCI being a deactivation/release DCI, the plurality of resources may be determined based on a previously received activation DCI and the configuration parameters of the uplink configured grant configuration. The activation or deactivation of the plurality of resources may be based on an offset from the timing of the reception of the DCI and may be based on the DCI processing time and/or wireless device capabilities.

[0289] In example embodiments for example as shown in FIG. 30, FIG. 31, FIG. 32 and FIG. 34, a wireless device may receive one or more messages comprising configuration parameters. The one or more messages may comprise one or more RRC messages. The one or more messages may comprise configuration parameters of one or more cells. The one or more messages may comprise configuration parameters of one or more bandwidth parts (BWPs) of a cell in the one or more cells. The one or more messages may comprise configuration parameters of one or more downlink semi-persistent scheduling (SPS) configurations comprising a downlink SPS configuration. The one or more SPS configurations, including the downlink SPS configuration, may be configured for the cell of the one or more cells. The one or more downlink SPS configurations, including the downlink SPS configuration, may be configured for a BWP of the one or more BWPs of the cell. The downlink SPS configuration may be activated in response to receiving an activation DCI and the downlink SPS configuration may be deactivated in response to receiving a deactivation DCI. The

wireless device may first validate a received DCI as a valid activation DCI or a valid deactivation DCI and may activate the downlink SPS configuration or deactivate the downlink SPS configuration based on the DCI and based on validating the DCI as a valid activation DCI or a valid deactivation DCI.

[0290] The configuration parameters of the one or more downlink SPS configurations may comprise an RNTI that may be used for activation or deactivation of a downlink SPS configuration or for retransmission of a TB transmitted via a downlink SPS resource associated with the downlink SPS retransmission. A DCI that may be used for activation or deactivation of the downlink SPS configuration or for scheduling retransmission of TB that was received via a downlink SPS resource may be associated with the RNTI. The RNTI may be a configured scheduling RNTI (CS-RNTI).

[0291] In an example when a plurality of downlink SPS configurations may be configured, configuration parameters of a downlink SPS configuration may comprise an identifier (e.g., a configuration index) for the downlink SPS configuration (e.g., a separate configuration index for each of the plurality of downlink SPS configurations). The configuration parameters of a downlink SPS configuration may further include a periodicity (e.g., in terms of number of symbols) that may indicate a separation between consecutive resources associated with the downlink SPS configuration. The configuration parameters of a downlink SPS configuration may further include a number of HARQ processes associated with the downlink SPS configuration, one or more parameters for determining resources associated with the downlink SPS configuration in the time domain and/or the frequency domain, etc.

[0292] The wireless device may receive a DCI associated with the RNTI (e.g., CS-RNTI) that is used for activation and/or deactivation/release of a downlink SPS configuration. The DCI may comprise a plurality of fields including a HARQ process number field, a new data indicator (NDI) field, a redundancy version (RV) field. The wireless device may determine, based on a validation process, whether the DCI is a valid activation DCI or a valid release DCI for the downlink SPS configuration. The wireless device may perform the validation process for the DCI based on the DCI being associated with the CS-RNTI and based on a value of the NDI field of the DCI being zero. In an example, the wireless device may be configured with multiple downlink SPS configurations and a value of the HARQ process number field in a DCI may indicate an activation or a deactivation for a corresponding DL SPS configuration with a same value as provided by

SPSconfig-index. In an example, the wireless device may be configured with multiple downlink SPS configurations, including the downlink SPS configuration, and one or more first bits of the HARQ process number field of the DCI may indicate a configuration index of the downlink SPS configuration. In an example, the wireless device may be configured with a single downlink SPS configurations, e.g., the downlink SPS configuration, and one or more bits of the HARQ process number field of the DCI may not be used for indication of a configuration index of the downlink SPS configuration. The DCI may further comprise a redundancy version (RV) field comprising one or more second bits.

[0293] The wireless device may determine that the wireless device is a valid activation DCI or a valid release/deactivation DCI. The validation process to determine that the DCI is a valid activation DCI or a valid deactivation/release DCI may be based on whether the HARQ process number field is used for indication of the configuration index of the downlink SPS configuration. The HARQ process number field of the DCI may comprise one or more first bits and the RV field of the DCI may comprise one or more second bits. The wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field of the DCI, for example by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros). In an example embodiment as shown in FIG. 30, the wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) further based on the one or more first bits of the HARQ process number field of the DCI (e.g., by comparing values of the one or more first bits with one or more first predetermined values (e.g., all zeros)) in response to the one or more first bits of the HARQ process number field of the DCI not indicating (e.g., not being used for indication of) the configuration index of the downlink SPS configuration. The wireless device may determine whether the one or more first bits of the HARQ process number field indicates (e.g., is used for indication of) the configuration index of the downlink SPS configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more first bits of the HARQ process number field (e.g., by comparing values of the one or more first bits with one or more first predetermined values (e.g., all zeros)) and the one or more second bits of the RV field (e.g., by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros)) in response to the determination that the one or more first bits of the HARQ

process number field of the DCI does not indicate (e.g., are not used for indication of) the configuration index of the downlink SPS configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field and not based on the one or more first bits of the HARQ process number field in response to the determination that the one or more first bits of the HARQ process number field of the DCI indicates (e.g., used for indication of) the configuration index of the downlink SPS configuration. In an example embodiment as shown in FIG. 31, in response to the one or more first bits of the HARQ process number field of the DCI not indicating (e.g., not being used for indication) of the configuration index of the downlink SPS configuration, the wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field of the DCI (e.g., by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros)) and based on the one or more first bits of the HARQ process number field of the DCI (e.g., by comparing values of the one or more first bits with one or more first predetermined values (e.g., all zeros)). In an example embodiment as shown in FIG. 32, in response to the one or more first bits of the HARQ process number field of the DCI indicating (e.g., being used for indication) of the configuration index of the downlink SPS configuration, the wireless device may determine that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., validate the DCI) based on the one or more second bits of the RV field of the DCI (e.g., by comparing values of the one or more second bits with one or more second predetermined values (e.g., all zeros)) and not based on the one or more first bits of the HARQ process number field of the DCI.

[0294] In an example embodiment as shown in FIG. 34, the wireless device may determine that the wireless device is a valid activation DCI or a valid release/deactivation DCI. The validation process for the received DCI (e.g., the determination that the DCI is a valid activation DCI or a valid release/deactivation DCI) at the wireless device may or may not be based on one or more bits of the HARQ process number field of the received DCI. The determination that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on whether one or more bits of the HARQ process field of the DCI are used for indication of a configuration index of the downlink SPS configuration.

[0295] In an example, the DCI may be used for deactivation/release of multiple downlink SPS configurations. The wireless device may receive a configuration parameter indicating a deactivation state list. The deactivation state list may comprise a plurality of deactivation states wherein each deactivation state, in the plurality of deactivation states, may indicate one or more configuration indexes of one or more downlink SPS configurations. A value of the HARQ process number field of DCI may indicate a deactivation state that indicates one or more configuration indexes of one or more downlink SPS configurations including a configuration index of the downlink SPS configuration. The wireless device may determine that the DCI is a valid deactivation/release DCI based on the one or more second bits of the RV field of the DCI and not based on the one or more first bits of the HARQ process number field of the DCI in response to determining that the HARQ process number field of the DCI is used for indication of the deactivation state which indicates the one or more configuration indexes of the one or more downlink SPS configurations including the configuration index of the downlink SPS configuration.

[0296] The wireless device may activate or deactivate a plurality of resources associated with the downlink SPS configuration based on determining that the DCI is a valid activation DCI or a valid deactivation/release DCI (e.g., based on the validation of the DCI being successful). For example, in case of the DCI being an activation DCI, the plurality of resources may be determined based on the activation DCI and the configuration parameters of the downlink SPS configuration. For example, in case of the DCI being a deactivation/release DCI, the plurality of resources may be determined based on a previously received activation DCI and the configuration parameters of the downlink SPS configuration. The activation or deactivation of the plurality of resources may be based on an offset from the timing of the reception of the DCI and may be based on the DCI processing time and/or wireless device capabilities.

[0297] In accordance with various exemplary embodiments in the present disclosure, a device (e.g., a wireless device, a base station and/or alike) may include one or more processors and may include memory that may store instructions. The instructions, when executed by the one or more processors, cause the device to perform actions as illustrated in the accompanying drawings and described in the specification. The order of events or actions, as shown in a flow chart of this disclosure, may occur and/or may be performed in any logically coherent order. In some examples, at least two of the events or actions shown may occur or may be performed at least in part simultaneously and/or in parallel. In some examples, one or more additional events or actions may

occur or may be performed prior to, after, or in between the events or actions shown the flow charts of the present disclosure.

[0298] FIG. 35 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 3510, a wireless device may receive configuration parameters of an uplink configured grant configuration. At 3520, the wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. At 3530, the wireless device may determine whether a first value of the one or more first bits indicates a configuration index of the uplink configured grant configuration. At 3540, the wireless device may determine that the DCI is a valid activation DCI or a valid release DCI: based on the one or more second bits and not based on the one or more first bits in response to the first value indicating the configuration index; and based on the one or more second bits and the one or more first bits in response to the first value not indicating the configuration index. At 3550, the wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0299] In example embodiments, the wireless device may receive a configuration parameter indicating one or more deactivation states. The first value of the one or more first bits of the HARQ process number field may indicate a first deactivation state of the one or more deactivation states. The first deactivation state may correspond to one or more uplink configured grant configurations comprising the uplink configured grant configurations. The wireless device may determine that the DCI is a valid release/deactivation DCI at 3540 and may deactivate the plurality of resources associated with the uplink configured grant configuration at 3550.

[0300] In example embodiments, the wireless device may transmit a confirmation control element. The confirmation control element may comprise a field with a second value. The second value may indicate that the DCI indicating activation or deactivation/release of the uplink configured grant configuration is received. The second value may indicate that the DCI indicating activation or deactivation/release of the uplink configured grant configuration, in a plurality of uplink configured grant confirmations, is received.

[0301] In an example embodiment, the configuration parameters of the uplink configured grant configuration, received at 3510, may comprise a first radio network temporary identifier (RNTI). The first RNTI may be a configured scheduling RNTI (CS-RNTI). The DCI received at 3520 may

be associated with the first radio network temporary identifier. In an example embodiment, the DCI may further comprise a new data indicator field. The determining, at 3540, that the DCI is a valid activation DCI or a valid release/deactivation DCI may further be based on the DCI being associated with the first radio network temporary identifier and based on a third value of the new data indicator field being zero.

[0302] In an example embodiment, the wireless device may be configured with a plurality of configured grant configurations comprising the uplink configured grant configuration. In an example embodiment, the wireless device may receive second configuration parameters of bandwidth part of a cell. The plurality of uplink configured grant configurations may be for the bandwidth part. The first value of the one or more first bits of the HARQ process number field may indicate the configuration index of the uplink configured grant configuration in the plurality of uplink configured grant configurations. In an example embodiment, the configuration parameters of the uplink configured grant configuration may comprise a first parameter indicating the configuration index. The determining, at 3540, that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on the one or more second bits and not based on the one or more first bits.

[0303] In an example embodiment, in response to the first value indicating the configuration index, the determining, at 3540, that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on comparing the one or more second bits with one or more second predetermined values. In an example embodiment, in response to the first value not indicating the configuration index, the determining, at 3540, that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on comparing the one or more second bits with one or more second predetermined values and comparing the one or more first bits with one or more first predetermined values. In example embodiments, the one or more first predetermined values may be all zeros. In example embodiments, the one or more second predetermined values may be all zeros.

[0304] In an example embodiment, a wireless device may receive configuration parameters of an uplink configured grant configuration. The wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. The wireless device may determine that a first value of the one or more first bits does not indicate a configuration index of the uplink configured grant configuration. The wireless device

may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and the one or more first bits. The wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0305] FIG. 36 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 3610, a wireless device may receive configuration parameters of an uplink configured grant configuration. At 3620, the wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. At 3630, in response to a first value of the one or more first bits not indicating a configuration index of the uplink configured grant configuration, the wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and the one or more first bits. At 3640, the wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0306] In an example embodiment, a wireless device may receive configuration parameters of an uplink configured grant configuration. The wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. The wireless may determine that a first value of the one or more first bits indicates a configuration index of the uplink configured grant configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and not based on the one or more first bits. The wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0307] FIG. 37 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 3710, a wireless device may receive configuration parameters of an uplink configured grant configuration. At 3720, the wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. At 3730, in response to a first value of the one or more first bits indicating a configuration index of the uplink configured grant configuration, determining that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and

not based on the one or more first bits. At 3740, the wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0308] FIG. 38 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 3810, a wireless device may receive configuration parameters of a downlink semi-persistent scheduling (SPS) configuration. At 3820, the wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. At 3830, the wireless device may determine whether a first value of the one or more first bits indicates a configuration index of the downlink SPS configuration. At 3840, the wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI: based on the one or more second bits and not based on the one or more first bits in response to the first value indicating the configuration index; and based on the one or more second bits and the one or more first bits in response to the first value not indicating the configuration index. At 3850, the wireless device may activate or deactivate a plurality of resources associated with the downlink SPS configuration.

[0309] In example embodiments, the wireless device may receive a configuration parameter indicating one or more deactivation states. The first value of the one or more first bits of the HARQ process number field may indicate a first deactivation state of the one or more deactivation states. The first deactivation state may correspond to one or more downlink SPS configurations comprising the downlink SPS configurations. The wireless device may determine that the DCI is a valid release/deactivation DCI at 3840 and may deactivate the plurality of resources associated with the downlink SPS configuration at 3850.

[0310] In an example embodiment, the configuration parameters of the downlink SPS configuration, received at 3810, may comprise a first radio network temporary identifier (RNTI). The first RNTI may be a configured scheduling RNTI (CS-RNTI). The DCI received at 3820 may be associated with the first radio network temporary identifier. In an example embodiment, the DCI may further comprise a new data indicator field. The determining, at 3840, that the DCI is a valid activation DCI or a valid release/deactivation DCI may further be based on the DCI being associated with the first radio network temporary identifier and based on a third value of the new data indicator field being zero.

[0311] In an example embodiment, the wireless device may be configured with a plurality of downlink SPS configurations comprising the downlink SPS configuration. In an example embodiment, the wireless device may receive second configuration parameters of bandwidth part of a cell. The plurality of downlink SPS configurations may be for the bandwidth part. The first value of the one or more first bits of the HARQ process number field may indicate the configuration index of the downlink SPS configuration in the plurality of downlink SPS configurations. In an example embodiment, the configuration parameters of the downlink SPS configuration may comprise a first parameter indicating the configuration index. The determining, at 3840, that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on the one or more second bits and not based on the one or more first bits.

[0312] In an example embodiment, in response to the first value indicating the configuration index, the determining, at 3840, that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on comparing the one or more second bits with one or more second predetermined values. In an example embodiment, in response to the first value not indicating the configuration index, the determining, at 3840, that the DCI is a valid activation DCI or a valid release/deactivation DCI may be based on comparing the one or more second bits with one or more second predetermined values and comparing the one or more first bits with one or more first predetermined values. In example embodiments, the one or more first predetermined values may be all zeros. In example embodiments, the one or more second predetermined values may be all zeros.

[0313] In an example embodiment, a wireless device may receive configuration parameters of a downlink semi-persistent scheduling (SPS) configuration. The wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. The wireless device may determine that that a first value of the one or more first bits does not indicate a configuration index of the downlink SPS configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and the one or more first bits. The wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0314] FIG. 39 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 3910, a wireless device may receive configuration

parameters of a downlink semi-persistent scheduling (SPS) configuration. At 3920, the wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. At 3930, in response to a first value of the one or more first bits not indicating a configuration index of the downlink SPS configuration, the wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and the one or more first bits. At 3940, the wireless device may activate or deactivate a plurality of resources associated with the downlink SPS configuration.

[0315] In an example embodiment, a wireless device may receive configuration parameters of a downlink semi-persistent scheduling (SPS) configuration. The wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. The wireless device may determine that a first value of the one or more first bits indicates a configuration index of the downlink SPS configuration. The wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and not based on the one or more first bits. The wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0316] FIG. 40 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 4010, a wireless device may receive configuration parameters of a downlink semi-persistent scheduling (SPS) configuration. At 4020, the wireless device may receive a downlink control information (DCI) comprising: a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and a redundancy version field comprising one or more second bits. At 4030, in response to a first value of the one or more first bits indicating a configuration index of the downlink SPS configuration, determining that the DCI is a valid activation DCI or a valid release/deactivation DCI based on the one or more second bits and not based on the one or more first bits. At 4040, the wireless device may activate or deactivate a plurality of resources associated with the downlink SPS configuration.

[0317] FIG. 41 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 4110, a wireless device may receive configuration parameters of an uplink configured grant configuration. At 4120, the wireless device may receive a

downlink control information (DCI) comprising a hybrid automatic repeat request (HARQ) process number field. At 4130, the wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI, wherein the determining is based on whether one or more bits of the HARQ process number field are used for indication of a configuration index of the uplink configured grant configuration. At 4140, the wireless device may activate or deactivate a plurality of resources associated with the uplink configured grant configuration.

[0318] In an example embodiment, the DCI, received at 4120, may further comprise a redundancy version field. The determining, at 4130, may further be based on one or more second bits of the redundancy version field.

[0319] FIG. 42 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 4210, a wireless device may receive configuration parameters of a downlink semi-persistent scheduling (SPS) configuration. At 4220, the wireless device may receive a downlink control information (DCI) comprising a hybrid automatic repeat request (HARQ) process number field. At 4230, the wireless device may determine that the DCI is a valid activation DCI or a valid release/deactivation DCI, wherein the determining is based on whether one or more bits of the HARQ process number field are used for indication of a configuration index of the downlink SPS configuration. At 4240, the wireless device may activate or deactivate a plurality of resources associated with the downlink SPS configuration.

[0320] In an example embodiment, the DCI, received at 4220, may further comprise a redundancy version field. The determining, at 4230, may further be based on one or more second bits of the redundancy version field.

[0321] Various exemplary embodiments of the disclosed technology are presented as example implementations and/or practices of the disclosed technology. The exemplary embodiments disclosed herein are not intended to limit the scope. Persons of ordinary skill in the art will appreciate that various changes can be made to the disclosed embodiments without departure from the scope. After studying the exemplary embodiments of the disclosed technology, alternative aspects, features and/or embodiments will become apparent to one of ordinary skill in the art. Without departing from the scope, various elements or features from the exemplary embodiments may be combined to create additional embodiments. The exemplary embodiments are described with reference to the drawings. The figures and the flowcharts that demonstrate the benefits and/or functions of various aspects of the disclosed technology are presented for illustration purposes only.

The disclosed technology can be flexibly configured and/or reconfigured such that one or more elements of the disclosed embodiments may be employed in alternative ways. For example, an element may be optionally used in some embodiments or the order of actions listed in a flowchart may be changed without departure from the scope.

[0322] An example embodiment of the disclosed technology may be configured to be performed when deemed necessary, for example, based on one or more conditions in a wireless device, a base station, a radio and/or core network configuration, a combination thereof and/or alike. For example, an example embodiment may be performed when the one or more conditions are met. Example one or more conditions may be one or more configurations of the wireless device and/or base station, traffic load and/or type, service type, battery power, a combination of thereof and/or alike. In some scenarios and based on the one or more conditions, one or more features of an example embodiment may be implemented selectively.

[0323] In this disclosure, the articles “a” and “an” used before a group of one or more words are to be understood as “at least one” or “one or more” of what the group of the one or more words indicate. The use of the term “may” before a phrase is to be understood as indicating that the phrase is an example of one of a plurality of useful alternatives that may be employed in an embodiment in this disclosure.

[0324] In this disclosure, an element may be described using the terms “comprises”, “includes” or “consists of” in combination with a list of one or more components. Using the terms “comprises” or “includes” indicates that the one or more components are not an exhaustive list for the description of the element and do not exclude components other than the one or more components. Using the term “consists of” indicates that the one or more components is a complete list for description of the element. In this disclosure, the term “based on” is intended to mean “based at least in part on”. The term “based on” is not intended to mean “based only on”. In this disclosure, the term “and/or” used in a list of elements indicates any possible combination of the listed elements. For example, “X, Y, and/or Z” indicates X; Y; Z; X and Y; X and Z; Y and Z; or X, Y, and Z.

[0325] Some elements in this disclosure may be described by using the term “may” in combination with a plurality of features. For brevity and ease of description, this disclosure may not include all possible permutations of the plurality of features. By using the term “may” in combination with the plurality of features, it is to be understood that all permutations of the plurality of features are being disclosed. For example, by using the term “may” for description of an element with four possible

features, the element is being described for all fifteen permutations of the four possible features. The fifteen permutations include one permutation with all four possible features, four permutations with any three features of the four possible features, six permutations with any two features of the four possible features and four permutations with any one feature of the four possible features.

[0326] Although mathematically a set may be an empty set, the term set used in this disclosure is a nonempty set. Set B is a subset of set A if every element of set B is in set A. Although mathematically a set has an empty subset, a subset of a set is to be interpreted as a non-empty subset in this disclosure. For example, for set A={subcarrier1, subcarrier2}, the subsets are {subcarrier1}, {subcarrier2} and {subcarrier1, subcarrier2}.

[0327] In this disclosure, the phrase “based on” may be used equally with “based at least on” and what follows “based on” or “based at least on” indicates an example of one of plurality of useful alternatives that may be used in an embodiment in this disclosure. The phrase “in response to” may be used equally with “in response at least to” and what follows “in response to” or “in response at least to” indicates an example of one of plurality of useful alternatives that may be used in an embodiment in this disclosure. The phrase “depending on” may be used equally with “depending at least on” and what follows “depending on” or “depending at least on” indicates an example of one of plurality of useful alternatives that may be used in an embodiment in this disclosure. The phrases “employing” and “using” and “employing at least” and “using at least” may be used equally in this in this disclosure and what follows “employing” or “using” or “employing at least” or “using at least” indicates an example of one of plurality of useful alternatives that may be used in an embodiment in this disclosure.

[0328] The example embodiments disclosed in this disclosure may be implemented using a modular architecture comprising a plurality of modules. A module may be defined in terms of one or more functions and may be connected to one or more other elements and/or modules. A module may be implemented in hardware, software, firmware, one or more biological elements (e.g., an organic computing device and/or a neurocomputer) and/or a combination thereof and/or alike. Example implementations of a module may be as software code configured to be executed by hardware and/or a modeling and simulation program that may be coupled with hardware. In an example, a module may be implemented using general-purpose or special-purpose processors, digital signal processors (DSPs), microprocessors, microcontrollers, application-specific integrated circuits (ASICs), programmable logic devices (PLDs) and/or alike. The hardware may be

programmed using machine language, assembly language, high-level language (e.g., Python, FORTRAN, C, C++ or the like) and/or alike. In an example, the function of a module may be achieved by using a combination of the mentioned implementation methods.

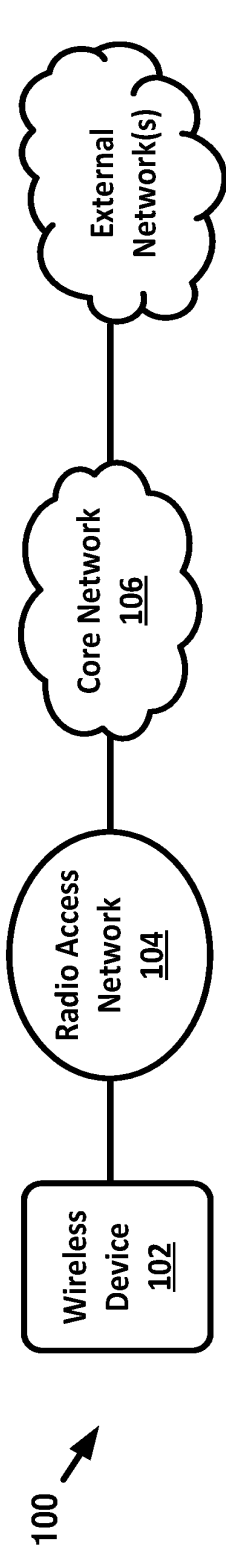


FIG. 1A

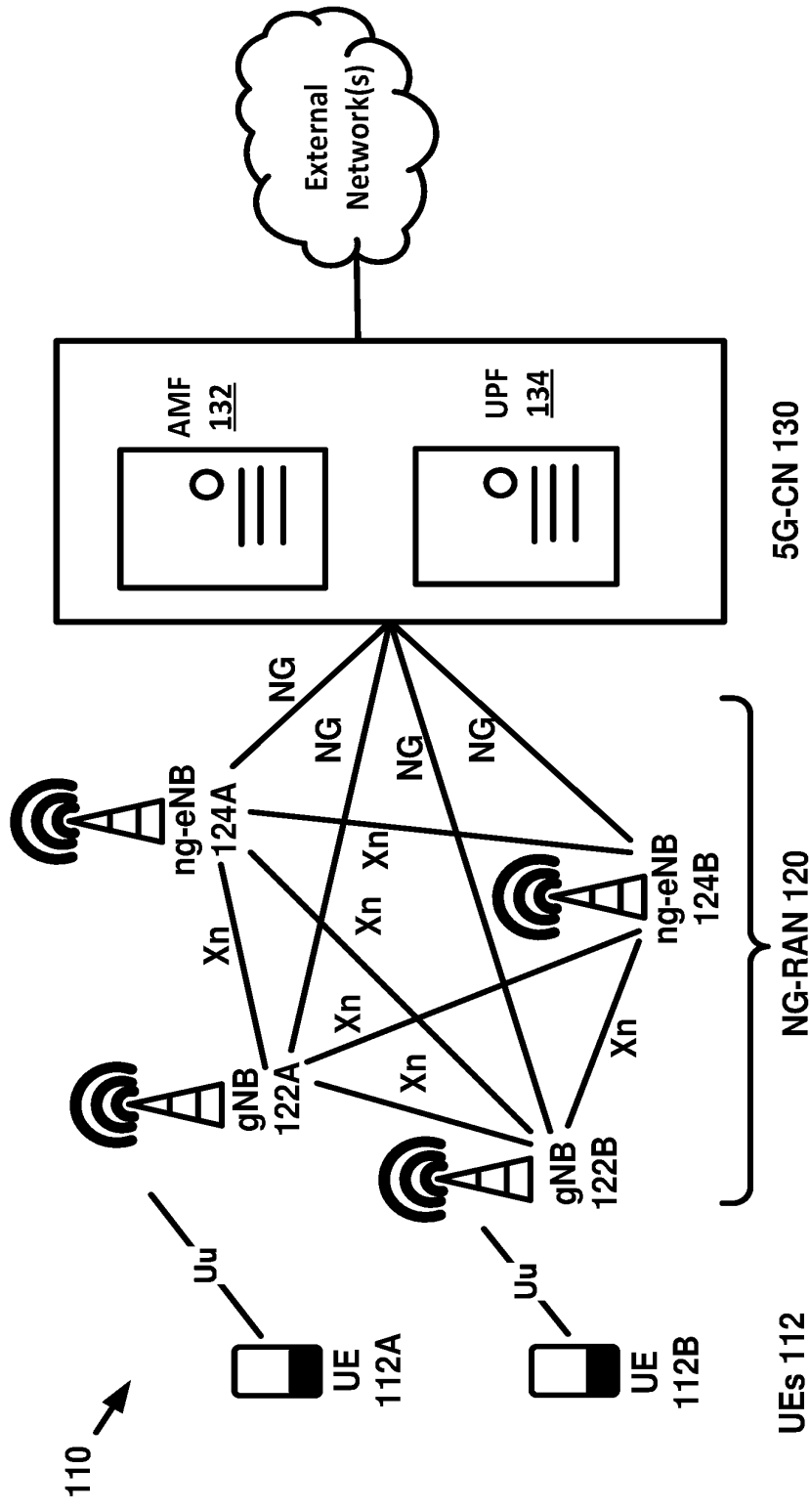


FIG. 1B

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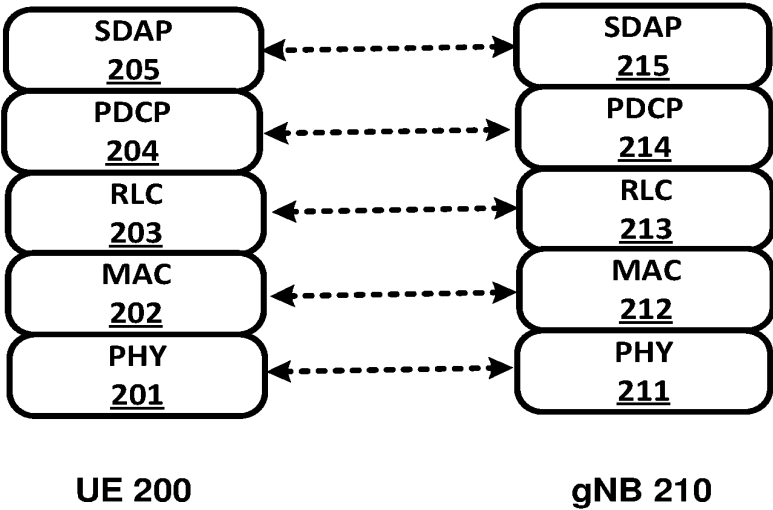


FIG. 2A

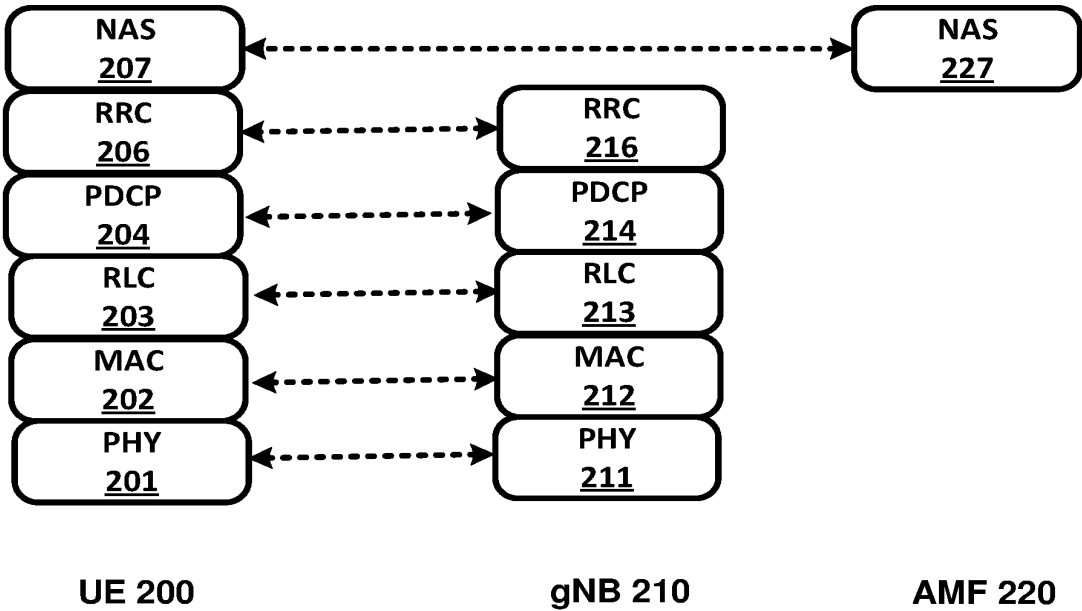


FIG. 2B

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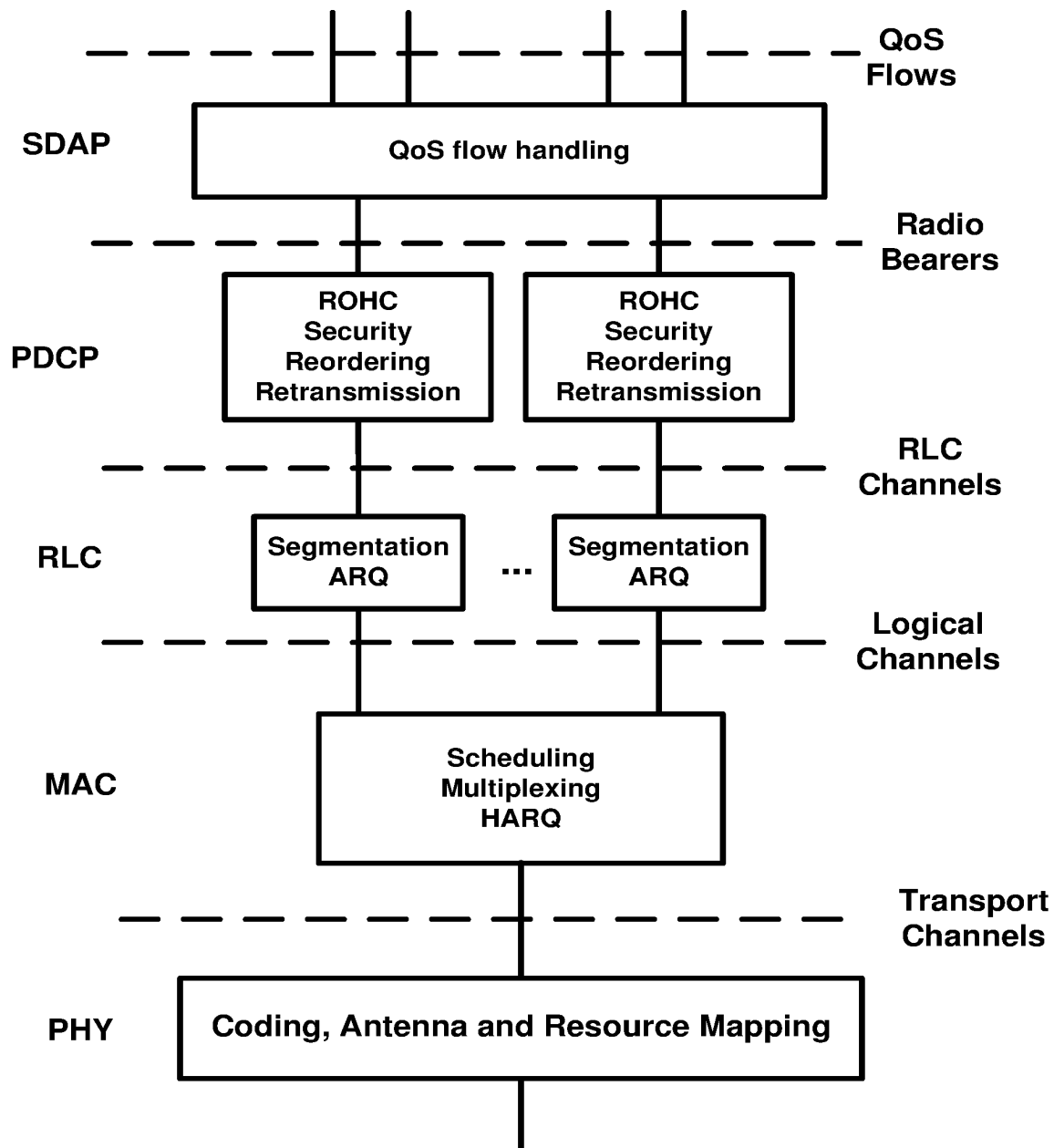


FIG. 3

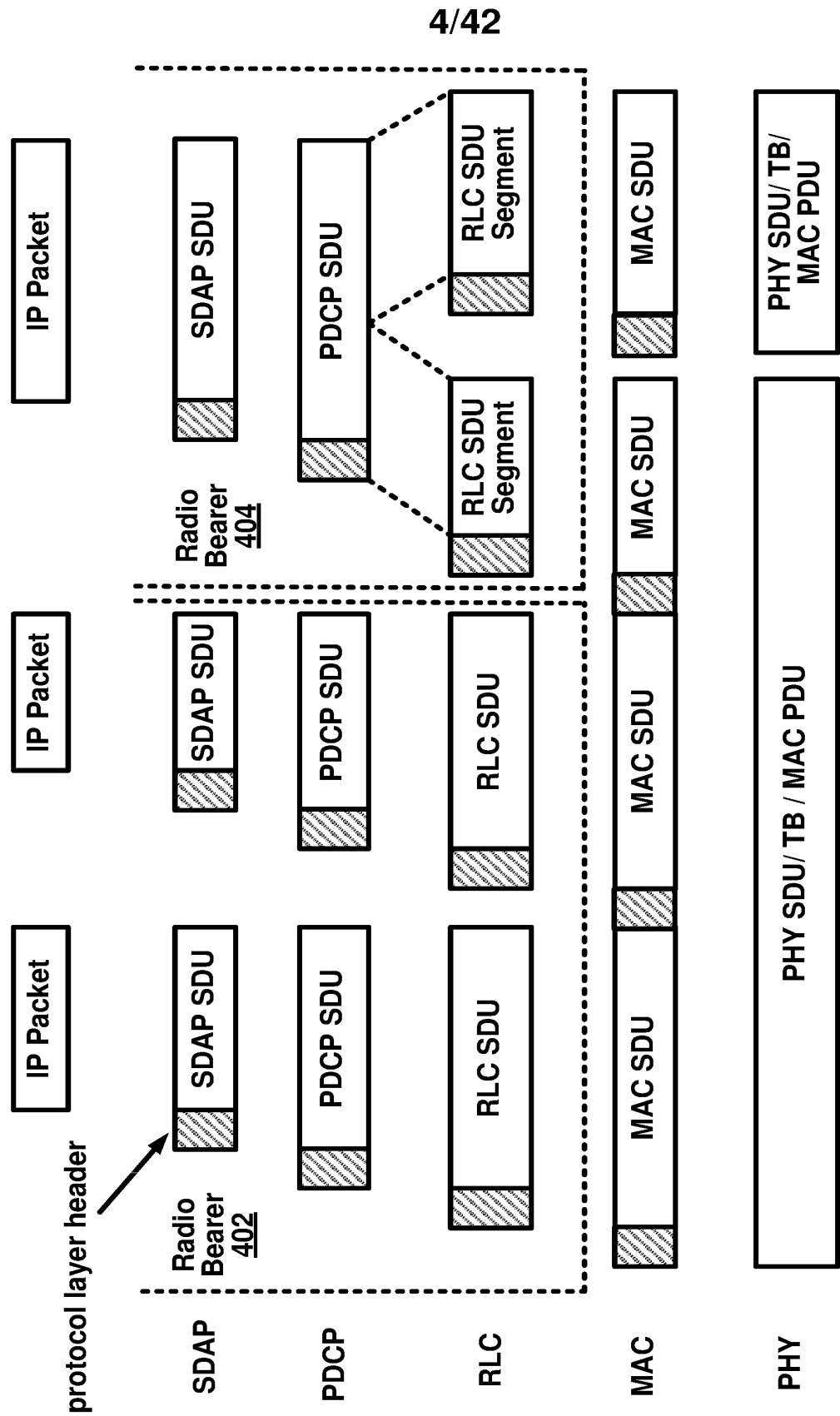


FIG. 4

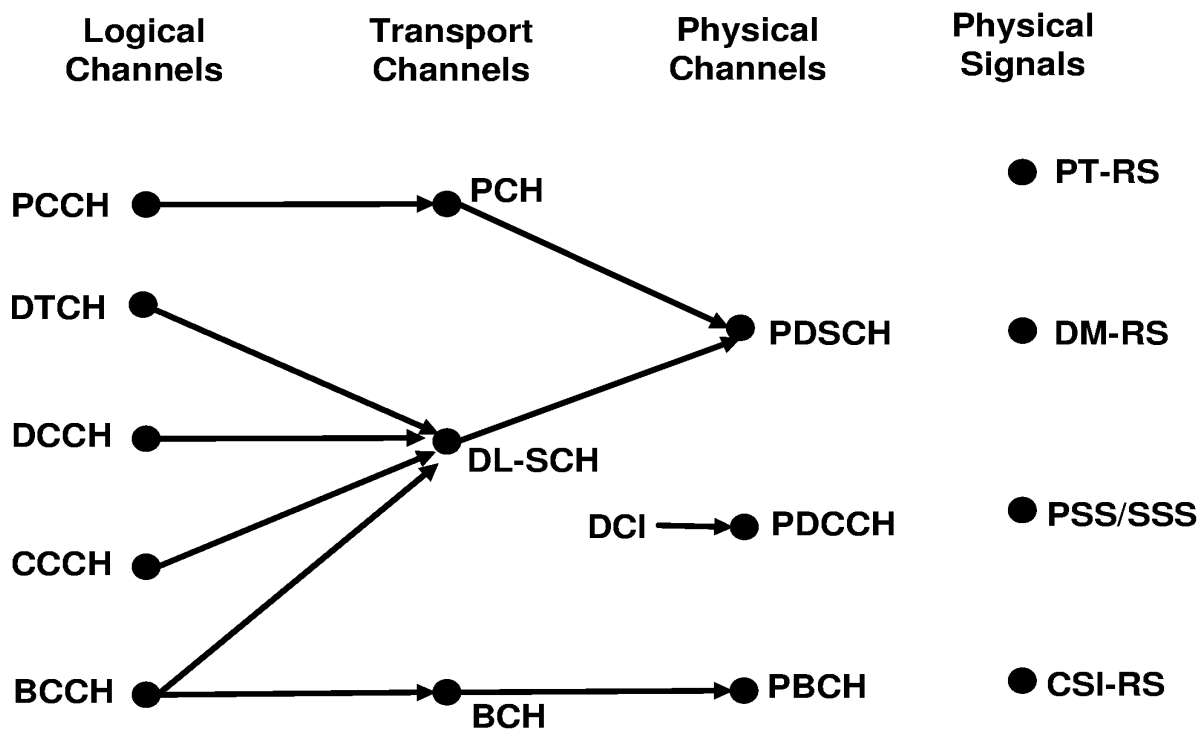


FIG. 5A

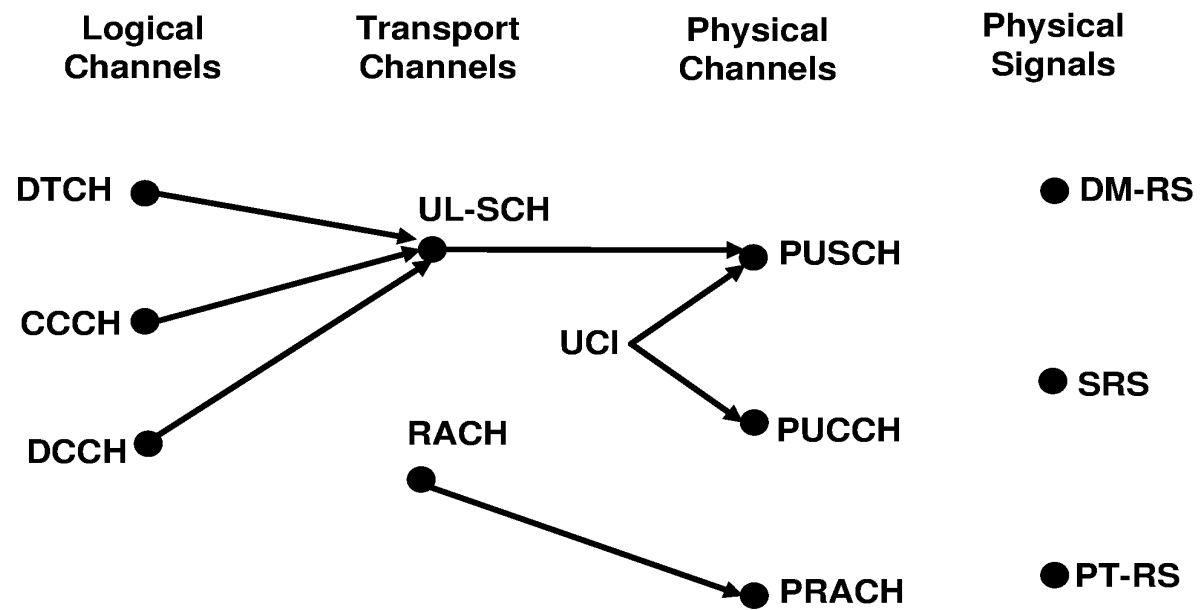


FIG. 5B

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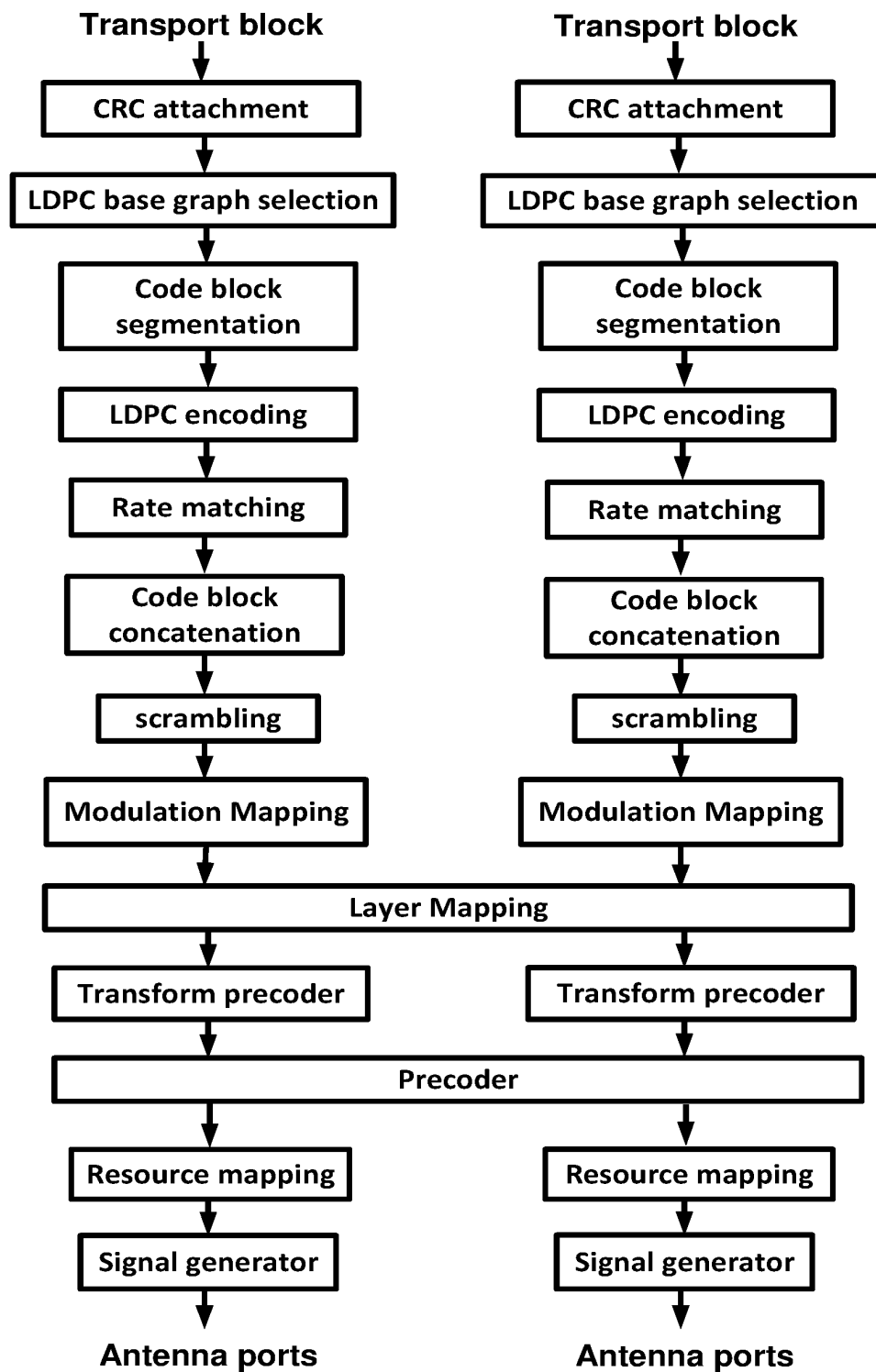


FIG. 6

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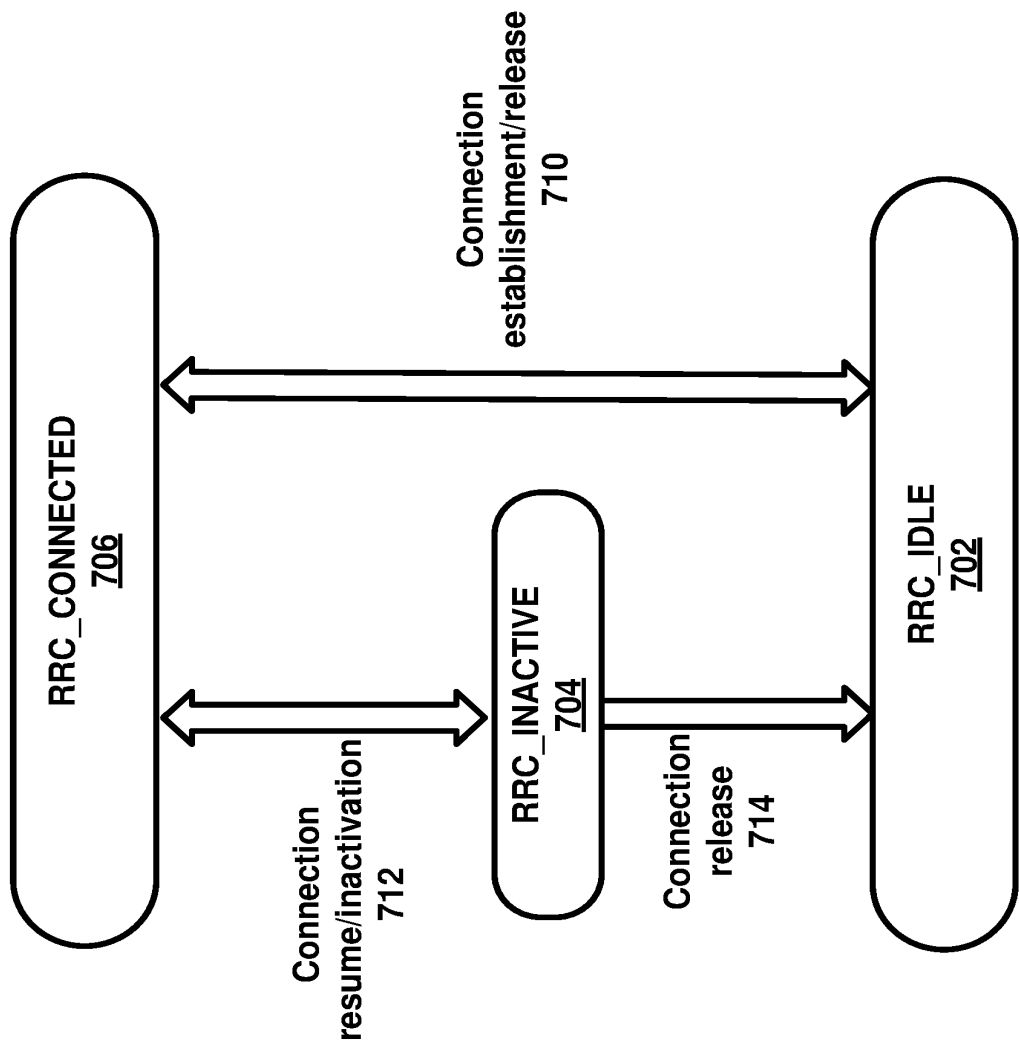


FIG. 7

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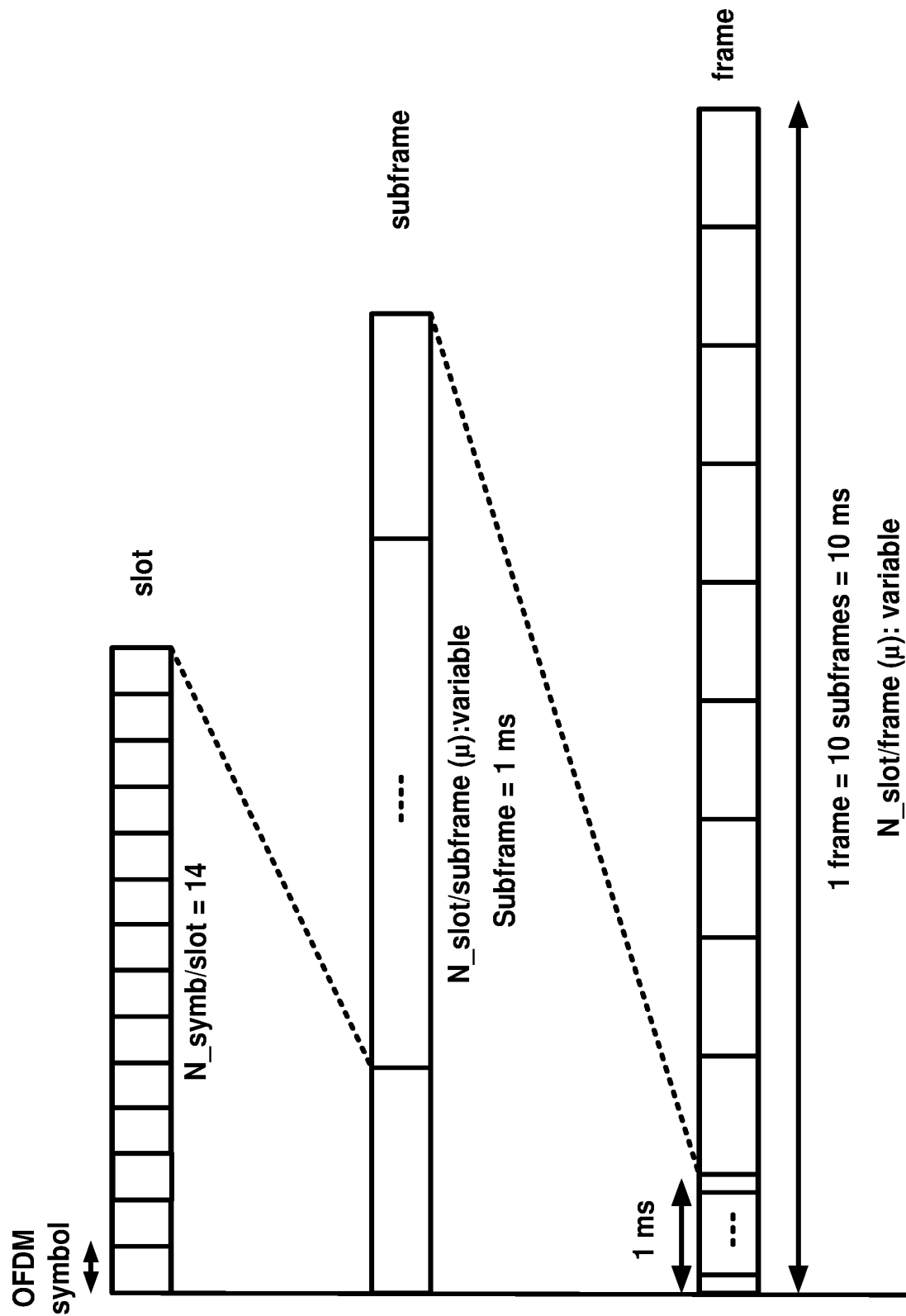


FIG. 8

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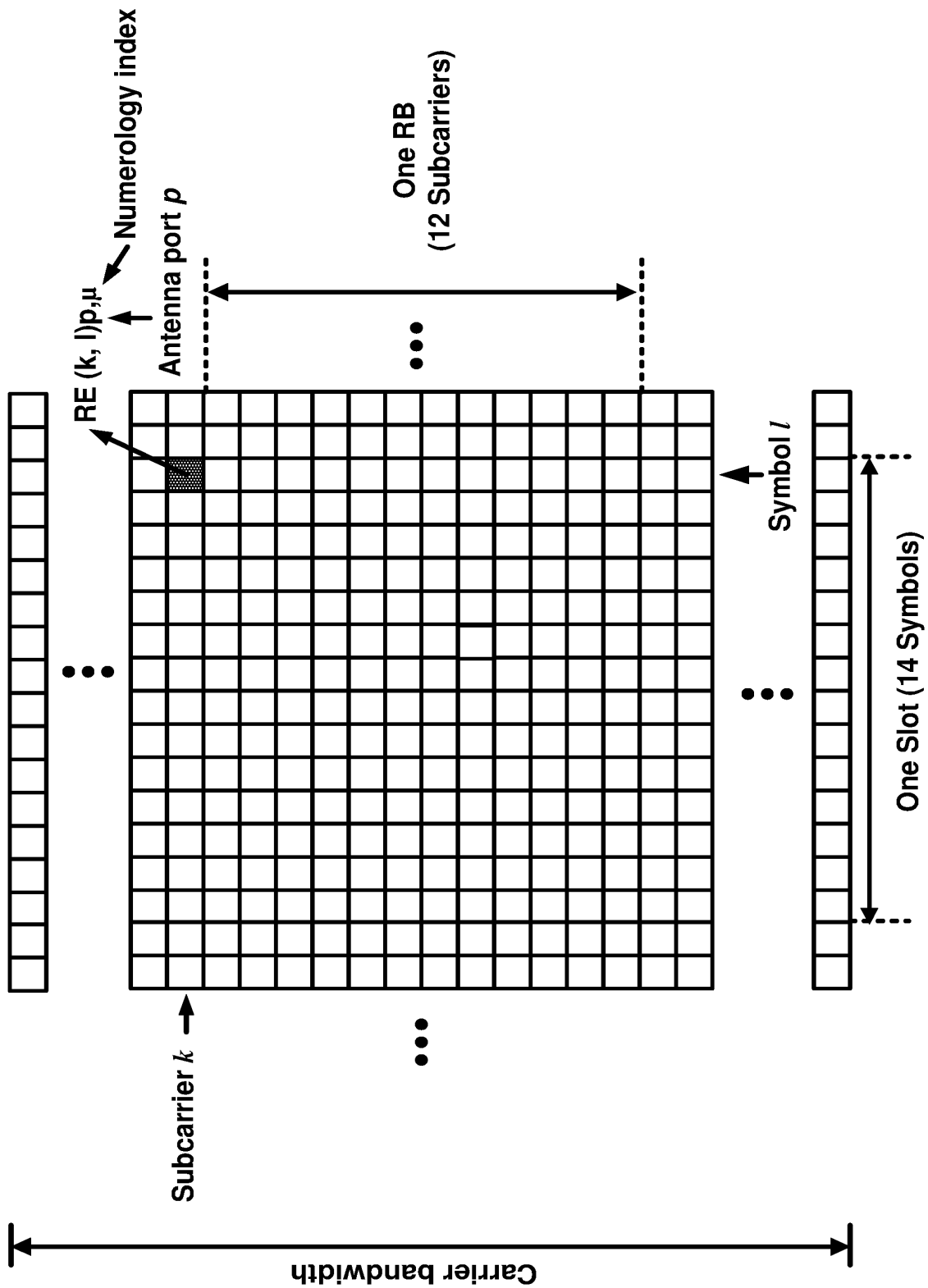


FIG. 9

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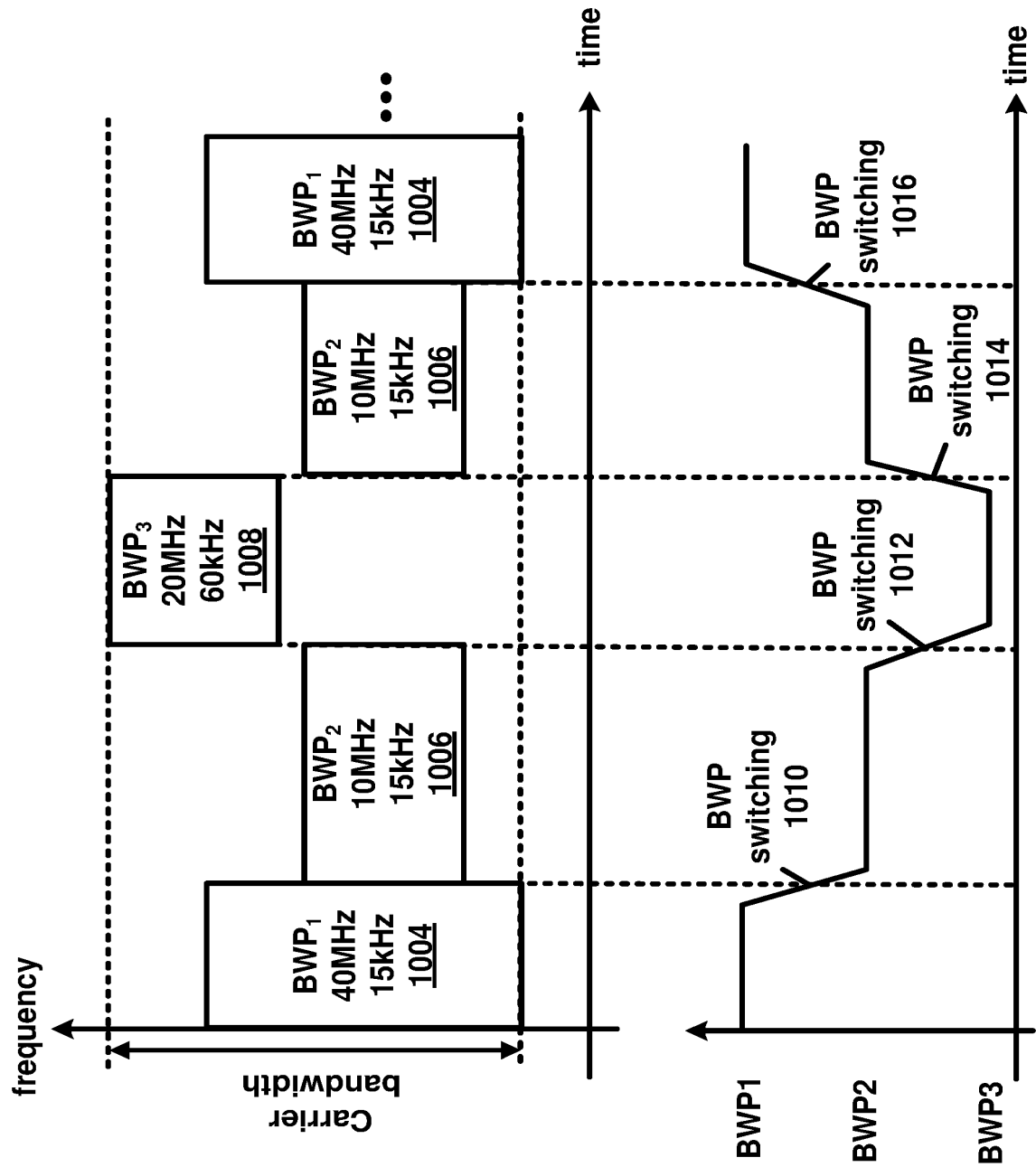


FIG. 10

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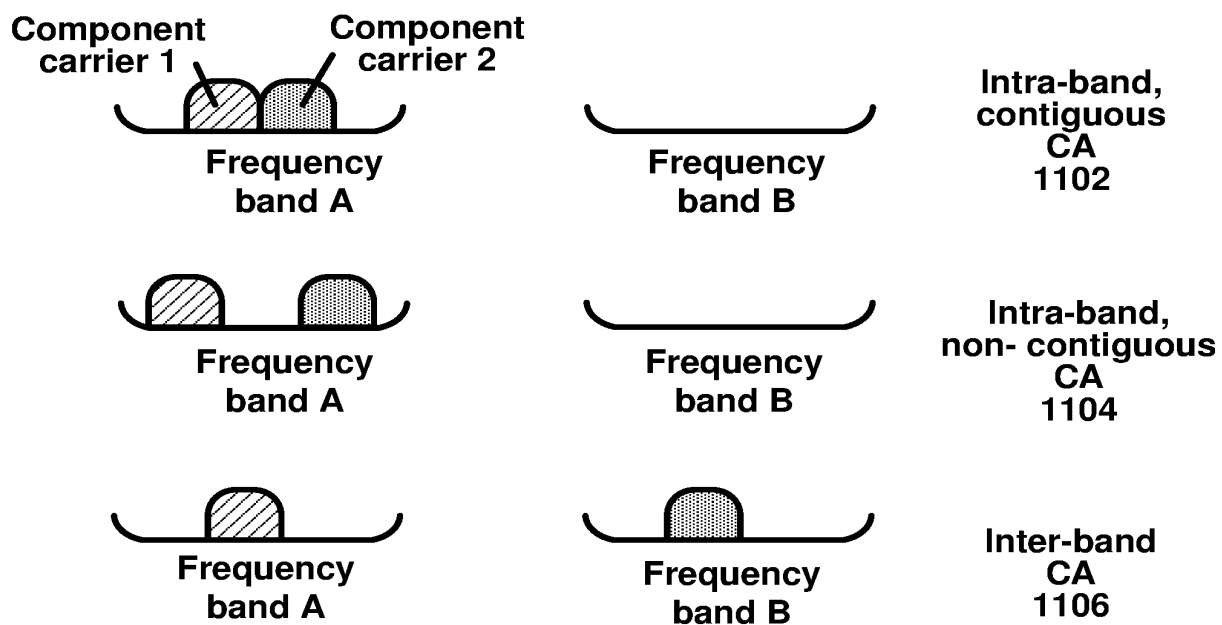


FIG. 11A

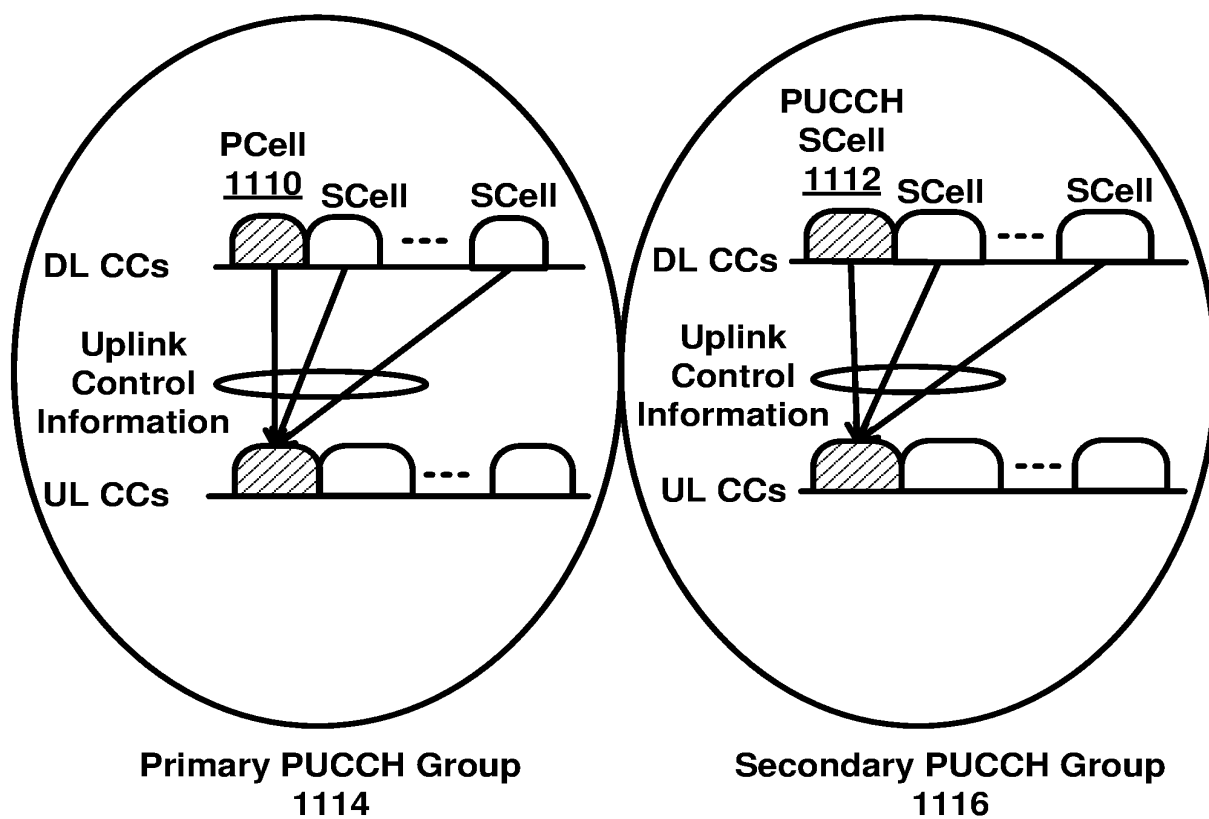


FIG. 11B

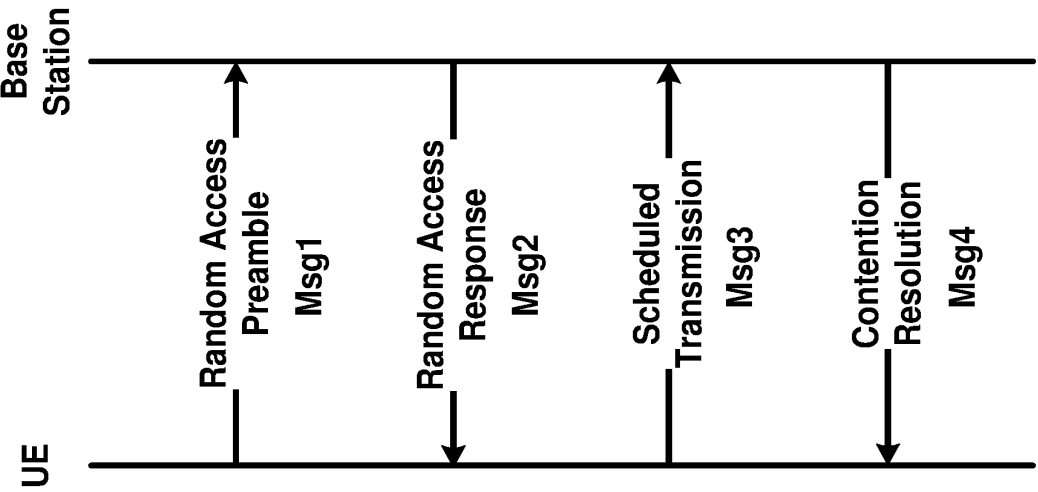


FIG. 12A

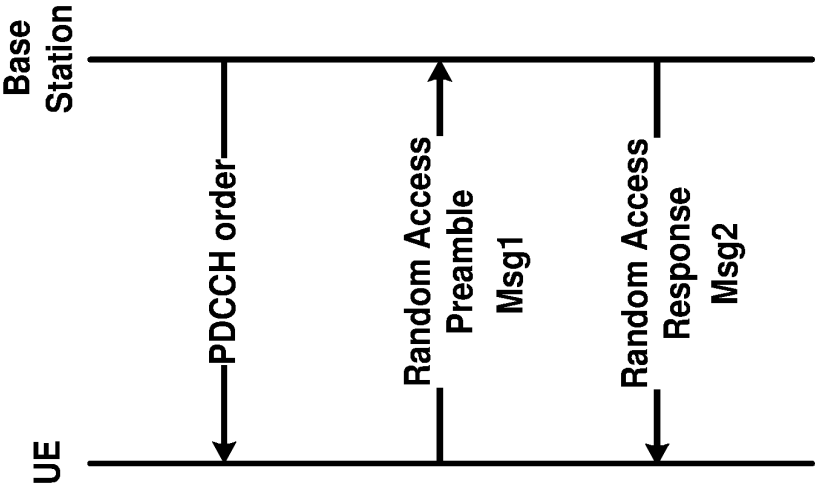


FIG. 12B

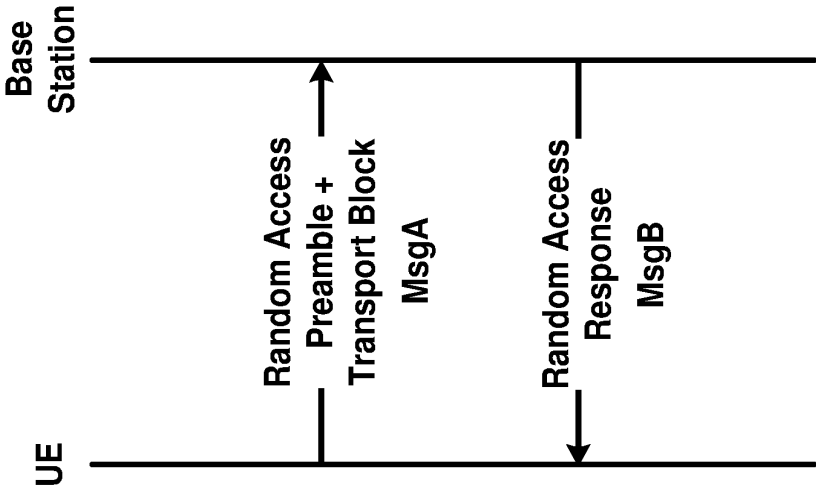


FIG. 12C

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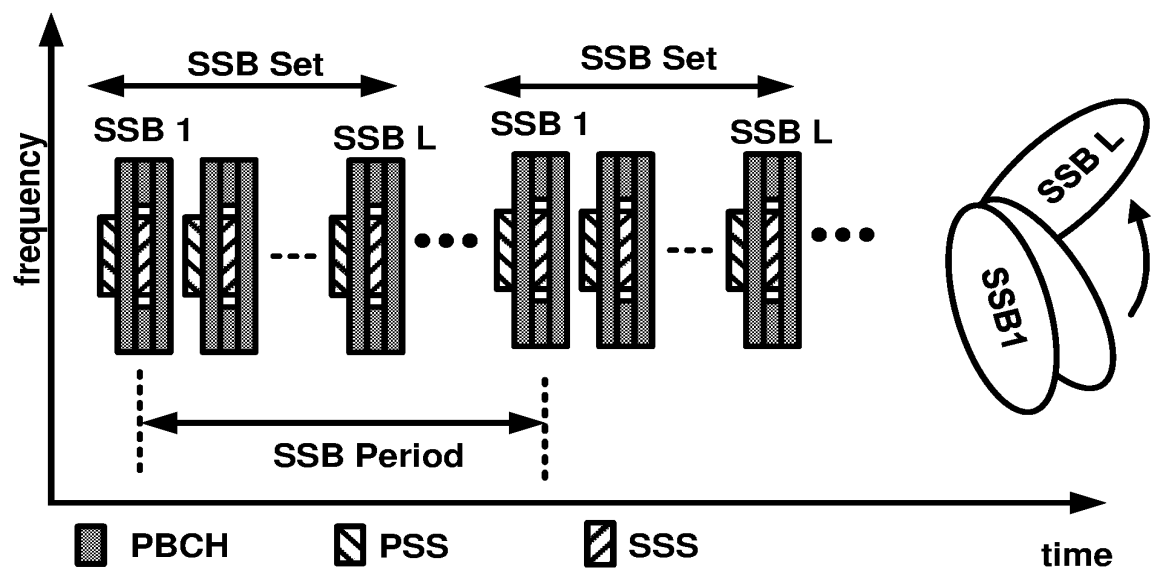


FIG. 13A

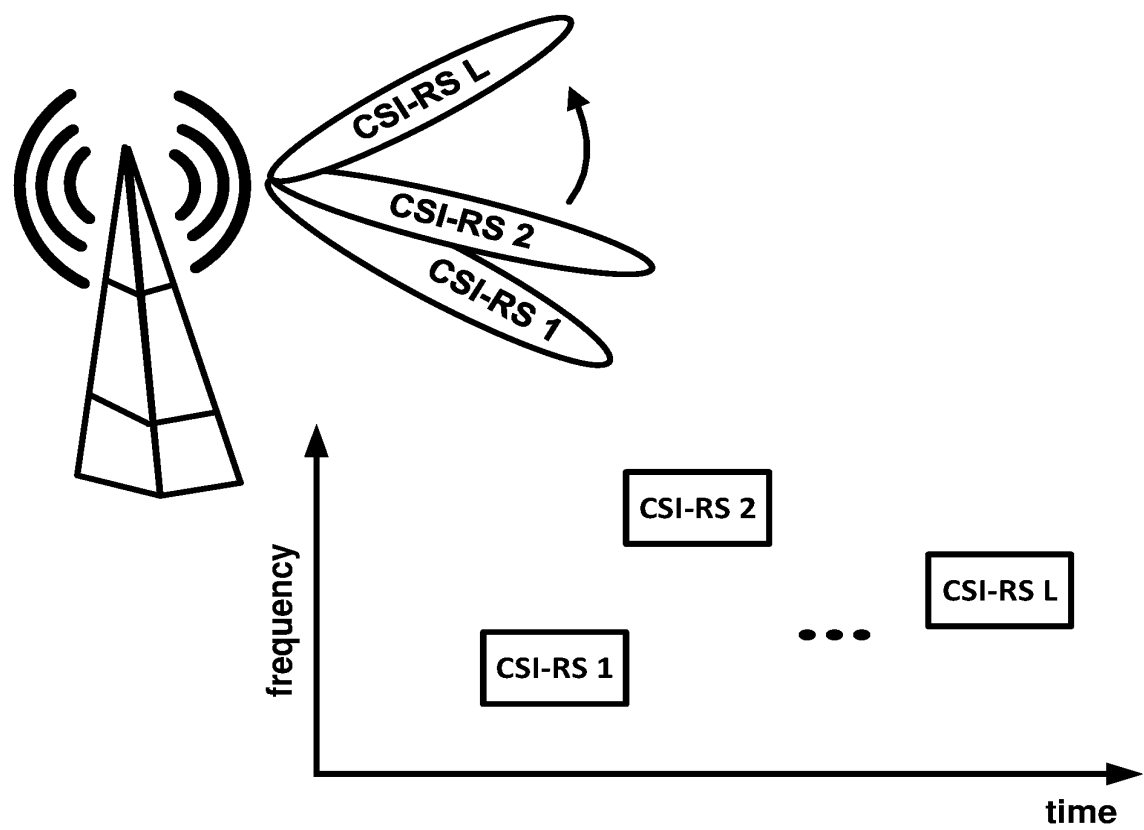
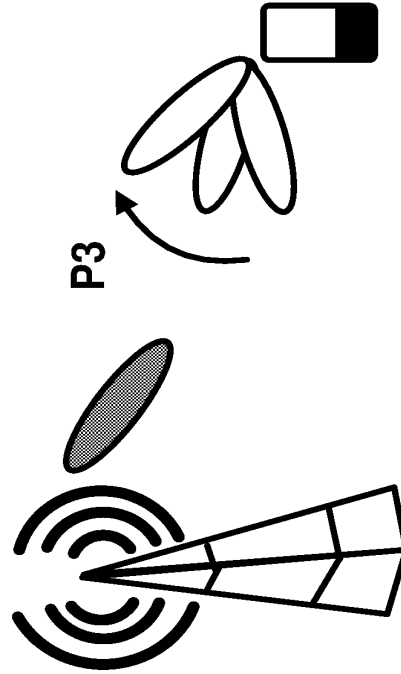
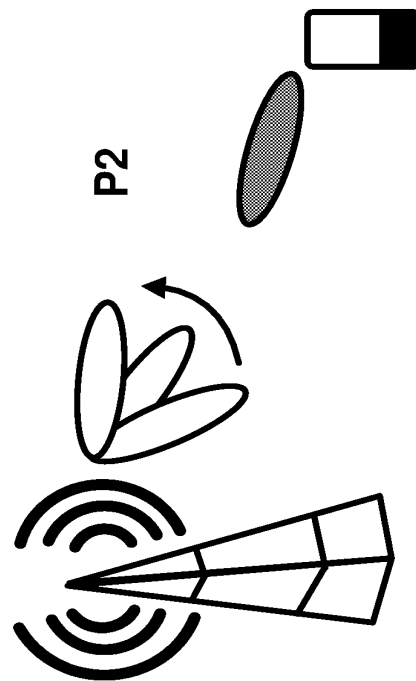
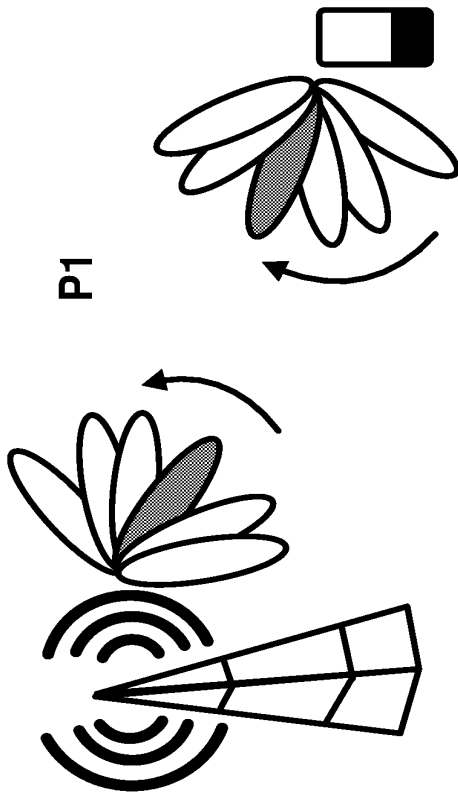


FIG. 13B

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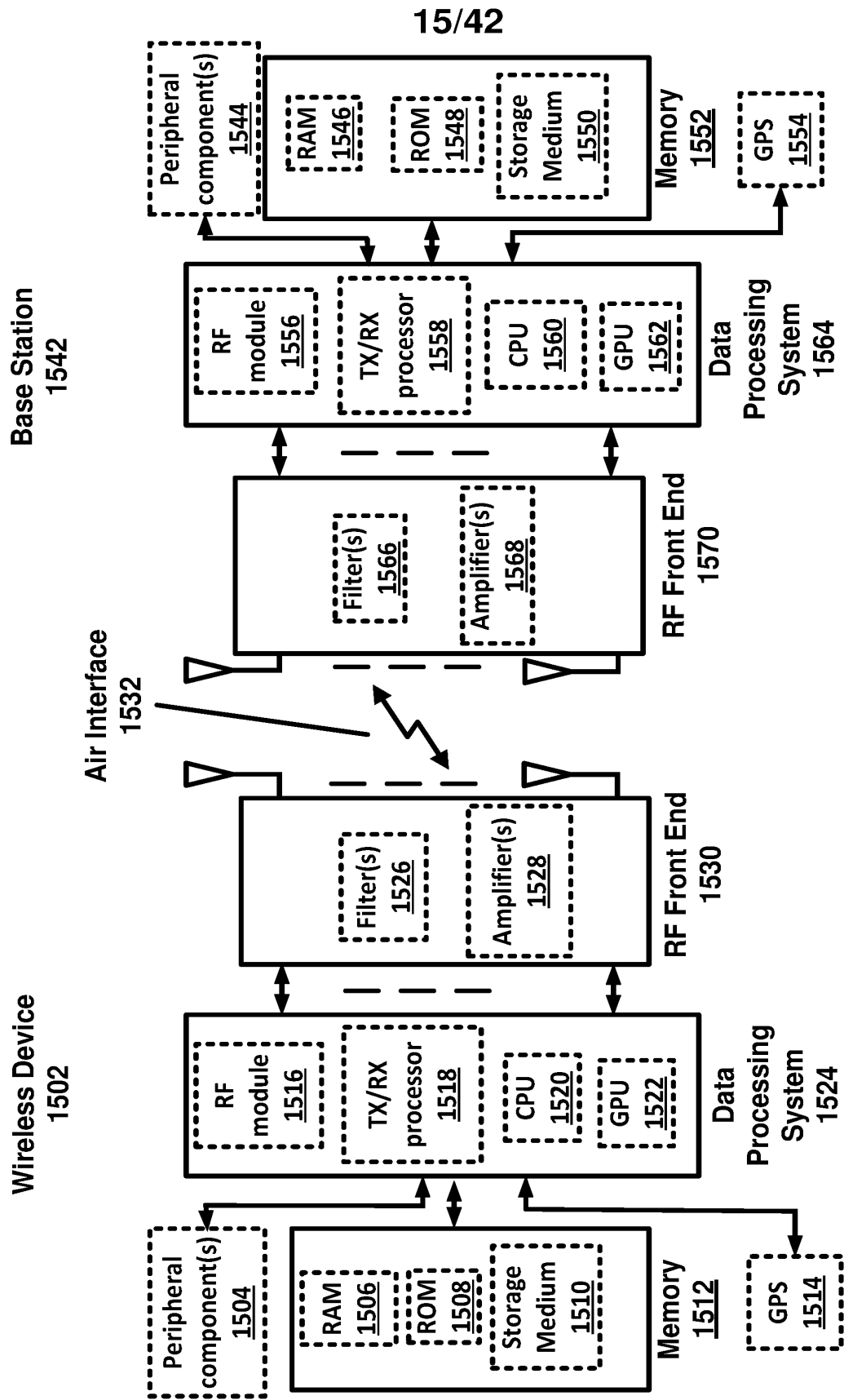


FIG. 15

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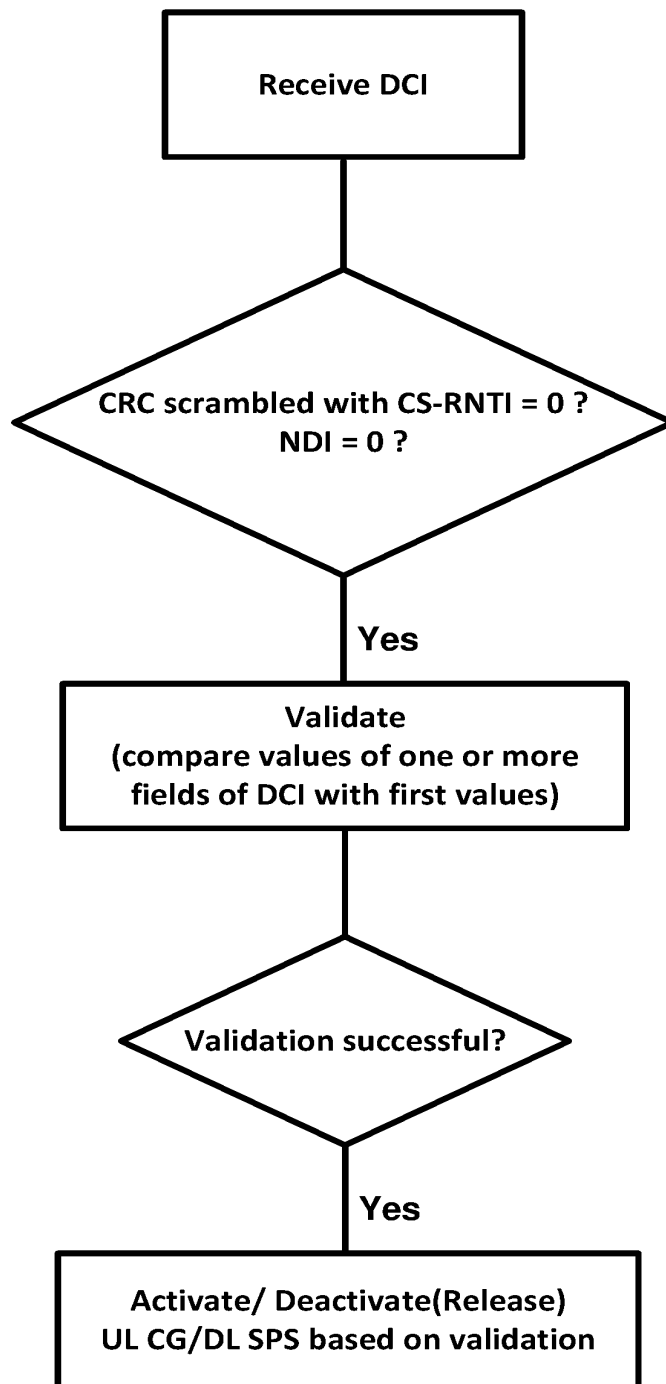


FIG. 16

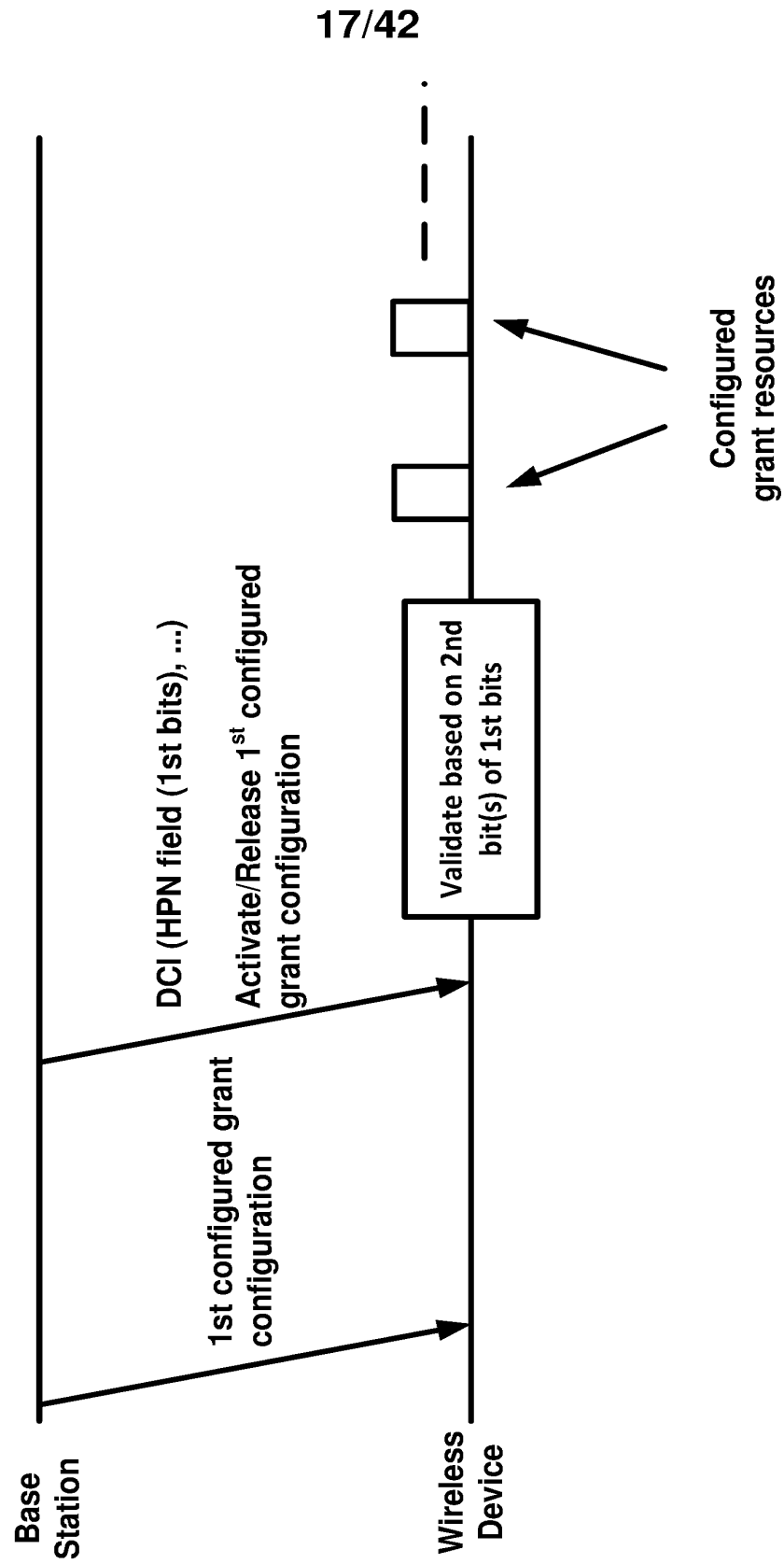


FIG. 17

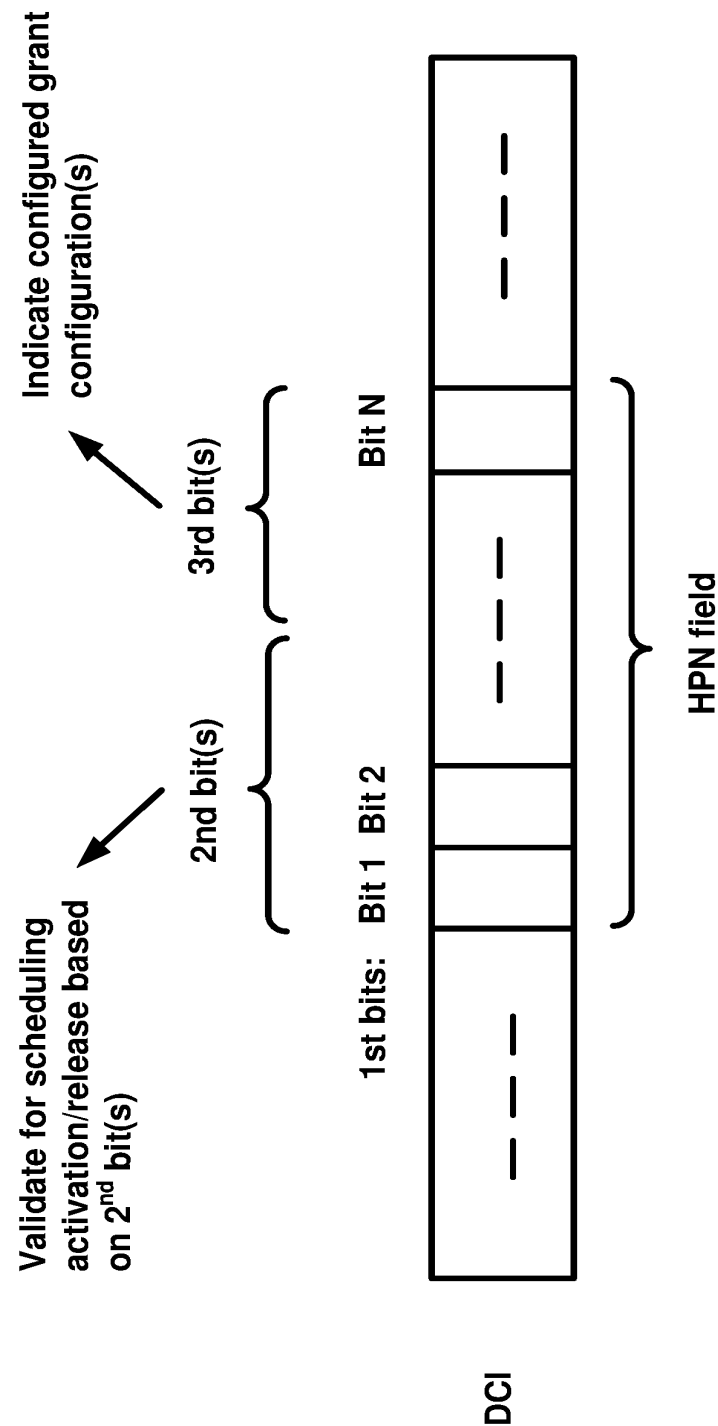


FIG. 18

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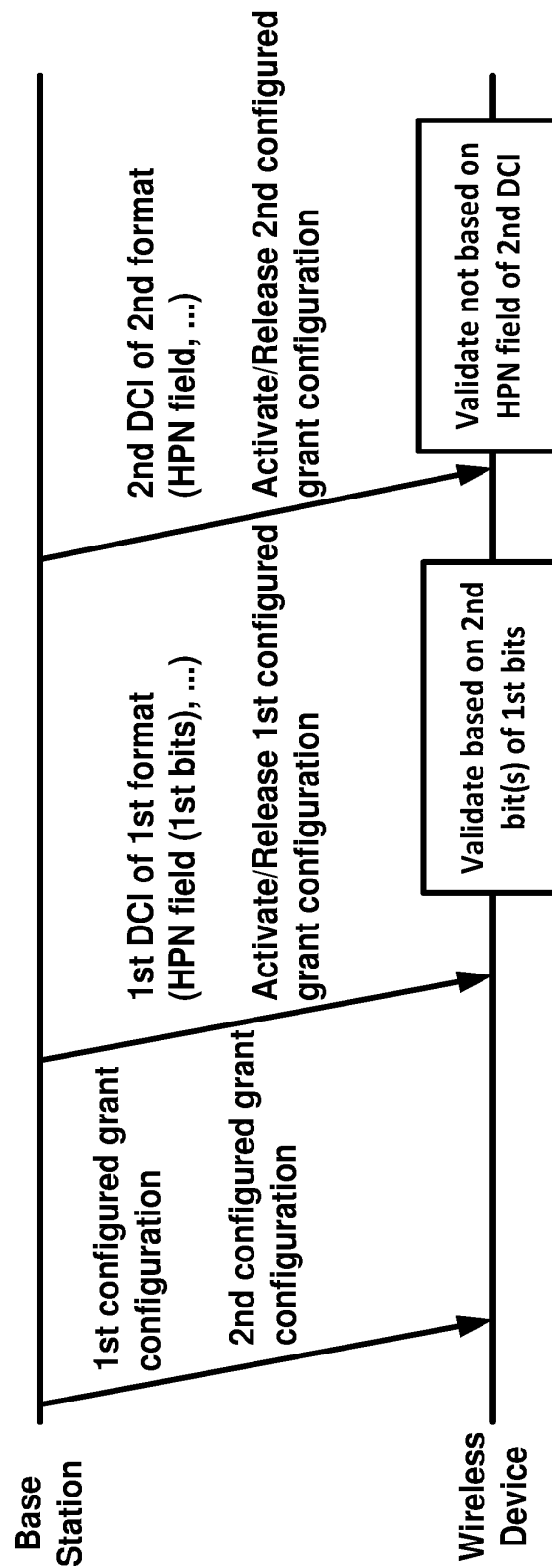


FIG. 19

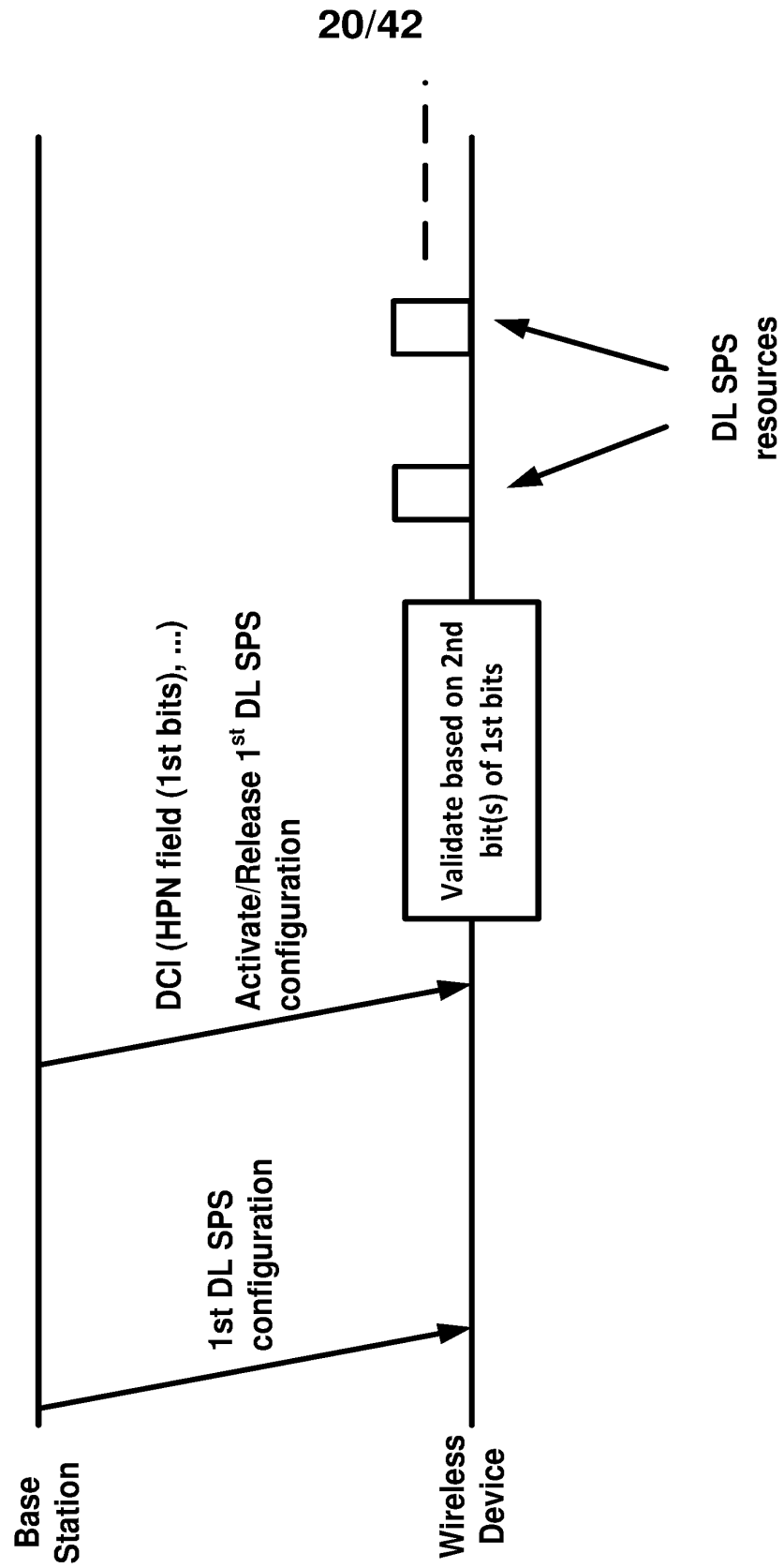


FIG. 20

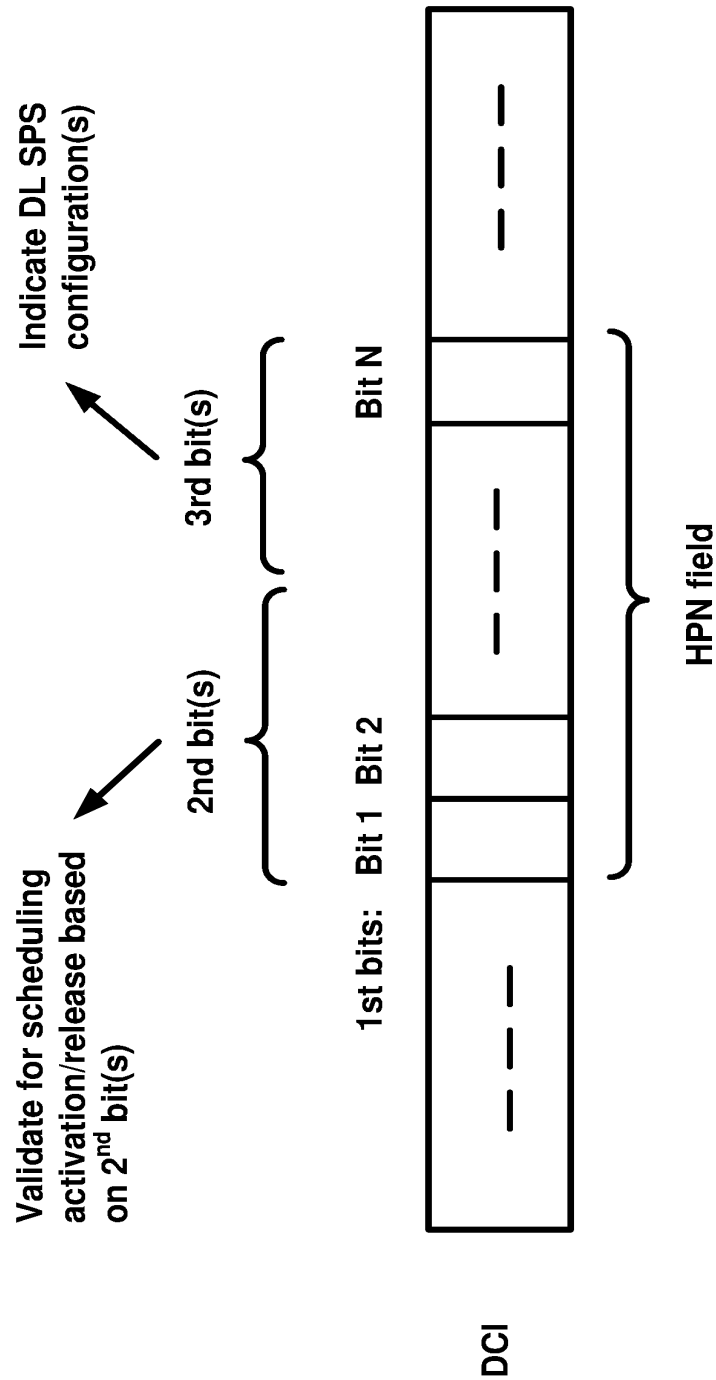


FIG. 21

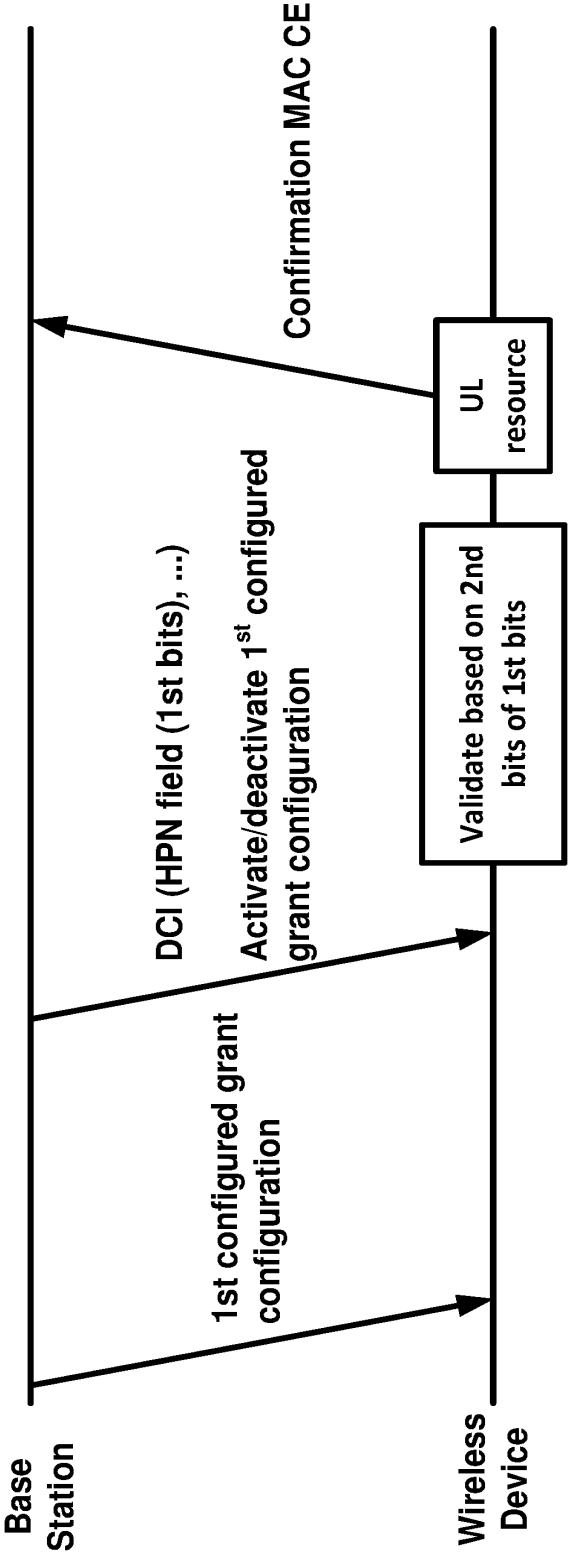


FIG. 22

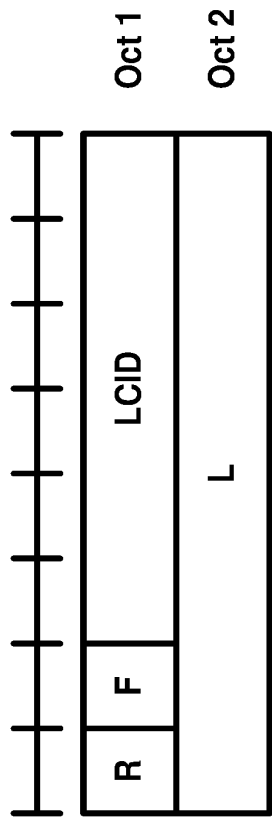


FIG. 23C

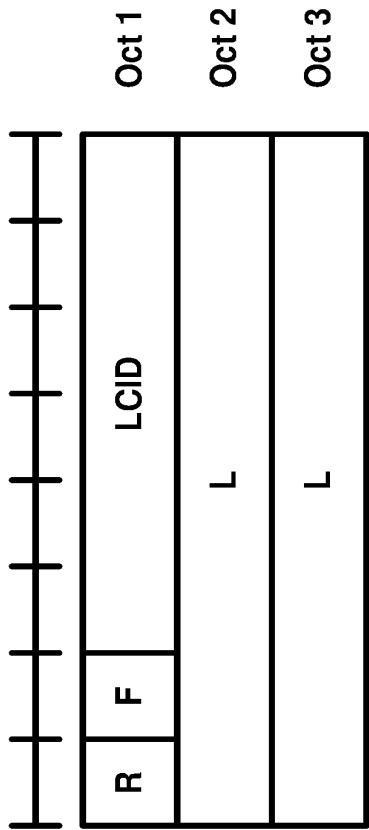


FIG. 23B

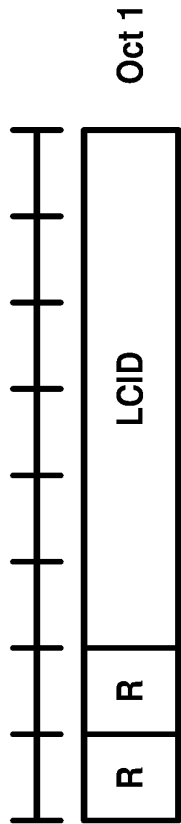


FIG. 23A

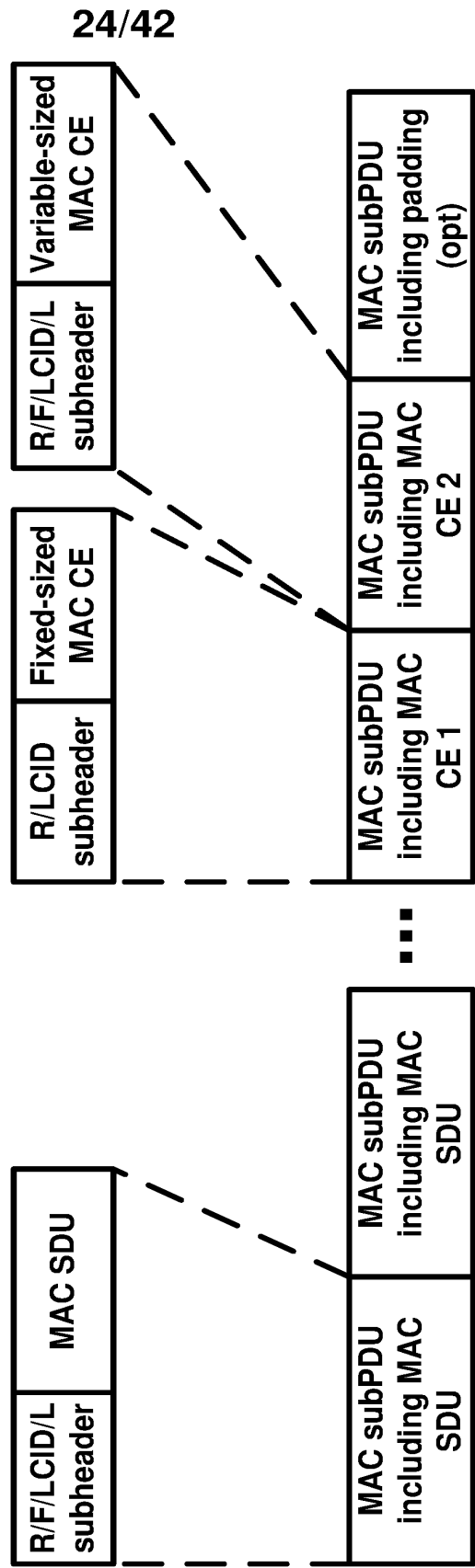


FIG. 24

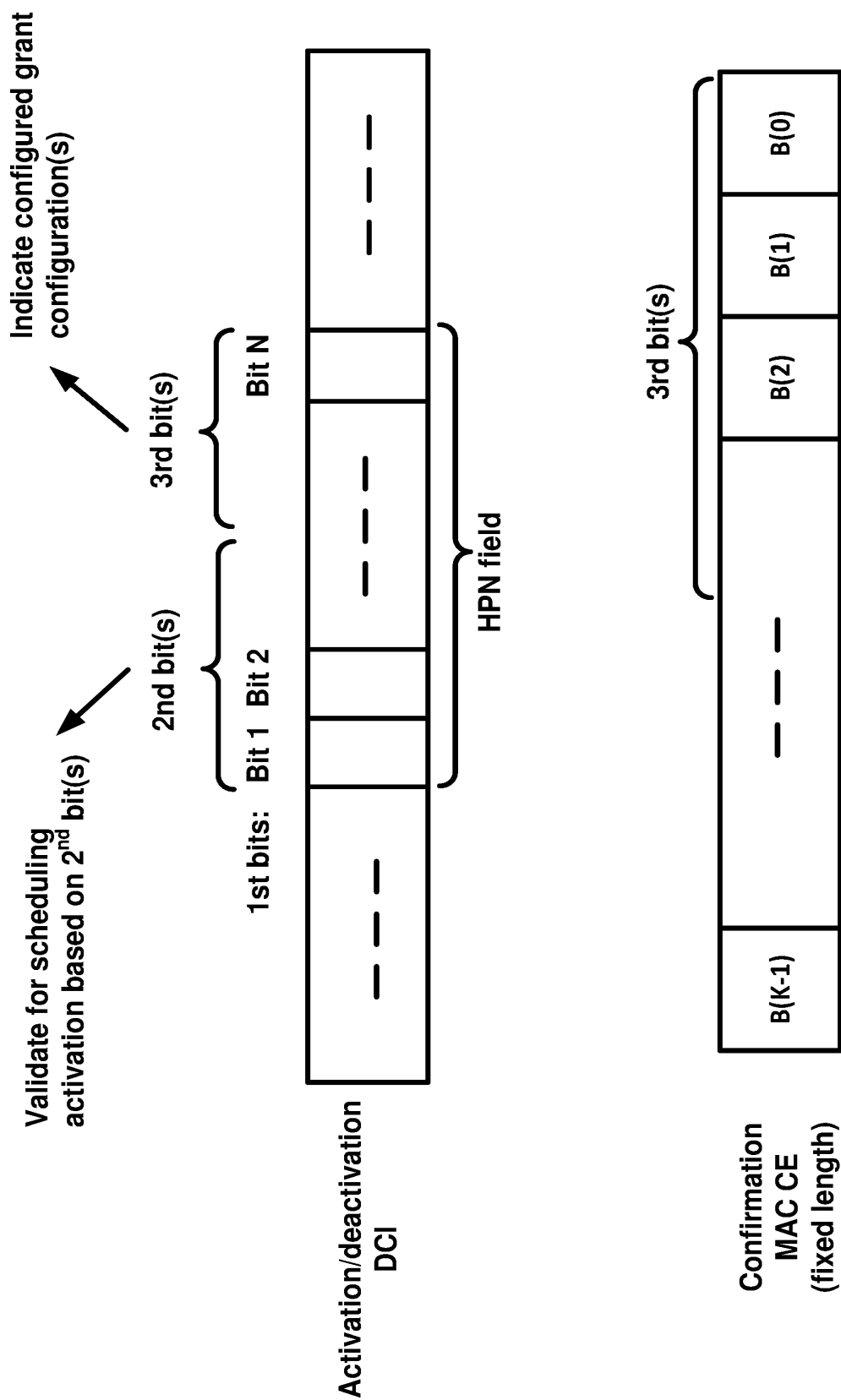


FIG. 25

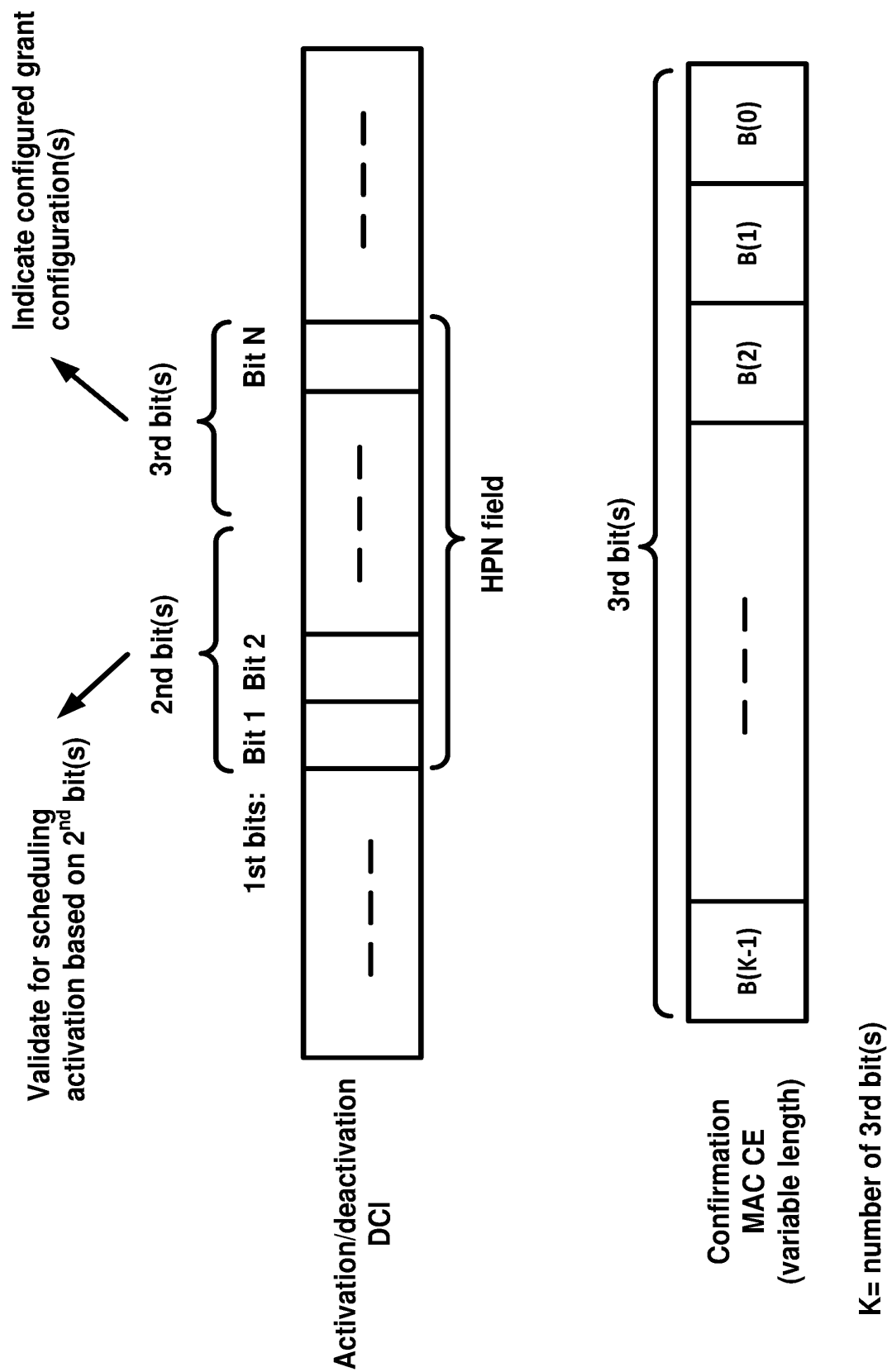


FIG. 26

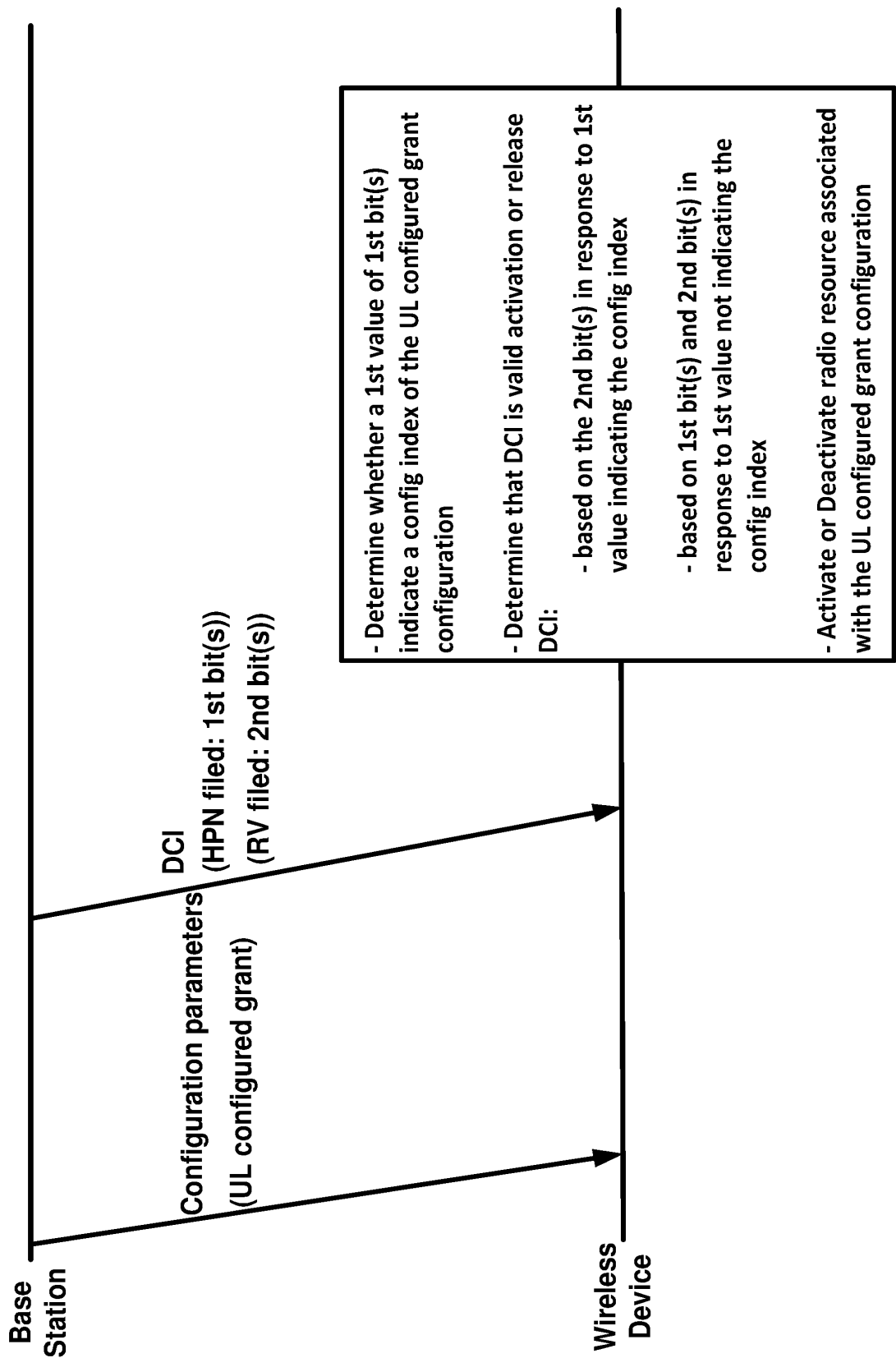


FIG. 27

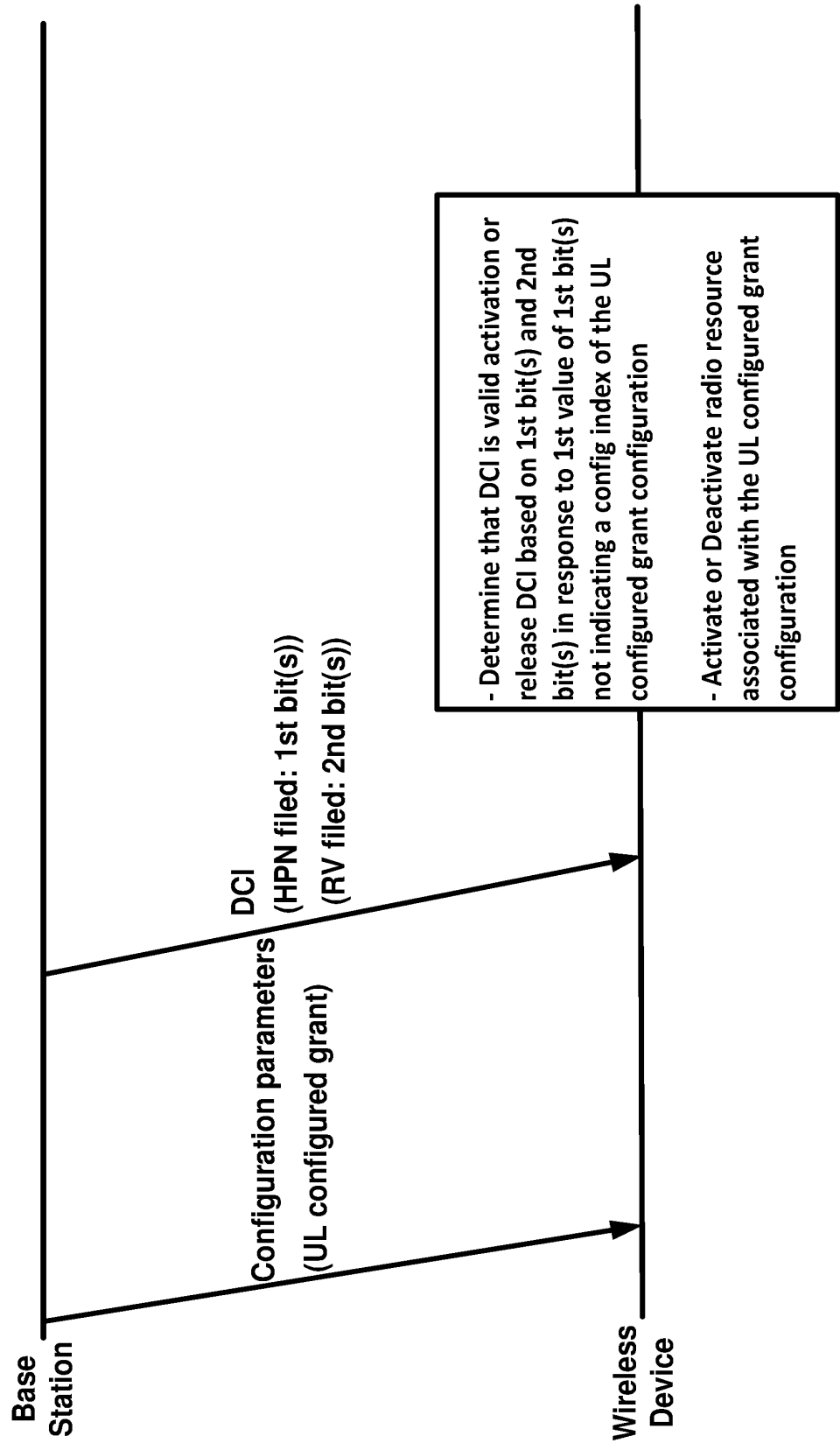


FIG. 28

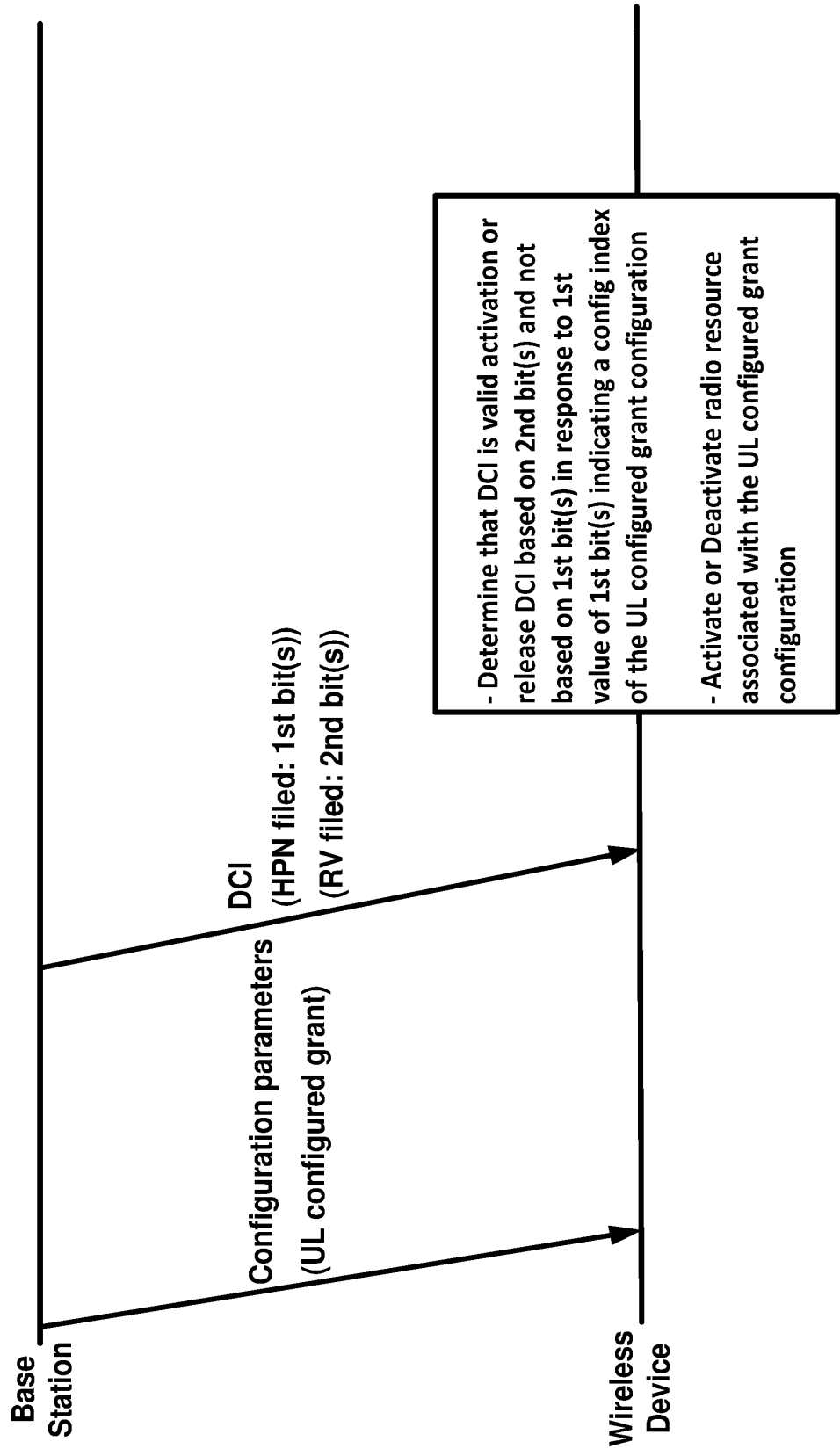


FIG. 29

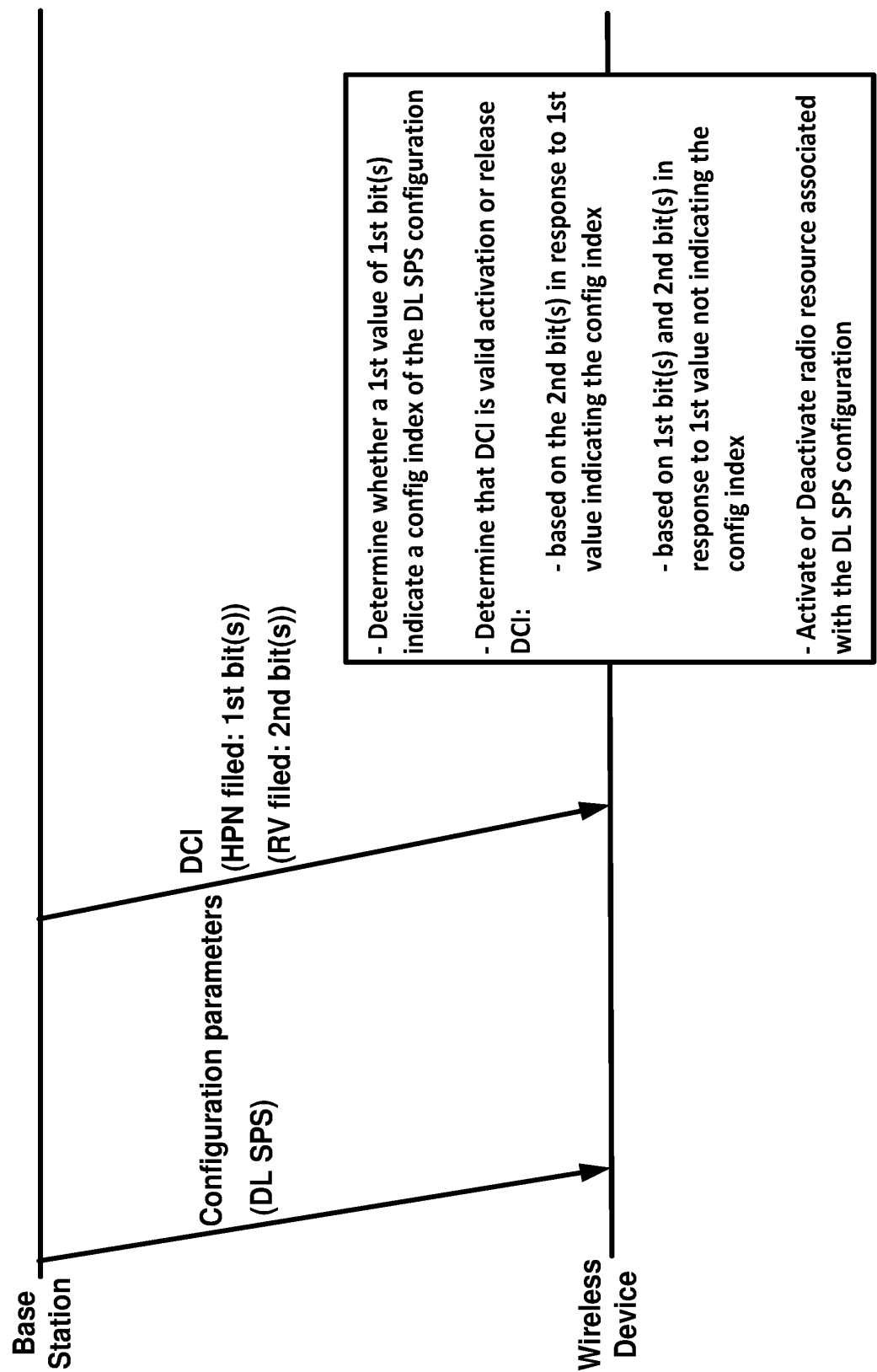


FIG. 30

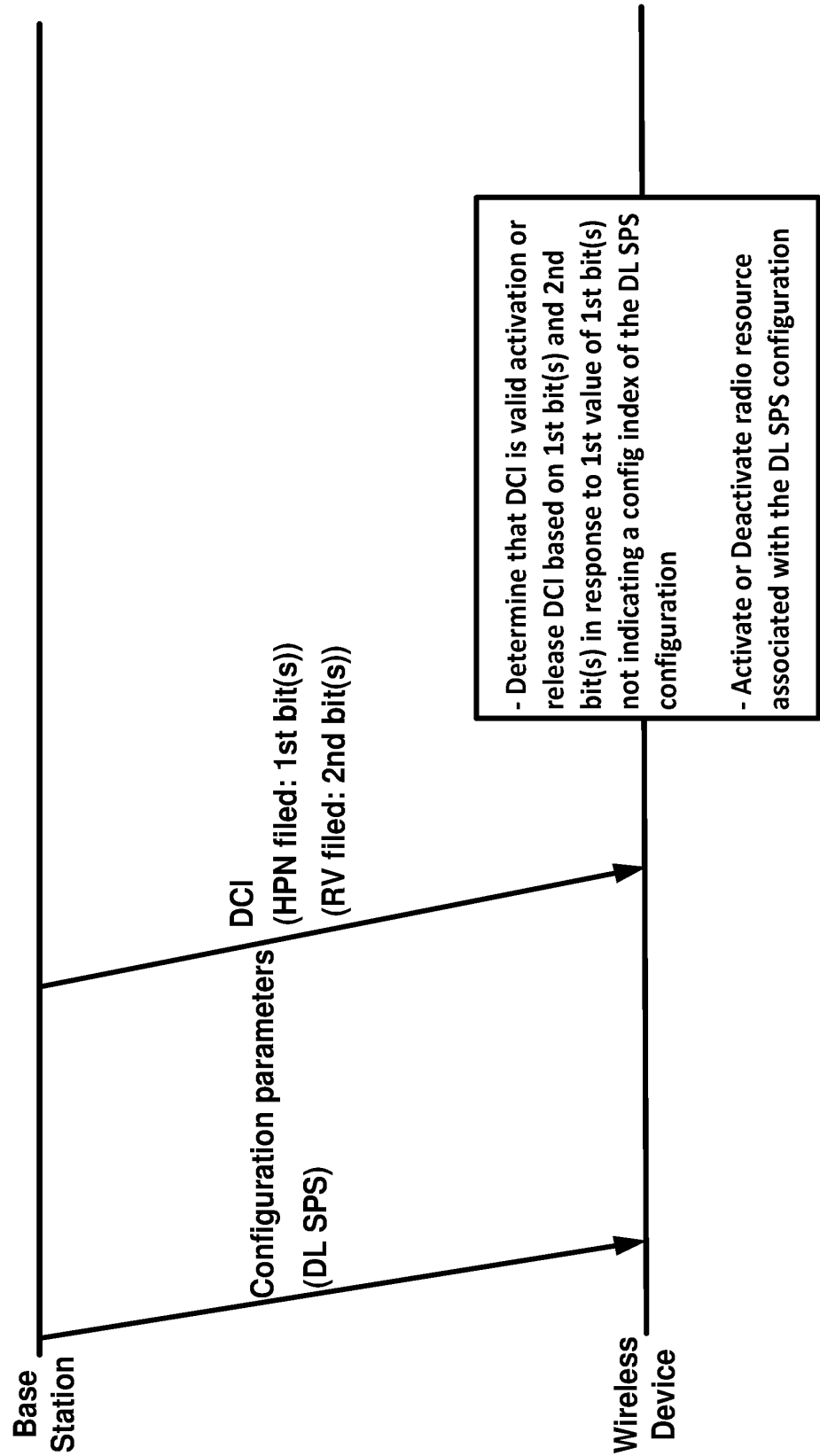


FIG. 31

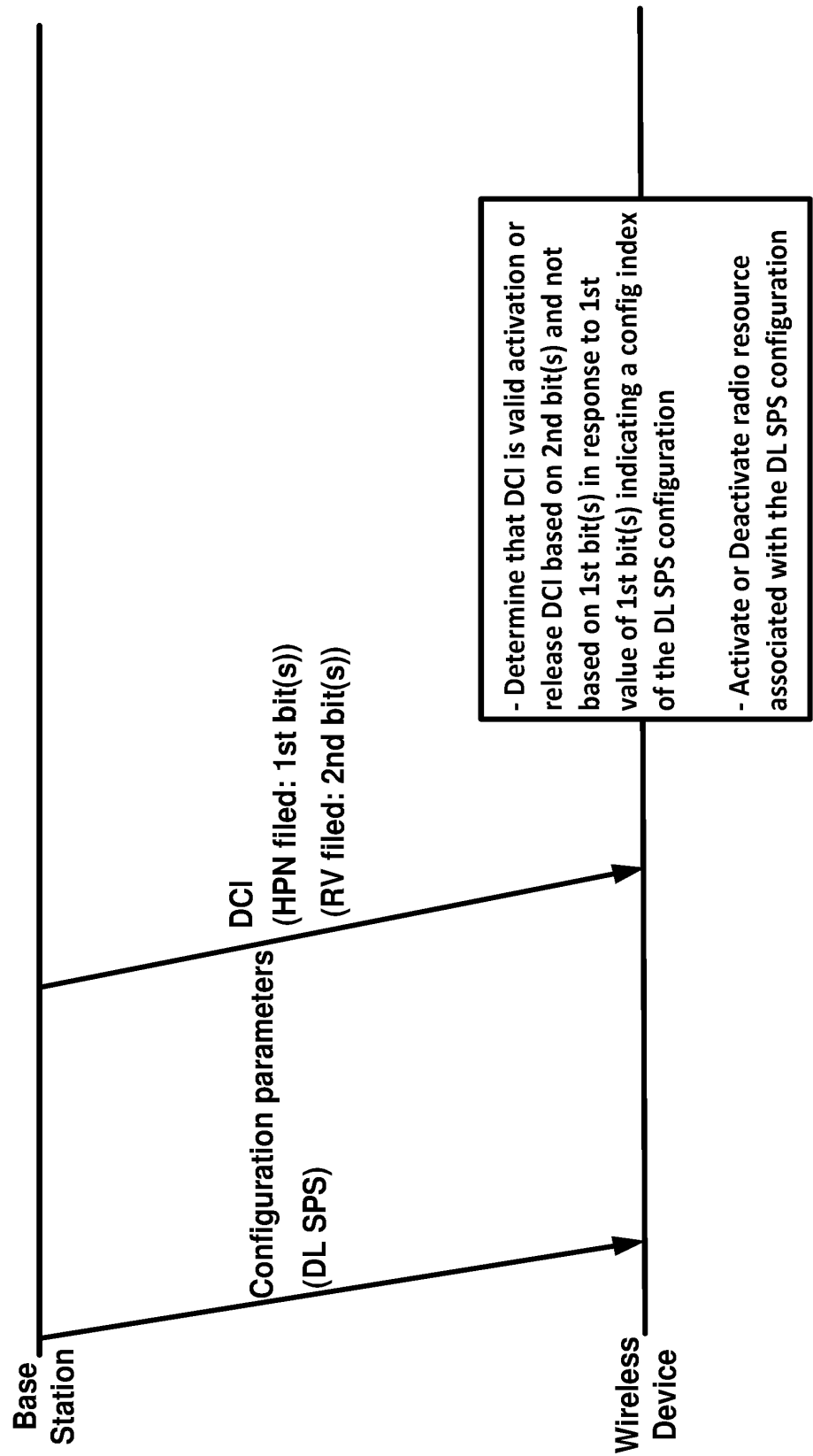


FIG. 32

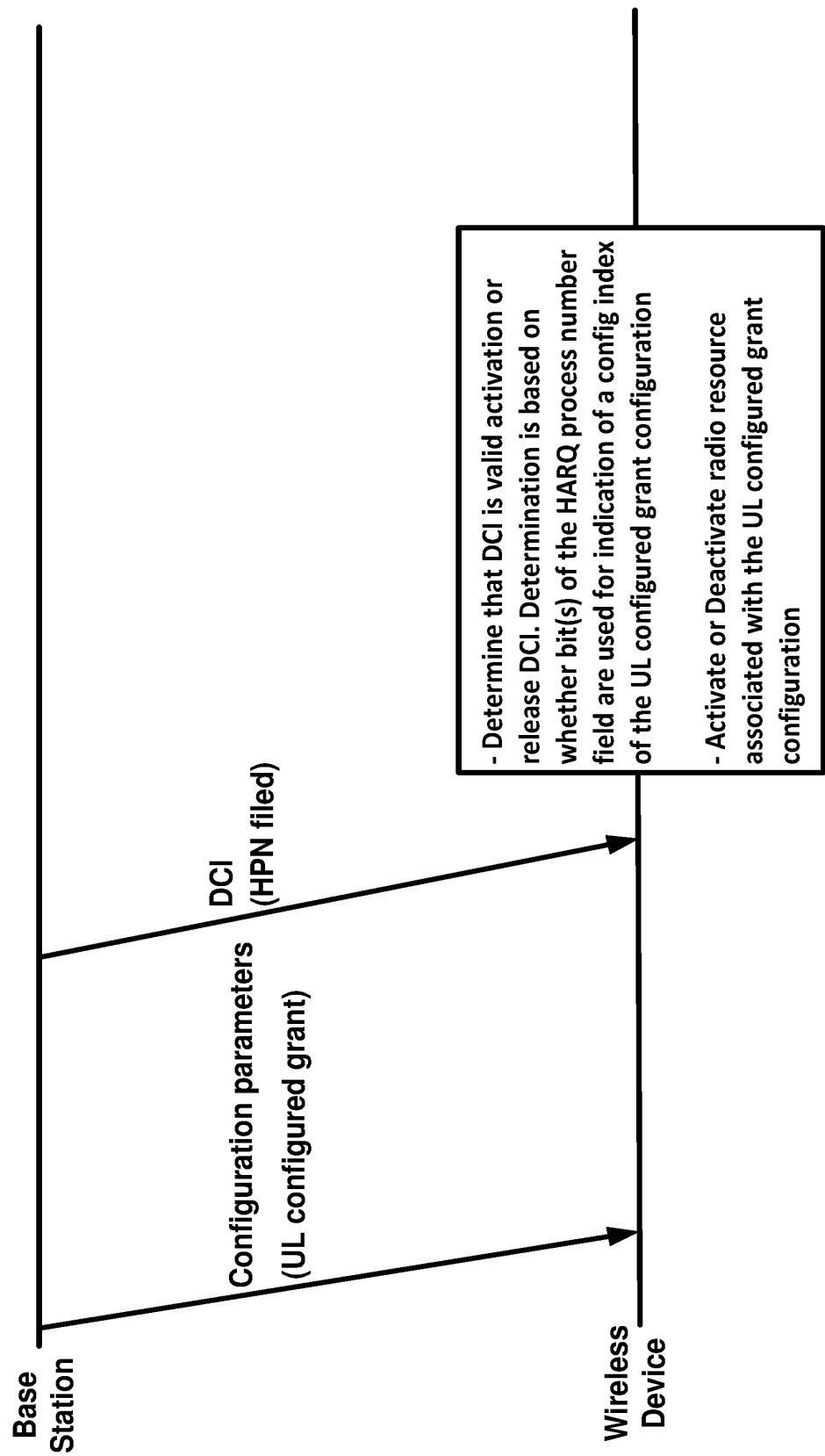


FIG. 33

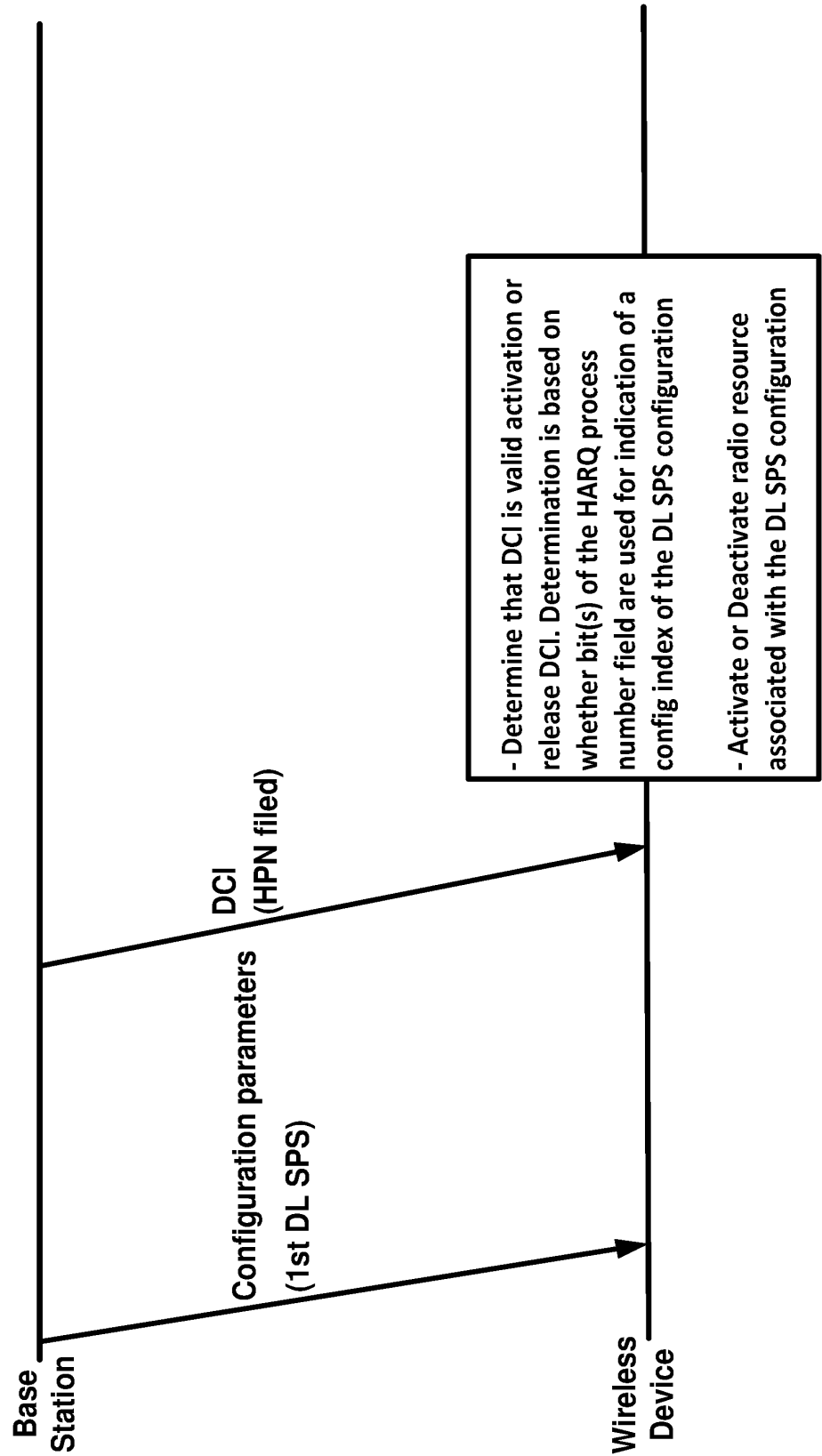


FIG. 34

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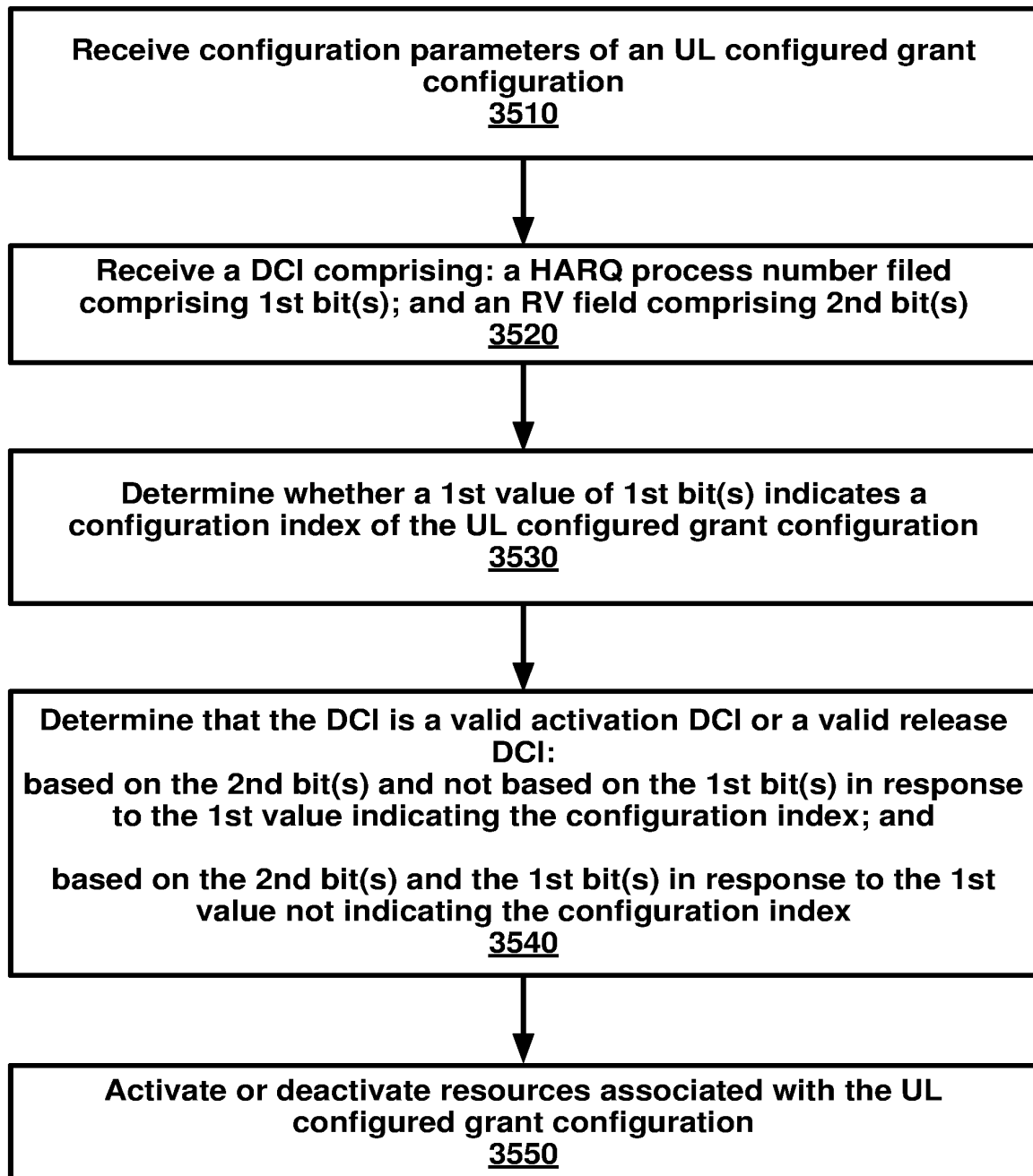


FIG. 35

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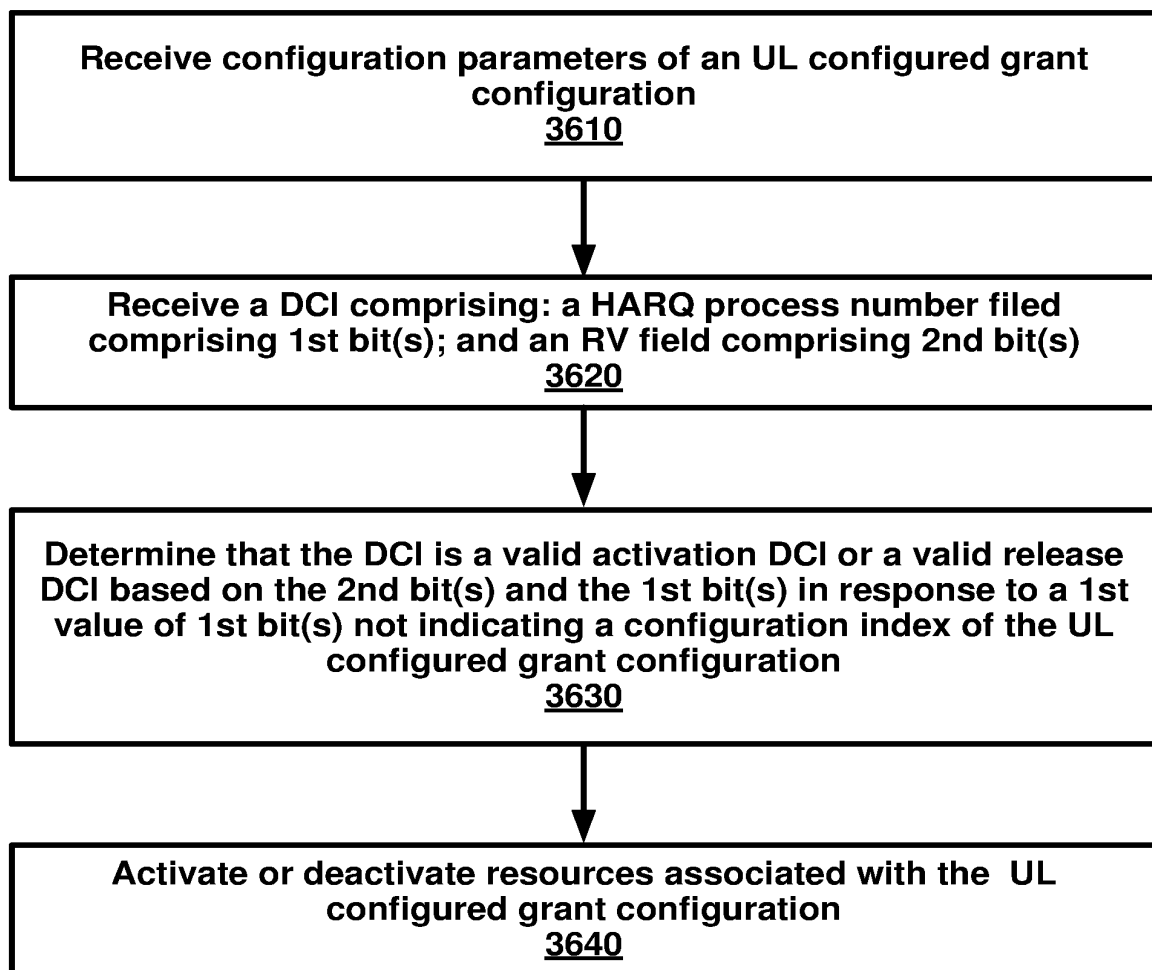


FIG. 36

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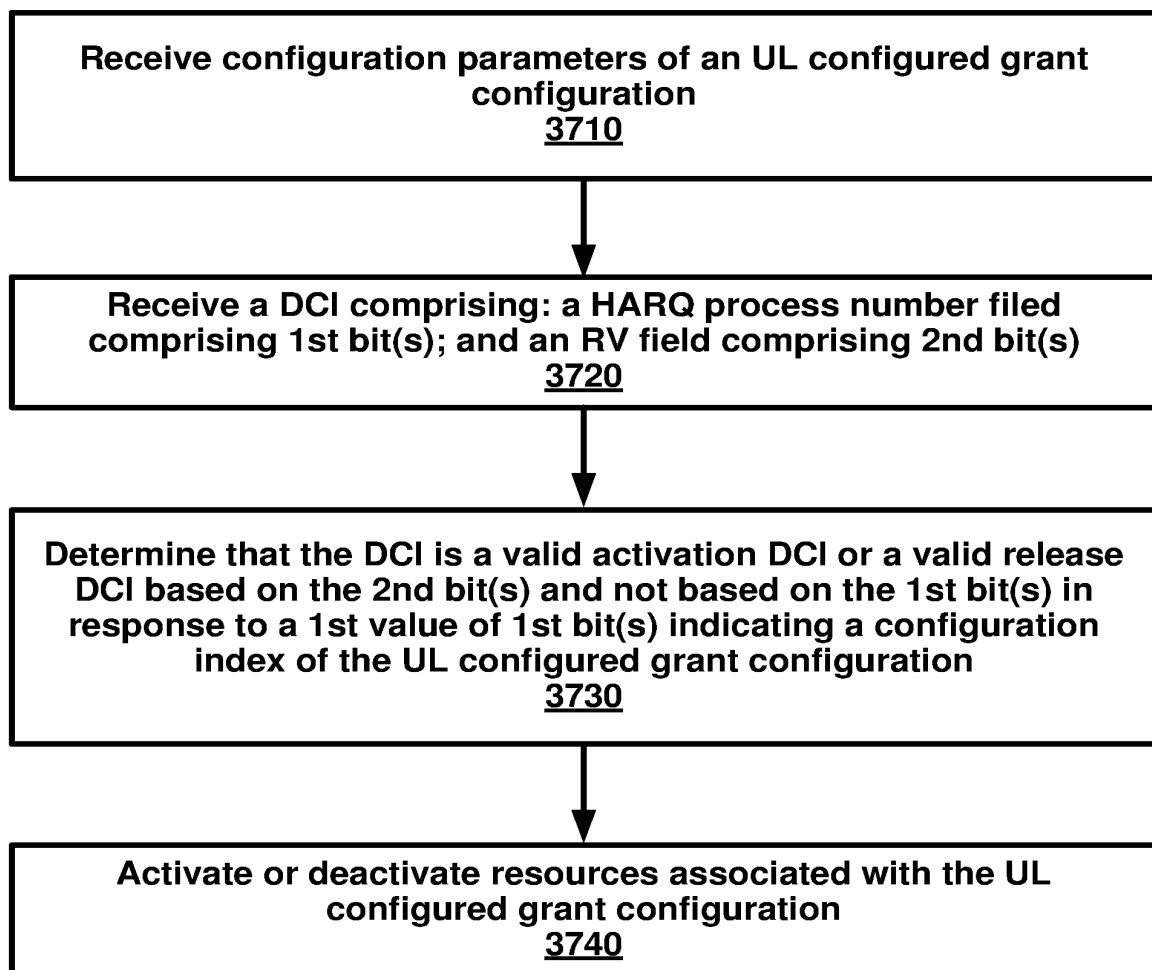


FIG. 37

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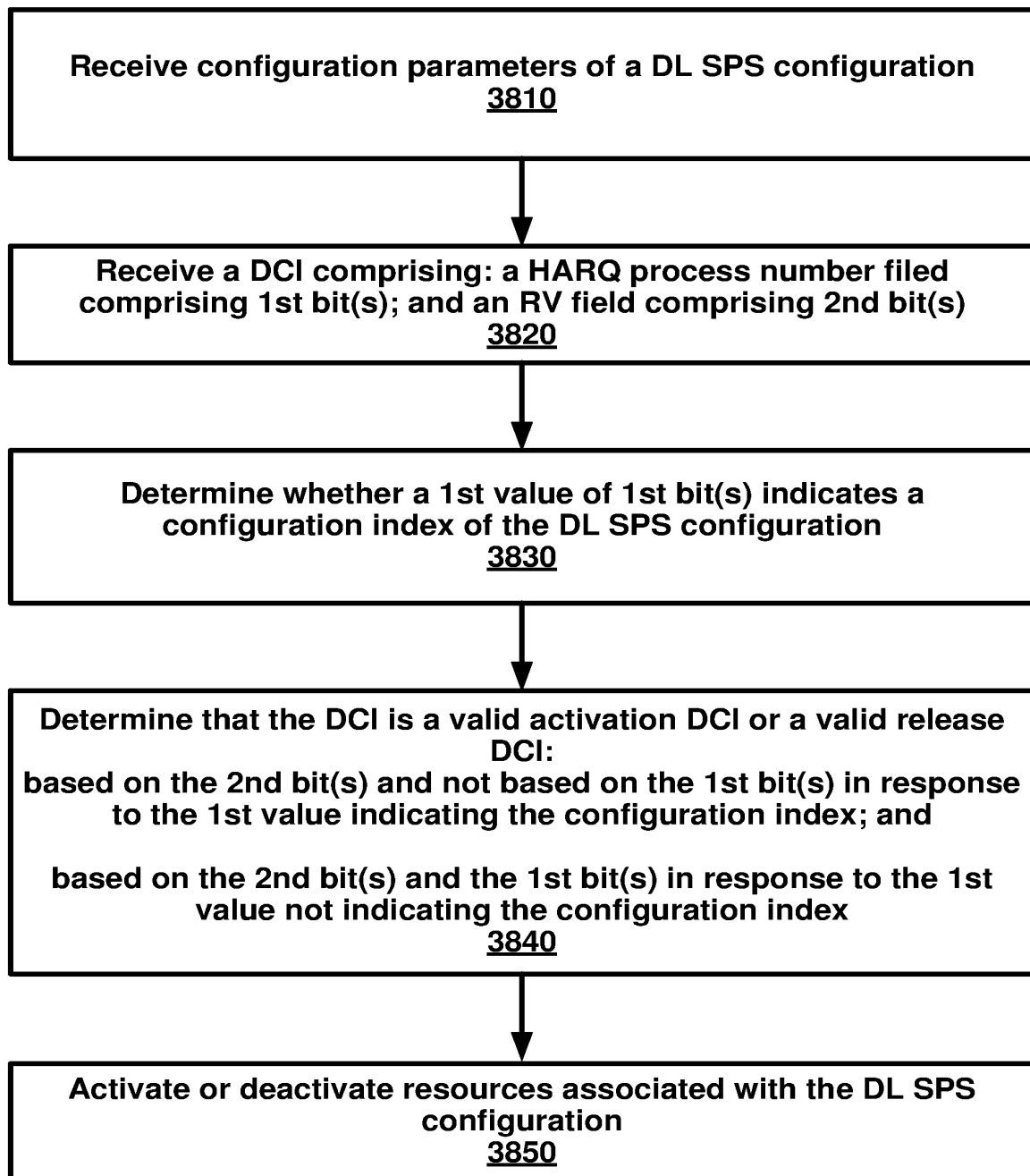


FIG. 38

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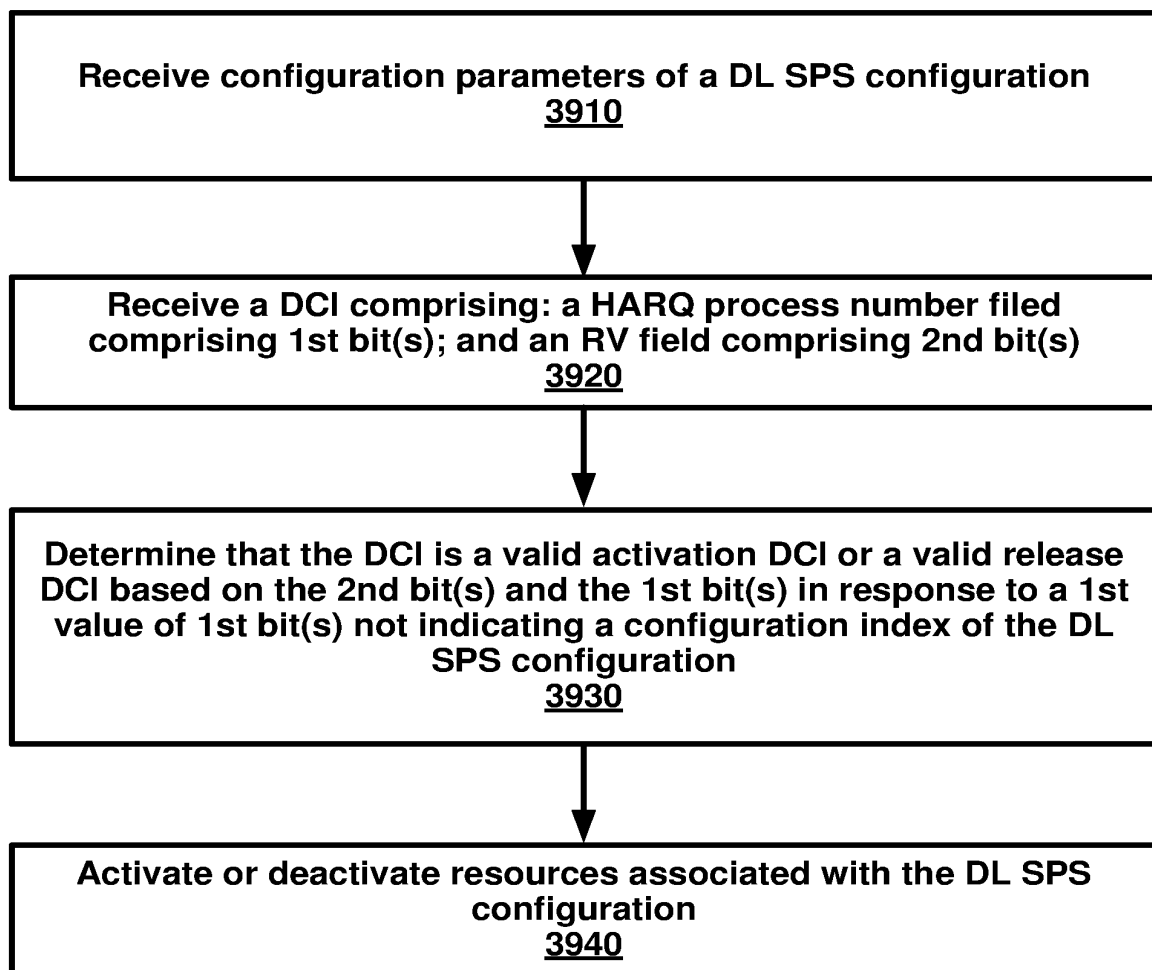


FIG. 39

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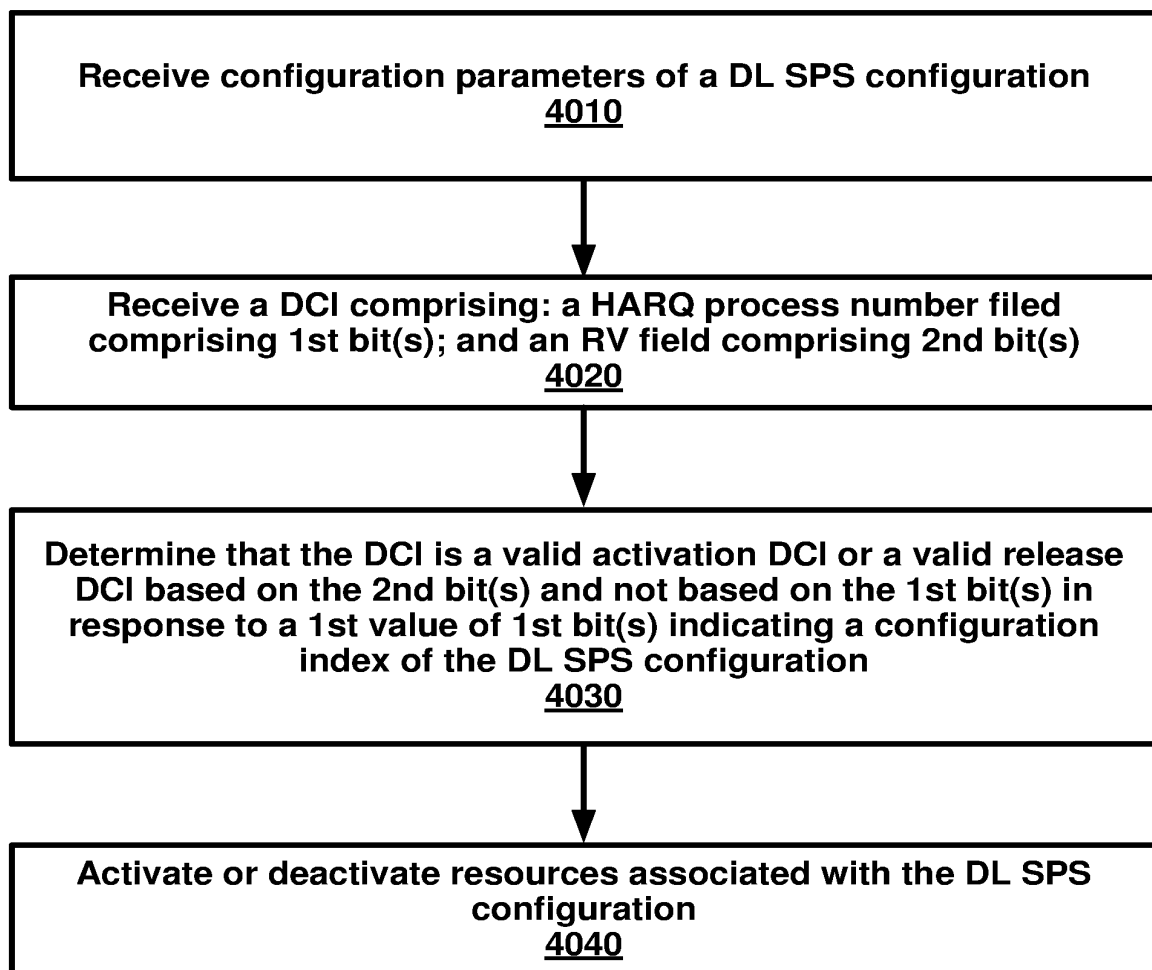


FIG. 40

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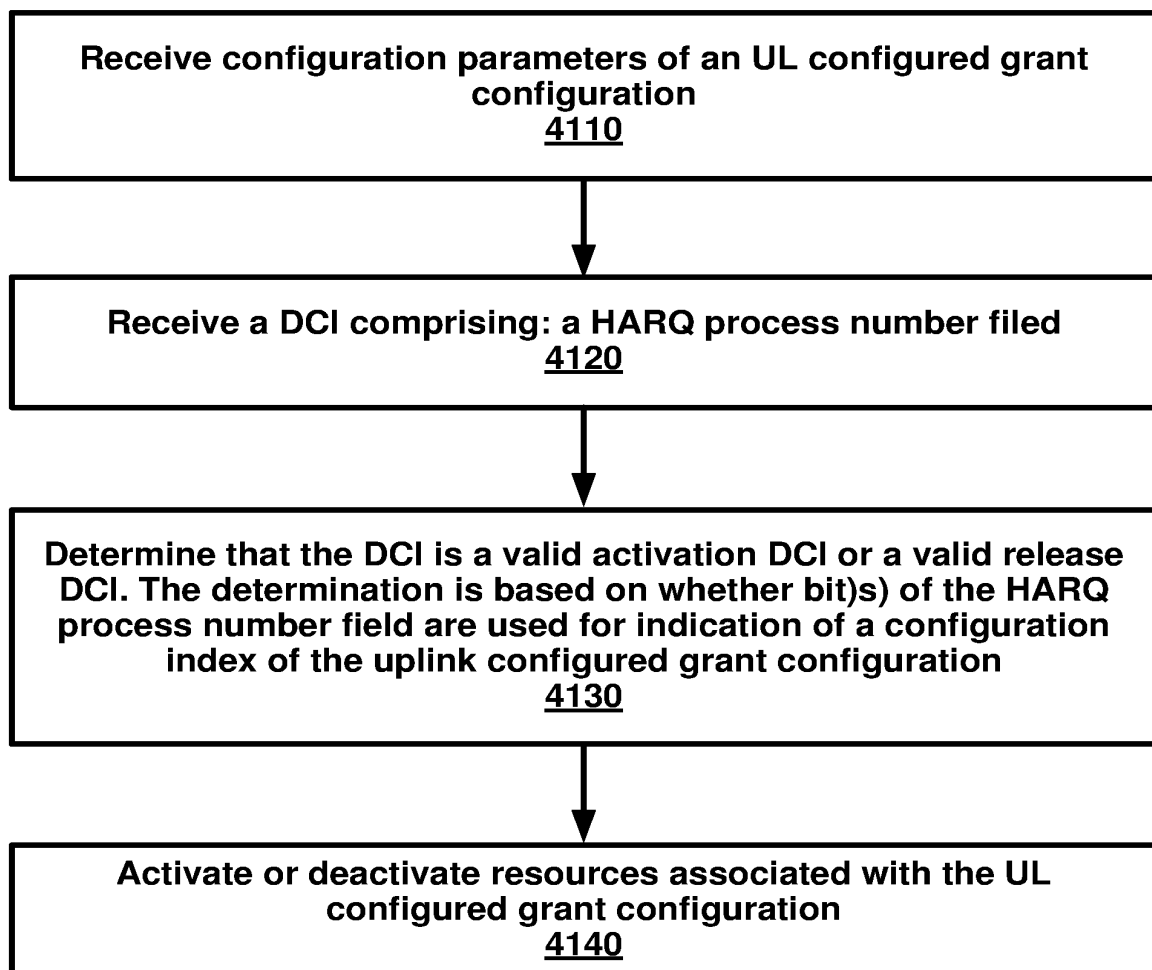


FIG. 41

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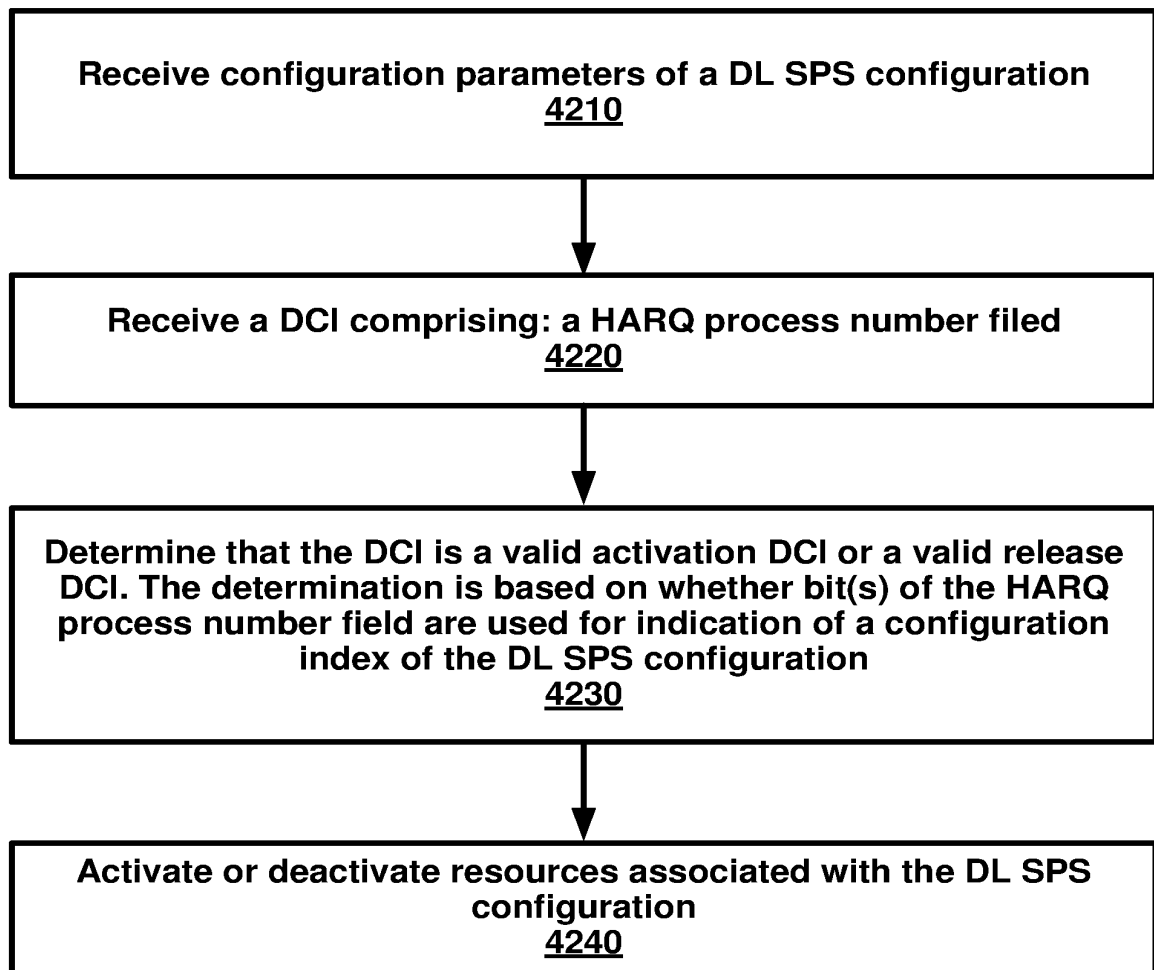


FIG. 42

CLAIMS

What is claimed is:

1. A method comprising:
 - receiving, by a wireless device, configuration parameters of an uplink configured grant configuration;
 - receiving a downlink control information (DCI) comprising:
 - a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and
 - a redundancy version field comprising one or more second bits;
 - determining whether a first value of the one or more first bits indicates a configuration index of the uplink configured grant configuration;
 - determining that the DCI is a valid activation DCI or a valid release DCI:
 - based on the one or more second bits and not based on the one or more first bits in response to the first value indicating the configuration index; and
 - based on the one or more second bits and the one or more first bits in response to the first value not indicating the configuration index; and
 - activating or deactivating a plurality of resources associated with the uplink configured grant configuration.
2. The method of claim 1, further comprising receiving a configuration parameter indicating one or more deactivation states, wherein the first value indicates a first deactivation state corresponding to one or more uplink configured grant configurations comprising the uplink configured grant configuration.
3. The method of claim 1, further comprising transmitting a confirmation control element comprising a field with a second value indicating that the DCI indicating activation or deactivation of the uplink configured grant configuration, in a plurality of uplink configured grant confirmations, is received.
4. The method of claim 1, wherein:
 - the configuration parameters of the uplink configured grant configuration comprise a first radio network temporary identifier; and

the DCI is associated with the first radio network temporary identifier.

5. The method of claim 4, wherein:
 - the DCI further comprises a new data indicator field; and
 - determining that the DCI is a valid activation DCI or a valid release DCI is further based on the DCI being associated with the first radio network temporary identifier and based on a third value of the new data indicator field being zero.
6. The method of claim 1, wherein:
 - the first value indicates the configuration index of the uplink configured grant configuration in a plurality of uplink configured grant configurations; and
 - determining that the DCI is a valid activation DCI or a valid release DCI is based on the one or more second bits and not based on the one or more first bits.
7. The method of claim 6, further comprising receiving second configuration parameters of bandwidth part of a cell, wherein the plurality of uplink configured grant configurations are for the bandwidth part.
8. The method of claim 6, wherein the configuration parameters of the uplink configured grant configuration comprise a first parameter indicating the configuration index.
9. The method of claim 1, wherein, in response to the first value indicating the configuration index, determining that the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with one or more second predetermined values.
10. The method of claim 1, wherein, in response to the first value not indicating the configuration index, determining that the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with one or more second predetermined values and comparing the one or more first bits with one or more first predetermined values.
11. The method of claim 10, wherein:
 - the one or more first predetermined values are all zeros; and
 - the one or more second predetermined values are all zeros.
12. A method comprising:

receiving, by a wireless device, configuration parameters of a downlink semi-persistent scheduling (SPS) configuration;
receiving a downlink control information (DCI) comprising:
 a hybrid automatic repeat request (HARQ) process number field comprising one or more first bits; and
 a redundancy version field comprising one or more second bits;
determining whether a first value of the one or more first bits indicates a configuration index of the downlink SPS configuration;
determining that the DCI is a valid activation DCI or a valid release DCI:
 based on the one or more second bits and not based on the one or more first bits in response to the first value indicating the configuration index; and
 based on the one or more second bits and the one or more first bits in response to the first value not indicating the configuration index; and
activating or deactivating a plurality of resources associated with the downlink SPS configuration.

13. The method of claim 12, further comprising receiving a configuration parameter indicating one or more deactivation states, wherein the first value indicates a first deactivation state corresponding to one or more downlink SPS configurations comprising the downlink SPS configuration.

14. The method of claim 12, wherein:
 the DCI further comprises a new data indicator field; and
 determining that the DCI is a valid activation DCI or a valid release DCI is further based on the DCI being associated with a first radio network temporary identifier and based on a second value of the new data indicator field being zero.

15. The method of claim 12, wherein:
 the first value indicates the configuration index of the downlink SPS configuration in a plurality of downlink SPS configurations; and
 determining that the DCI is a valid activation DCI or a valid release DCI is based on the one or more second bits and not based on the one or more first bits.

16. The method of claim 15, further comprising receiving second configuration parameters of bandwidth part of a cell, wherein the plurality of downlink SPS configurations are for the bandwidth part.
17. The method of claim 15, wherein the configuration parameters of the downlink SPS configuration comprise a first parameter indicating the configuration index.
18. The method of claim 12, wherein, in response to the first value indicating the configuration index, determining that the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with one or more second predetermined values.
19. The method of claim 12, wherein, in response to the first value not indicating the configuration index, determining that the DCI is a valid activation DCI or a valid release DCI is based on comparing the one or more second bits with one or more second predetermined values and comparing the one or more first bits with one or more first predetermined values.
20. The method of claim 12, wherein:
 - the one or more first predetermined values are all zeros; and
 - the one or more second predetermined values are all zeros.

ABSTRACT

A wireless device may receive configuration parameters of an uplink configured grant configuration. A DCI is received that comprises: a HARQ process number field comprising first bit(s); and a redundancy version field comprising second bit(s). A determination is made whether a first value of the first bit(s) indicates a configuration index of the uplink configured grant configuration. A determination is made that the DCI is a valid activation DCI or a valid release DCI: based on the second bit(s) and not based on the first bit(s) in response to the first value indicating the configuration index; and based on the second bit(s) and the first bit(s) in response to the first value not indicating the configuration index. A plurality of resources, associated with the uplink configured grant configuration, are activated or deactivated.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Scheduling Activation and Release
-------------------------------	-----------------------------------

As the below named inventor, I hereby declare that:

This declaration is directed to: ☒ The attached application, or
☐ United States application or PCT international application number _____
 filed on _____.

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

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Alireza Babaei Date (Optional) : _____

Signature: /Alireza Babaei/

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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