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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	124961

Acknowledgement of Change to Small Entity Status

The entity status change request below filed through Private PAIR on 11/07/2020 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

X 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

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

PTO/AIA/82A (07-13)
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Application Number	
Filing Date	November 7, 2020
First Named Inventor	Alireza Babaei
Title	Uplink Cancellation Indication Signaling
Art Unit	
Examiner Name	
Attorney Docket Number	2019-004Ut

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.**

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

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

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

Application Number	Filing Date

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☐ 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.)

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

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☐ 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.

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Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	Uplink Cancellation Indication Signaling
First Named Inventor/Applicant Name:	Alireza Babaei
Filer:	Alireza Babaei
Attorney Docket Number:	2019-004Ut
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:	41064068
Application Number:	17092244
International Application Number:	
Confirmation Number:	8842
Title of Invention:	Uplink Cancellation Indication Signaling
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
Filer Authorized By:	
Attorney Docket Number:	2019-004Ut
Receipt Date:	07-NOV-2020
Filing Date:	
Time Stamp:	14:42:58
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	E2020A7E45040409
Deposit Account	
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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	2019-004Ut_Track1Req.pdf	140318 fd550687d8bade14100c4c3749467b4f844ad848	no	2
Warnings:					
Information:					
2	Application Data Sheet	2019-004Ut_ADS.pdf	1255783 b7229ee09ec2c085b3c018c3c702301545a6e514	no	8
Warnings:					
Information:					
3	Specification	2019-004Ut_Specification.pdf	322974 eac2af803ef0344660729dbc09484aea1c60944a	no	61
Warnings:					
Information:					
4	Drawings-only black and white line drawings	2019-004Ut_Drawings.pdf	208435 be8f39dbdf799aae2b8273b468fcfa9a25816fd4	no	30
Warnings:					
Information:					
5	Claims	2019-004Ut_Claims.pdf	19837 8e835e00db8557e032e6e748539f399400dde492	no	3
Warnings:					
Information:					
6	Abstract	2019-004Ut_Abstract.pdf	11648 e291cf61c58a07cfce22638c66c6308c51fd1fdc	no	1
Warnings:					
Information:					

7	Oath or Declaration filed	2019-004Ut_Declaration.pdf	210389 2c0fbe738345e28b5d50df45a232fd7b31d523d6	no	2
Warnings:					
Information:					
8	Power of Attorney	2019-004Ut_PoA.pdf	274492 d5468b0a79bdd573172f686f3698602036e72993	no	2
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	40123 60d176f48eccf2492be8fc1cd1bd04c95d8930a9	no	2
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		Total Files Size (in bytes):	2483999		

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UPLINK CANCELLATION INDICATION SIGNALING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/932,487, filed November 7, 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 shows an example operation of normal uplink carrier and supplementary uplink carrier in accordance with several of various embodiments of the present disclosure.

[0021] FIG. 17 shows an example uplink cancellation process in accordance with several of various embodiments of the present disclosure.

[0022] FIG. 18 shows an example process in accordance with several of various embodiments of the present disclosure.

[0023] FIG. 19 shows an example information element for uplink cancellation indication 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 an example information element for uplink cancellation indication 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. 23 shows an example information element for uplink cancellation indication in accordance with several of various embodiments of the present disclosure.

[0028] FIG. 24 shows an example process in accordance with several of various embodiments of the present disclosure.

[0029] FIG. 25 shows an example information element for uplink cancellation indication in accordance with several of various embodiments of the present disclosure.

[0030] FIG. 26 shows an example uplink cancellation process in accordance with several of various embodiments of the present disclosure.

[0031] FIG. 27 shows an example uplink cancellation process in accordance with several of various embodiments of the present disclosure.

[0032] FIG. 28 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

[0033] FIG. 29 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

[0034] FIG. 30 shows an example flow diagram in accordance with several of various embodiments of the present disclosure.

DETAILED DESCRIPTION

[0035] The exemplary embodiments of the disclosed technology enable uplink cancellation indication 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 signaling and determination of uplink cancellation indication.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] 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.

[0040] 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.

[0041] 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)).

[0042] 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.

[0043] 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.

[0044] 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.

[0045] 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.

[0046] 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.

[0047] 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.

[0048] 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.

[0049] 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.

[0050] 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.

[0051] 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.

[0052] 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.

[0053] 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.

[0054] 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.

[0055] 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).

[0056] 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.

[0057] 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).

[0058] 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.

[0059] 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.

[0060] 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.

[0061] 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.

[0062] 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.

[0063] 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.

[0064] 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).

[0065] 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 or one or more processes,

activation/deactivation of one or more processes, indication of parameters used in one or more processes, etc.

[0066] 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.

[0067] 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).

[0068] 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 form 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).

[0069] 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).

[0070] 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.

[0071] 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.

[0072] 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.

[0073] 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.

[0074] 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.

[0075] 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.

[0076] 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).

[0077] 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.

[0078] 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 66.7μs. 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.

[0079] 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 $\Delta f = 2^{\mu}.15\ KHz$ (μ=0, 1, 2, …). Example subcarrier spacings used in NR include 15KHz (μ=0), 30KHz (μ=1), 60 KHz (μ=2), 120 KHz (μ=3) and 240 KHz (μ=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).

[0080] 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 $N_{slot}^{frame,\mu}$.

[0081] 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.

[0082] 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., μ=0), a resource block may be 180 KHz and for a subcarrier spacing of 30 KHz (e.g., μ=1), a resource block may be 360 KHz.

[0083] 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.

[0084] FIG. 10 shows an example of bandwidth part adaptation and switching. In this example, three BWPs (BWP_1 1004, BWP_2 1006 and BWP_3 1008) are configured for a UE on a carrier bandwidth. The BWP_1 is configured with a bandwidth of 40 MHz and a numerology with subcarrier spacing of 15 KHz, the BWP_2 is configured with a bandwidth of 10 MHz and a numerology with subcarrier spacing of 15 KHz and the BWP_3 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., BWP_1) to a second BWP (e.g., BWP_2). An active BWP of the cell may change from the first BWP to the second BWP in response to the BWP switching.

[0085] 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.

[0086] 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.

[0087] 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.

[0088] 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.

[0089] 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.

[0090] 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.

[0091] 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.

[0092] 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.

[0093] 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.

[0094] 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., SBB 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.

[0095] 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.

[0096] 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.

[0097] 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.

[0098] 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. The 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 that the SS/PBCH block is repeated at least every 20 ms.

[0099] 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.

[0100] 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.

[0101] 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 SBBs 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.

[0102] 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.

[0103] 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.

[0104] 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.

[0105] 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.

[0106] 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.

[0107] 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.

[0108] 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.

[0109] 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).

[0110] 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.

[0111] 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 Nth subcarrier. Different SRS transmissions from different wireless devices may have different comb structures and may be multiplexed in frequency domain.

[0112] 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.

[0113] 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.

[0114] 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.

[0115] 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.

[0116] 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 sever 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.

[0117] 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.

[0118] 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).

[0119] 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.

[0120] 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.

[0121] 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 configurating different channels (e.g., physical layer channel, logical channels, RLC channels, etc.) and/or signals (e.g., CSI-RS, SRS, etc.).

[0122] 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 [t1, t2], wherein the timer is started at time t1 and expires at time t2 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.

[0123] 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.

[0124] 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 System1524 at the wireless device 1502 and Data Processing System1564 at the base station 1542), Memory (e.g., Memory 1512 at the wireless device 1502 and Memory 1542 at the base station1542). 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).

[0125] 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.

[0126] 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 System1524 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 System1524 and/or the Data Processing System1564. 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).

[0127] 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.

[0128] 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.

[0129] 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.

[0130] 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.

[0131] In an example, a DCI format 2_1 may be used for notifying the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE. The following information may be transmitted by means of the DCI format 2_1 with CRC scrambled by INT-RNTI: Pre-emption indication 1, Pre-emption indication 2, …, Pre-emption indication N. The size of DCI format 2_1 may be configurable by higher layers up to 126 bits. A pre-emption indication may be 14 bits.

[0132] In an example, a UE may receive configuration parameters comprising a DownlinkPreemption IE. The UE may be configured with an INT-RNTI provided by int-RNTI for monitoring PDCCH conveying DCI format 2_1. The UE may be additionally configured with: a set of serving cells by int-ConfigurationPerServingCell that includes a set of serving cell indexes provided by corresponding servingCellId and a corresponding set of locations for fields in DCI

format 2_1 by positionInDCI; an information payload size for DCI format 2_1 by dci-PayloadSize; an indication granularity for time-frequency resources by timeFrequencySet.

[0133] In an example, if a UE detects a DCI format 2_1 for a serving cell from the configured set of serving cells, the UE may assume that no transmission to the UE is present in PRBs and in symbols that are indicated by the DCI format 2_1, from a set of PRBs and a set of symbols of the last monitoring period. The indication by the DCI format 2_1 may not be applicable to receptions of SS/PBCH blocks.

[0134] In an example, the set of PRBs may be equal to the active DL BWP as defined in Subclause 12 and may include B_{INT} PRBs. In an example, if a UE detects a DCI format 2_1 in a PDCCH transmitted in a CORESET in a slot, the set of symbols may be the last $N_{\mathrm{symb}}^{\mathrm{slot}} \cdot T_{\mathrm{INT}} \cdot 2^{\mu - \mu_{\mathrm{INT}}}$ symbols prior to the first symbol of the CORESET in the slot where T_{INT} may be the PDCCH monitoring periodicity provided by the value of monitoringSlotPeriodicityAndOffset $N_{\mathrm{symb}}^{\mathrm{slot}}$ is the number of symbols per slot, μ may be the SCS configuration for a serving cell with mapping to a respective field in the DCI format 2_1, μ_{INT} may be the SCS configuration of the DL BWP where the UE may receive the PDCCH with the DCI format 2_1. In an example, if the UE is provided tdd-UL-DL-ConfigurationCommon, symbols indicated as uplink by tdd-UL-DL-ConfigurationCommon may be excluded from the last $N_{\mathrm{symb}}^{\mathrm{slot}} \cdot T_{\mathrm{INT}} \cdot 2^{\mu - \mu_{\mathrm{INT}}}$ symbols prior to the first symbol of the CORESET in the slot. The resulting set of symbols may include a number of symbols that is denoted as N_{INT}.

[0135] In an example, the UE may be provided the indication granularity for the set of PRBs and for the set of symbols by timeFrequencySet. In an example, if the value of timeFrequencySet is 0, 14 bits of a field in DCI format 2_1 may have a one-to-one mapping with 14 groups of consecutive symbols from the set of symbols where each of the first $N_{\mathrm{INT}} - \lfloor N_{\mathrm{INT}}/14 \rfloor \cdot 14$ symbol groups includes $\lceil N_{\mathrm{INT}}/14 \rceil$ symbols, each of the last $14 - N_{\mathrm{INT}} + \lfloor N_{\mathrm{INT}}/14 \rfloor \cdot 14$ symbol groups may include $\lfloor N_{\mathrm{INT}}/14 \rfloor$ symbols, a bit value of 0 may indicate transmission to the UE in the corresponding symbol group and a bit value of 1 may indicate no transmission to the UE in the corresponding symbol group.

[0136] In an example, if the value of timeFrequencySet is 1, 7 pairs of bits of a field in the DCI format 2_1 may have a one-to-one mapping with 7 groups of consecutive symbols where each of the first $N_{\mathrm{INT}} - \lfloor N_{\mathrm{INT}}/7 \rfloor \cdot 7$ symbol groups includes $\lceil N_{\mathrm{INT}}/7 \rceil$ symbols, each of the last $7 -$

$N_{\mathrm{INT}} + \lfloor N_{\mathrm{INT}}/7 \rfloor \cdot 7$ symbol groups may include $\lfloor N_{\mathrm{INT}}/7 \rfloor$ symbols, a first bit in a pair of bits for a symbol group may be applicable to the subset of first $\lceil B_{\mathrm{INT}}/2 \rceil$ PRBs from the set of B_{INT} PRBs, a second bit in the pair of bits for the symbol group may be applicable to the subset of last $\lfloor B_{\mathrm{INT}}/2 \rfloor$ PRBs from the set of B_{INT} PRBs, a bit value of 0 may indicate transmission to the UE in the corresponding symbol group and subset of PRBs, and a bit value of 1 may indicate no transmission to the UE in the corresponding symbol group and subset of PRBs.

[0137] In an example, an IE DownlinkPreemption may be used to configure the UE to monitor PDCCH for the INT-RNTI (interruption). The DownlinkPreemption may comprise one or more of following parameters: a dci-PayloadSize parameter indicating total length of the DCI payload scrambled with INT-RNTI; an int-ConfigurationPerServingCell parameter indicating (per serving cell) the position of the 14 bit INT values inside the DCI payload; an int-RNTI parameter indicating RNTI used for indication pre-emption in DL; a timeFrequencySet parameter indicating set selection for DL-preemption indication, wherein the set may determine how the UE may interpret the DL preemption DCI payload; and a positionInDCI parameter indicating starting position (in number of bit) of the 14 bit INT value applicable for this serving cell (servingCellId) within the DCI payload wherein the positionInDCI may be multiples of 14 (bit).

[0138] In an example, in conjunction with a UL/DL carrier pair (FDD band) or a bidirectional carrier (TDD band), a UE may be configured with additional, Supplementary Uplink (SUL).

[0139] In case of Supplementary Uplink (SUL), the UE may be configured with a plurality (e.g., 2) ULs for one DL of the same cell, and uplink transmissions on those ULs may be controlled by the network to avoid overlapping PUSCH/PUCCH transmissions in time. Overlapping transmissions on PUSCH may be avoided through scheduling while overlapping transmissions on PUCCH may be avoided through configuration (e.g., PUCCH may be configured for only one of the ULs of the cell).

[0140] To improve UL coverage for high frequency scenarios, SUL may be configured. With SUL, the UE may be configured with 2 ULs for one DL of the same cell as depicted in FIG. 16.

[0141] In an example, PDCCH may be used for UL cancelation indication. In an example, based on detecting an UL cancelation indication, the wireless device may stop an uplink transmission without resuming. In an example, the UL transmission may include one or more of dynamically scheduled UL transmissions (e.g., PUSCH, PUCCH, and SRS), semi-persistent UL transmissions

(e.g., PUSCH, PUCCH, SRS), Periodic UL transmissions (e.g., configured grant PUSCH, PUCCH, SRS) and PRACH.

[0142] In an example, the UL cancellation indication may be indicated using a group common DCI.

[0143] In an example, a time/frequency region may be provided in the cancelation indication DCI for a group of UEs to derive the UL cancelation behavior. In an example, UL cancellation indication may be separately provided for each UE in a group common DCI.

[0144] In an example, for a UE supporting UL cancellation, the UE may be configured with slot-level or mini-slot level monitoring for UL cancellation indication monitoring. For mini-slot level monitoring, monitoring occasion and number for blind decoding for UL cancellation indication may be configurable.

[0145] In an example, upon receiving UL cancellation indication, UE may determine the starting position of cancelled time resources based on one or more of the following: slot and/or symbol offset indicated by DCI relative to the ending symbol PDCCH CORESET carrying the UL cancellation indication plus the minimum UE processing time for cancelation operation; slot and/or symbol offset configured by RRC relative to the ending symbol PDCCH CORESET carrying the UL cancellation indication plus the minimum UE processing time for cancelation operation; and symbol-level offset implicitly determined based on the ending symbol PDCCH CORESET carrying the UL cancellation indication plus the minimum UE processing time for cancelation operation.

[0146] In an example, a wireless device may apply the UL cancellation in one slot. The UE may cancel the UL transmission in one slot given by UL cancellation indication until the boundary of the slot. In an example, UL cancellation may be applied for multiple slots.

[0147] In an example, for UL transmission with associated PDCCH, UE may start UL CI monitoring after the PDCCH is decoded. In an example, UE may monitor UL CI at least at the latest monitoring occasion ending no later than X symbols before the start of the UL transmission, and X may be related to UL CI processing time. For UL transmission without associated PDCCH, UE may monitor UL CI at least at the latest monitoring occasion that ends no later than X symbols before the start of the UL transmission, In an example, the RRC configuration parameters for UL cancellation indication may indicate a new RNTI (e.g. CI-RNTI) for UL Cancellation Indication. The DCI payload size for UL CI may be configured by RRC.

[0148] In an example, for UL transmissions with and without associated PDCCH, UE may start monitoring UL CI at least at the latest monitoring occasion ending no later than X symbols before the start of the UL transmission, and X may be related to UL CI processing time. The UE may stop monitoring UL CI from X symbols before the end of relevant UL transmission, and X may be related to UL CI processing time.

[0149] In an example, a wireless device may be configured with a plurality of carriers, for example a normal carrier (NUL) and a supplementary uplink (SUL). An example is shown in FIG. 16. The SUL may be configured to improve uplink coverage for high frequency scenarios. In case of a Supplementary Uplink, the wireless device may be configured with 2 ULs for one DL of the same cell, and uplink transmissions on those two ULs may be controlled by the network (for example to avoid overlapping PUSCH/PUCCH transmissions in time). The overlapping transmissions on PUSCH may be avoided through scheduling. The overlapping transmissions on PUCCH are avoided through configuration. Initial access may be supported in each of the uplink. In an example, overlapping PUSCH/PUCCH transmissions of uplink carriers in time may be possible.

[0150] Example embodiments may operate considering different traffic/service types including enhanced mobile broadband (eMBB) traffic/service type and ultra-reliable low-latency communications (URLLC) traffic/service types. The eMBB traffic/service type may be related to high data rate applications where latency and reliability requirements may not be as strict as the data rate requirements. The URLLC applications may have strict requirements on latency and reliability and may require comparatively lower data rates than the eMBB traffic/service type.

[0151] In example embodiments and as shown in FIG. 17, a wireless device may be scheduled with an uplink transmission and may stop the uplink transmission due to receiving an uplink cancellation indication indicating radio resources that overlap with the uplink transmission. In an example, in response to the radio resources indicated by the uplink cancellation indication staring before the scheduled the resources, the wireless device may not start the scheduled uplink transmission. In an example the scheduled uplink transmission may correspond to an eMBB traffic/service type and the base station may transmit the uplink cancellation indication so that the resources indicated by the uplink cancellation may be used for scheduling uplink transmissions (e.g., transport blocks) corresponding to URLLC traffic/service type. As shown in FIG. 17, the wireless device may start its scheduled uplink transmission due to uplink cancellation indication indicating resources that has overlap with the scheduled resources. The wireless device may not resume its transmission of the

scheduled uplink transmission even if the cancelled resources end before the scheduled uplink transmission ends. The wireless device may receive a DCI, associated with an RNTI for uplink cancellation indication, comprising a plurality of uplink cancellation indications including an uplink cancellation indication related to the scheduled uplink transmission. The DCI may determine a relevant uplink cancellation indication based on one or more configuration parameters (e.g., uplink cancellation indication configuration parameters).

[0152] Uplink cancellation mechanism may be used by a base station to cancel scheduled uplink transmissions for one or more wireless devices. The resources of the scheduled uplink transmissions may be used for other uplink transmissions that have strict delay and reliability requirements (for example, in URLLC applications). The uplink cancellation mechanisms may be indicated using a group common downlink control information comprising a plurality of uplink cancellation indications. Existing technologies for determination of a relevant uplink cancellation indication among a plurality of uplink cancellation indications, by the wireless device, may be inefficient when a serving cell is configured with a plurality of uplink carriers and/or when an uplink carrier is configured with a plurality of BWPs (e.g., a plurality of simultaneously active BWPs). There is a need to enhance the existing uplink cancellation indication technologies when a serving cell is configured with a plurality of uplink carriers and/or when an uplink carrier is configured with a plurality of BWPs (e.g., a plurality of simultaneously active BWPs). Example embodiments enhance the uplink cancellation indication and determination processes.

[0153] In an example, 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 parameters may comprise configuration parameters of one or more cells comprising a serving cell. The configuration parameters of the serving cell may comprise a serving cell index. The serving cell may be configured with a plurality of uplink carriers. The plurality of uplink carriers may comprise a normal uplink carrier and a supplementary uplink carrier. An uplink carrier, in the plurality of uplink carriers, may be configured with a plurality of BWPs. In an example, one or more uplink carrier of the plurality of uplink carriers may be active. In an example, one or more BWPs of a plurality of BWPs of an uplink carrier may be simultaneously active. An uplink carrier or a BWP of an uplink carrier may be active when normal transmission processes can occur on the uplink carrier and/or on the BWP of the uplink carrier.

[0154] I an example, the one or more messages may comprise uplink cancellation indication configuration parameters. The uplink cancellation indication configuration parameters may comprise a radio network temporary identifier (RNTI). The RNTI may be called a cancellation indication RNTI (e.g., CI-RNTI).

[0155] In an example embodiment as shown in FIG. 19, the uplink cancellation configuration parameters may comprise a sequence of parameters/information elements (IEs), wherein an IE in the sequence of one or more IEs may comprise: an identifier of a serving cell, a first position, in a downlink control information, for a first uplink carrier of a serving cell and a second position, in a downlink control information, for a second uplink carrier of the serving cell. In an example, the first uplink carrier may be one of a normal uplink carrier and a supplementary uplink carrier. In an example, the second uplink carrier, different from the first uplink carrier, may be one of the normal uplink carrier and the supplementary uplink carrier. In an example, the first position may indicate an integer between one and a payload size of the download control information, wherein the payload size may be a constant number and/or may be configurable (e.g., using an RRC parameter). In an example, the second position may indicate an integer between one and a payload size of the download control information. The first position may indicate a first bit in the plurality of bits in the downlink control information. The first bit may indicate a starting bit of an uplink cancellation indication. The second position may indicate a second bit in the plurality of bits of the downlink control information. The second bit may indicate a starting bit of an uplink cancellation indication. In an example, the size of the uplink cancellation may be a fixed number. By determining a starting bit of an uplink cancellation indication, the wireless device may determine an uplink cancellation indication based on the size of the uplink cancellation indication. For example, the last bit of an uplink cancellation indication may be determined based on the staring bit of the uplink cancellation indication and the size of the uplink cancellation indication.

[0156] In an example embodiment, the uplink cancellation configuration parameters may comprise a sequence of parameters/information elements (IEs), wherein an IE in the sequence of one or more IEs may comprise: an identifier of a serving cell, a position, in a downlink control information, for a first uplink carrier of a plurality of uplink carrier of the serving cell. In an example, the first uplink carrier may be one of a normal uplink carrier and a supplementary uplink carrier. In an example, the position may indicate an integer between one and a payload size of the download control information, wherein the payload size may be a constant number and/or may be

configurable (e.g., using an RRC parameter). The position may indicate a first bit in the plurality of bits in the downlink control information. The first bit may indicate a starting bit of an uplink cancellation indication. In an example, the size of the uplink cancellation may be a fixed number. By determining a starting bit of an uplink cancellation indication, the wireless device may determine an uplink cancellation indication based on the size of the uplink cancellation indication. For example, the last bit of an uplink cancellation indication may be determined based on the staring bit of the uplink cancellation indication and the size of the uplink cancellation indication.

[0157] As shown in FIG. 18, the wireless device may receive a downlink control information, associated with the RNTI (e.g., CI-RNTI), wherein the downlink control information may comprise a plurality of uplink cancellation indications. In an example, the plurality of uplink cancellation indications may be for a plurality of cells. In an example, the plurality of uplink cancellation indications may be for a plurality of uplink carriers of a plurality of cells. The downlink control information may be a group common DCI and the wireless device may receive the downlink control information in a common search space of a control channel.

[0158] As shown in FIG. 18, the wireless device may determine that an uplink transmission is scheduled on the first uplink carrier of the serving cell. For example, the wireless device may determine that a dynamically scheduled PUSCH or a PUSCH based on a configured grant or a SRS or another signal/channel is scheduled for transmission via the first uplink carrier of the serving cell. The wireless device may determine, based on the downlink control information and the first position (e.g., first position associated with the first uplink carrier) a first uplink cancellation indication in the plurality of uplink cancellation indications of the downlink control information. In an example, based on the determination that uplink transmission is scheduled on the first uplink carrier of the serving cell, the wireless device may determine, based on the downlink control information and the first position (e.g., first position associated with the first uplink carrier) a first uplink cancellation indication in the plurality of uplink cancellation indications of the downlink control information.

[0159] As shown in FIG. 18, the wireless device may determine, based on the first uplink cancellation indication, first radio resources of the first uplink carrier of the serving cell. The wireless device may determine the first radio resources based on the first uplink cancellation indication and one or more configuration parameters (e.g., one or more uplink cancellation indication configuration parameters). The wireless device may determine, based on the first uplink

cancellation indication, radio resources (e.g., resource blocks and/or symbols) of the first uplink carrier of the serving cell for uplink cancellation, wherein the radio resources comprise the first radio resources.

[0160] As shown in FIG. 18, the wireless device may cancel second radio resources of the first radio resource based on the determining the first radio resources. In an example, the radio resources of the scheduled transmission, on the first uplink carrier of the servicing cell, may comprise the second radio resources. In an example, the second radio resources of the first radio resources may be radio resources among those indicated for uplink cancellation that have overlap with the scheduled uplink transmission on the first uplink carrier of the serving cell. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission on the second radio resources. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission at an earliest symbol of the second radio resources and in the midst of the scheduled uplink transmission. In an example, the cancelling the uplink transmission on the second radio resources may comprise not transmitting the scheduled uplink transmission.

[0161] In an example embodiment as shown in FIG. 21, the uplink cancellation configuration parameters may comprise a sequence of one or more parameters/information elements (IEs), wherein an IE in the sequence of one or more IEs may comprise: a first identifier of a serving cell, a second identifier of a BWP of the serving cell, a position, in a downlink control information, for the BWP of the serving cell. In an example, the position may indicate an integer between one and a payload size of the download control information, wherein the payload size may be a constant number and/or may be configurable (e.g., using an RRC parameter). The position may indicate a bit in the plurality of bits in the downlink control information. The bit may indicate a starting bit of an uplink cancellation indication. In an example, the size of the uplink cancellation indication may be a fixed number. By determining a starting bit of an uplink cancellation indication, the wireless device may determine an uplink cancellation indication based on the size of the uplink cancellation indication. For example, the last bit of an uplink cancellation indication may be determined based on the staring bit of the uplink cancellation indication and the size of the uplink cancellation indication.

[0162] As shown in FIG. 20, the wireless device may receive a downlink control information, associated with the RNTI (e.g., CI-RNTI), wherein the downlink control information may comprise a plurality of uplink cancellation indications. In an example, the plurality of uplink cancellations may be for a plurality of cells. In an example, the plurality of uplink cancellations may be for a plurality of BWPs of a plurality of cell. The downlink control information may be a group common DCI and the wireless device may receive the downlink control information in a common search space of a control channel.

[0163] As shown in FIG. 20, The wireless device may determine, based on the downlink control information and the position a first uplink cancellation indication in the plurality of uplink cancellation indications of the downlink control information.

[0164] As shown in FIG. 20, the wireless device may determine, based on the first uplink cancellation indication, first radio resources of the BWP of the serving cell. The wireless device may determine the first radio resources based on the first uplink cancellation indication and one or more configuration parameters (e.g., uplink cancellation indication configuration parameters). The wireless device may determine, based on the first uplink cancellation indication, radio resources (e.g., resource blocks and/or symbols) of the BWP of the serving cell for uplink cancellation, wherein the radio resources comprise the first radio resources.

[0165] As shown in FIG. 20, the wireless device may cancel second radio resources of the first radio resource based on the determining the first radio resources. In an example, the radio resources of the scheduled transmission, on the BWP of the serving cell, may comprise the second radio resources. In an example, the second radio resources of the first radio resources may be radio resources among those indicated for uplink cancellation that have overlap with the scheduled uplink transmission on the BWP of the serving cell. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission on the second radio resources. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission at an earliest symbol of the second radio resources and in the midst of the scheduled uplink transmission. In an example, the cancelling the uplink transmission on the second radio resources may comprise not transmitting the scheduled uplink transmission.

[0166] In an example embodiment, a downlink control information for uplink cancellation indication (e.g., associated with the cancellation indication RNTI) may comprise and/or indicate

uplink cancellation indications for a plurality of BWPs and/or uplink carriers of a plurality of cells. In an example, the wireless device may determine an uplink cancellation indication for a BWP and/or uplink carrier of a cell based on the receiving the downlink control information.

[0167] In an example embodiment as shown in FIG. 23, the uplink cancellation configuration parameters may comprise a sequence of parameters/information elements (IEs), wherein an IE in the sequence of one or more IEs may comprise: a target cell parameter indicating an identifier of a serving cell, a first cancellation indication index for a first uplink carrier of the serving cell and a second cancellation indication index for a second uplink carrier of the serving cell. In an example, the first uplink carrier may be one of a normal uplink carrier and a supplementary uplink carrier. In an example, the second uplink carrier, different from the first uplink carrier, may be one of the normal uplink carrier and the supplementary uplink carrier. In an example, the first uplink cancellation indication index may be an integer between one and a max number, wherein the max number may indicate a number of the uplink cancellation indications in the downlink control information. In an example, the second uplink cancellation index may be an integer between one and a max number, wherein the max number may indicate a number of the uplink cancellation indications in the downlink control information. In an example, the size of an uplink cancellation indication may be a fixed number.

[0168] As shown in FIG. 22, the wireless device may receive a downlink control information, associated with the RNTI (e.g., CI-RNTI), wherein the downlink control information may comprise a plurality of uplink cancellation indications. In an example, the plurality of uplink cancellation indications may be for a plurality of cells. In an example, the plurality of uplink cancellation indications may be for a plurality of uplink carrier of a plurality of cell. The downlink control information may be a group common DCI and the wireless device may receive the downlink control information in a common search space of a control channel.

[0169] As shown in FIG. 22, the wireless device may determine that an uplink transmission is scheduled on the first uplink carrier of the serving cell. For example, the wireless device may determine that a dynamically scheduled PUSCH or a PUSCH based on a configured grant or a SRS or another signal/channel is scheduled for transmission via the first uplink carrier of the serving cell. The wireless device may determine, based on the downlink control information and the first uplink cancellation index, a first uplink cancellation indication in the plurality of uplink cancellation indications of the downlink control information. In an example, based on the

determination that uplink transmission is scheduled on the first uplink carrier of the serving cell, the wireless device may determine, based on the downlink control information and the first uplink cancellation index, a first uplink cancellation indication in the plurality of uplink cancellation indications of the downlink control information.

[0170] As shown in FIG. 22, the wireless device may determine, based on the first uplink cancellation indication, first radio resources of the first uplink carrier of the serving cell. The wireless device may determine the first radio resources based on the first uplink cancellation indication and one or more configuration parameters (e.g., uplink cancellation indication configuration parameters). The wireless device may determine, based on the first uplink cancellation indication, radio resources (e.g., resource blocks and/or symbols) of the first uplink carrier of the serving cell for uplink cancellation, wherein the radio resources comprise the first radio resources.

[0171] As shown in FIG. 22, the wireless device may cancel second radio resources of the first radio resource based on the determining the first radio resources. In an example, the radio resources of the scheduled transmission, on the first uplink carrier of the servicing cell, may comprise the second radio resources. In an example, the second radio resources of the first radio resources may be radio resources among those indicated for uplink cancellation that have overlap with the scheduled uplink transmission on the first uplink carrier of the serving cell. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission on the second radio resources. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission at an earliest symbol of the second radio resources and in the midst of the scheduled uplink transmission. In an example, the cancelling the uplink transmission on the second radio resources may comprise not transmitting the scheduled uplink transmission.

[0172] In an example embodiment as shown in FIG. 25, the uplink cancellation configuration parameters may comprise a sequence of parameters/information elements (IEs), wherein an IE in the sequence of one or more IEs may comprise: a target cell indicating a first identifier of a serving cell, a target BWP indicating a target identifier of a BWP of the serving cell, an uplink cancellation index for the BWP of the serving cell.

[0173] As shown in FIG. 24, the wireless device may receive a downlink control information, associated with the RNTI (e.g., CI-RNTI), wherein the downlink control information may comprise a plurality of uplink cancellation indications. In an example, the plurality of uplink cancellations may be for a plurality of cells. In an example, the plurality of uplink cancellations may be for a plurality of BWPs of a plurality of cell. The downlink control information may be a group common DCI and the wireless device may receive the downlink control information in a common search space of a control channel.

[0174] As shown in FIG. 24, The wireless device may determine, based on the downlink control information and the uplink cancellation index, a first uplink cancellation indication in the plurality of uplink cancellation indications of the downlink control information.

[0175] As shown in FIG. 24, the wireless device may determine, based on the first uplink cancellation indication, first radio resources of the BWP of the serving cell. The wireless device may determine the first radio resources based on the first uplink cancellation indication and one or more configuration parameters (e.g., one or more uplink cancellation indication configuration parameters). The wireless device may determine, based on the first uplink cancellation indication, radio resources (e.g., resource blocks and/or symbols) of the BWP of the serving cell for uplink cancellation, wherein the radio resources comprise the first radio resources.

[0176] As shown in FIG. 24, the wireless device may cancel second radio resources of the first radio resource based on the determining the first radio resources. In an example, the radio resources of the scheduled transmission, on the BWP of the servicing cell, may comprise the second radio resources. In an example, the second radio resources of the first radio resources may be radio resources among those indicated for uplink cancellation that have overlap with the scheduled uplink transmission on the BWP of the serving cell. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission on the second radio resources. In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission of the scheduled uplink transmission at an earliest symbol of the second radio resources and in the midst of the scheduled uplink transmission. In an example, the cancelling the uplink transmission on the second radio resources may comprise not transmitting the scheduled uplink transmission.

[0177] In an example embodiment, a wireless device may receive separate uplink cancellation indication configuration parameters for different channels (e.g., PUSCH) and/or signals (SRS)

whose transmission may be cancelled by an uplink cancellation indication. In an example, the uplink cancellation indication configuration parameters may comprise first parameters that may be shared between different signals and/or channels. In addition to the first parameters, different channels and signals may have their specific configuration parameters.

[0178] In an example embodiment, a wireless device may receive uplink cancellation configuration parameters, comprising: a radio network temporary identifier; a sequence of one or more parameters/IEs, a first parameter/IE in the one or more parameters/IEs indicating: an identifier of a serving cell (e.g., a serving cell index); a first position, in a downlink control information, for a first uplink carrier of the serving cell; and a second position, in a downlink control information, for a second uplink carrier of the serving cell. The wireless device may receive a downlink control information, associated with the radio network temporary identifier, comprising a plurality of uplink cancellation indications. The wireless device may determine that an uplink transmission is scheduled on the first uplink carrier. The wireless device may determine, based on the downlink control information and the first position, a first uplink cancellation indication of the plurality of uplink cancellation indications. The wireless device may determine, based on the first uplink cancellation indication, first radio resources of the first uplink carrier of the serving cell. The wireless device may cancel uplink transmission on second radio resources of the first the radio resources based on the determining the first radio resources.

[0179] In an example, the radio resources of the scheduled uplink transmission comprise the second radio resources.

[0180] In an example, the first position indicates an integer between one and a payload size of the download control information, wherein the payload size is a constant number.

[0181] In an example, the second position indicates an integer between one and a payload size of the download control information, wherein the payload size is a constant number.

[0182] In an example, the size of the uplink cancellation indication is a fixed number.

[0183] In an example, the determining the first resources may be based on the first uplink cancellation indication and one or more configuration parameters of the uplink cancellation indication.

[0184] In an example, the determining the first uplink cancellation index may be based on determining a first bit of the uplink cancellation indication based on the first position and

determining a last bit of the uplink cancellation indication based on a size of the uplink cancellation indication.

[0185] In an example, the receiving the downlink control channel may be within a common search space of a downlink control channel.

[0186] In an example, the first uplink carrier may be a normal uplink carrier.

[0187] In an example, the second uplink carrier may be a supplementary uplink carrier.

[0188] In an example, the wireless device may determine, based on the first uplink cancellation indication, radio resources (resource blocks and symbols) of the first uplink carrier of the serving cell for uplink cancellation, wherein the radio resources comprise the first radio resources.

[0189] In an example, the downlink control information may be a group common DCI; and the downlink control information may be received in a common search space.

[0190] In an example, the plurality of cancellation indications may be for a plurality of cells.

[0191] In an example, the plurality of cancellation indications may be for a plurality of uplink carriers of a plurality of cells.

[0192] In an example, the cancelling the uplink transmission on the second radio resources may comprise stopping transmission on the second radio resources in the middle of a first uplink transmission. In an example, the first uplink transmission may be via a physical uplink shared channel (e.g., using a dynamic grant or configured grant). In an example, the first uplink transmission may be a sounding reference signal.

[0193] In an example embodiment, a wireless device may receive uplink cancellation configuration parameters, comprising: a radio network temporary identifier; and a sequence of one or more parameters/IEs, a first parameter/IE of the one or more parameters/IEs indicating: an identifier of a serving cell with a plurality of uplink carriers; and a position, in a downlink control information, for a first uplink carrier of the plurality of uplink carriers. The wireless device may receive a downlink control information, associated with the radio network temporary identifier, comprising a plurality uplink cancellation indications. The wireless device may determine that an uplink transmission is scheduled on the first uplink carrier of the serving cell. The wireless device may determine, based on the downlink control information and the position, a first uplink cancellation indication of the plurality of uplink cancellation indications. The wireless device may determine, based on the first uplink cancellation indication, first radio resources of the uplink carrier of the serving cell. The

wireless device may cancel uplink transmission on second radio resources of the first the radio resources based on the determining the first radio resources.

[0194] In an example, the radio resources of the scheduled uplink transmission may comprise the second radio resources.

[0195] In an example, the position may indicate an integer between one and a payload size of the download control information, wherein the payload size is a constant number.

[0196] In an example, a size of the uplink cancellation indication may be a fixed number.

[0197] In an example, the determining the first resources may be based on the first uplink cancellation indication and one or more configuration parameters of the uplink cancellation indication.

[0198] In an example, the determining the first uplink cancellation index may be based on determining a first bit of the uplink cancellation indication based on the first position and determining a last bit of the uplink cancellation indication based on a size of the uplink cancellation indication.

[0199] In an example, the receiving the downlink control may be within a common search space of a downlink control channel.

[0200] In an example, radio resources of an uplink transmission and the first radio resources may overlap on the second radio resources. In an example, the cancelling the uplink transmission on the second radio resources comprises stopping transmission on the second radio resources in the middle of a first uplink transmission.

[0201] In an example, the uplink transmission may be via a physical uplink shared channel. In an example, the wireless device may receive a DCI/uplink grant for the transmission via the PUSCH. In an example, the uplink transmission may be for transmission via a configured grant. In an example, the wireless device may receive a DCI indicating activation of a plurality of resources comprising second radio resources.

[0202] In an example, the uplink transmission may be for SRS. In an example, the wireless device may receive a DCI comprising a field, a value of the field indicating a request for the transmission of the SRS.

[0203] In an example, the downlink control information may be received via a common search space.

[0204] In an example, the uplink cancellation indication may indicate one or more symbols. In an example, the downlink control information is received at a first timing; and the one or more symbols is based on the first timing. In an example, a first symbol of the one or more symbols may start at an offset from the first timing.

[0205] In an example, an uplink cancellation in the plurality of uplink cancellations may comprises a first/fixed/constant number of bits. The uplink cancellation configuration parameters may indicate a size of the downlink control information. The second number of the plurality of uplink cancellation indications may be based on the size and the first number.

[0206] In an example embodiment, a wireless device may receive uplink cancellation configuration parameters, comprising: a radio network temporary identifier; and a sequence of one or more parameters/IEs, a first parameter/IE in the one or more parameters/IEs indicating: a first identifier of a serving cell; a second identifier of a bandwidth part of the serving cell; and a position, in a downlink control information, for the bandwidth part of the serving cell. The wireless device may receive a downlink control information, associated with the radio network temporary identifier, comprising a plurality uplink cancellation indications. The wireless device may determine, based on the downlink control information and the position, a first uplink cancellation indication of the plurality of uplink cancellation indications. The wireless device may determine, based on the first uplink cancellation indication, first radio resources of the bandwidth part of the serving cell. The wireless device may cancel uplink transmission on second radio resources of the first the radio resources based on the determining the first radio resources.

[0207] In an example embodiment, a wireless device may receive configuration parameters for uplink cancellation indication, comprising: a first radio network temporary identifier; a sequence of one or more parameters/IEs, a first parameter/IE in the one or more parameters/IEs indicating: a target cell parameter indicating an identifier of a serving cell; a first cancellation indication index for a first uplink carrier of the serving cell; and a second cancellation indication index for a second uplink carrier of the serving cell. The wireless device may receive a downlink control information, associated with the first radio network identifier, comprising a plurality of uplink cancellation indications. The wireless device may determine that an uplink transmission is scheduled on the first uplink carrier of the serving cell. The wireless device may determine, based on the downlink control information and the first cancellation indication index, a first uplink cancellation indication of the plurality of uplink cancellation indications. The wireless device may determine, based on the

first uplink cancellation indication, first radio resources of the first uplink carrier of the serving cell. The wireless device may cancel uplink transmission on second radio resources of the first the radio resources based on the determining the first radio resources.

[0208] In an example, radio resources of the scheduled uplink transmission comprise the second radio resources.

[0209] In an example, the first uplink cancellation index may be an integer between one and a max number, wherein the max number may indicate a number of the uplink cancellation indications indicated by the downlink control information.

[0210] In an example, the second uplink cancellation index may be an integer between one and a max number, wherein the max number may indicate a number of the uplink cancellation indications indicated by the downlink control information.

[0211] In an example, a size of the uplink cancellation indication may be a fixed number.

[0212] In an example, the determining the first resources may be based on the first uplink cancellation indication and one or more configuration parameters of the uplink cancellation indication.

[0213] In an example, the receiving the downlink control may be within a common search space of a downlink control channel.

[0214] In an example, the first uplink carrier is a normal uplink carrier.

[0215] In an example, the second uplink carrier is a supplementary uplink carrier.

[0216] In an example, the first cancellation index may indicate a first position of the first uplink cancellation indication in the downlink control information; and the second cancellation index may indicate a second position of the second uplink cancellation indication in the downlink control information.

[0217] In an example embodiment, a wireless device may receive configuration parameters for uplink cancellation indication, comprising: a first radio network temporary identifier; a sequence of one or more parameters/IEs, a first parameter/IE in the one or more parameters/IEs indicating: a target cell parameter indicating an identifier of a serving cell with a plurality of uplink carriers; and a cancellation indication index for a first uplink carrier of the plurality of uplink carriers. The wireless device may receive a downlink control information, associated with the first radio network identifier, comprising a plurality of uplink cancellation indications. The wireless device may determine, based on the downlink control information and the cancellation indication index, a first

uplink cancellation indication of the plurality of uplink cancellation indications. The wireless device may determine, based on the first uplink cancellation indication, first radio resources of the first uplink carrier of the serving cell. The wireless device may cancel uplink transmission on second radio resources of the first the radio resources based on the determining the first radio resources.

[0218] In an example, radio resources of the scheduled uplink transmission comprise the second radio resources.

[0219] In an example, the uplink cancellation index may be an integer between one and a max number, wherein the max number may indicate a number of the uplink cancellation indications indicated by the downlink control information.

[0220] In an example, a size of the uplink cancellation indication may be a fixed number.

[0221] In an example, the determining the first resources may be based on the first uplink cancellation indication and one or more configuration parameters of the uplink cancellation indication.

[0222] In an example, the receiving the downlink control may be within a common search space of a downlink control channel.

[0223] In an example, the first uplink carrier is a normal uplink carrier.

[0224] In an example, the second uplink carrier is a supplementary uplink carrier.

[0225] In an example, the first cancellation index may indicate a first position of the first uplink cancellation indication in the downlink control information; and the second cancellation index may indicate a second position of the second uplink cancellation indication in the downlink control information.

[0226] In an example embodiment, a wireless device may receive configuration parameters for uplink cancellation indication, comprising: a first radio network temporary identifier; a sequence of one or more parameters/IEs, a first parameter/IE in the one or more parameters/IEs indicating: a target cell parameter indicating an identifier of a serving cell; a target BWP parameter indicating an identifier of a BWP; and an uplink cancellation indication index for the BWP of the serving cell. The wireless device may receive a downlink control information, associated with the first radio network identifier, comprising a plurality of uplink cancellation indications. The wireless device may determine, based on the downlink control information and the uplink cancellation indication index, a first uplink cancellation indication of the plurality of uplink cancellation indications. The

wireless device may determine, based on the first uplink cancellation indication, first radio resources of the BWP of the serving cell. The wireless device may cancel uplink transmission on second radio resources of the first the radio resources based on the determining the first radio resources.

[0227] In an example embodiment as shown in FIG. 26, 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 configuration parameters may comprise uplink cancellation configuration parameters. An UplinkCancellation IE may be used to configure uplink cancellation configuration parameters and may be used to configure a wireless device to monitor a control channel (PDCCH) for an RNTI associated with uplink cancellation (e.g., CI-RNTI). The uplink cancellation configuration parameters may comprise a cancellation indication RNTI (e.g., CI-RNTI). The uplink cancellation indication configuration parameters may further comprise a sequence of serving cell-specific uplink cancellation indication IE (e.g., a sequence of CI-ConfigurationPerServingCell IEs). A serving cell-specific uplink cancellation indication IE may comprise an identifier of a serving cell (e.g., a serving cell index), a first parameter (e.g., a positionInDCI parameter) indicating a first position in a DCI (a cancellation indication DCI) for a serving cell (e.g., a normal uplink (NUL) carrier of a serving cell), a second parameter (e.g., a positionInDCI-ForSUL parameter) indicating a second position in a DCI (a cancellation indication DCI) for a supplementary uplink (SUL) carrier of the serving cell. The first parameter (e.g., the positionInDCI parameter) may indicate a starting position (in number of bit) of a cancellation indication value applicable for this serving cell (servingCellId) within the DCI payload. The number of bit may be from one to the payload size of the DCI. The number of bit may indicate the first bit to the n-th bit (n=payload size of the DCI).The second parameter (e.g., the positionInDCI-ForSUL parameter) may indicate a starting position (in number of bit) of a cancellation indication value applicable for SUL of this serving cell (servingCellId) within the DCI payload. The number of bit may be from one to the payload size of the DCI. The number of bit may indicate the first bit to the n-th bit (n=payload size of the DCI). The uplink cancellation configuration parameters may include a DCI payload size parameter (e.g., dci-PayloadSizeForCI) indicating a total length of the DCI payload scrambled with CI-RNTI.

[0228] The wireless device may receive a first DCI (cancellation indication DCI) associated with the cancellation indication RNTI (CI-RNTI). The wireless device may receive the first DCI by

monitoring a common search space (CSS) configured for monitoring control channels associated with CI-NTI. The wireless device may receive configuration parameters for monitoring the CSS used for monitoring control channels associated with CI-NTI. The first DCI may comprise a plurality of cancellation indications (CIs). The wireless device may determine a first CI in the plurality of CIs of the first DCI. The wireless device may determine the first CI based on one of the first position and the second position. The wireless device may determine the first CI based on the first position when a scheduled uplink transmission is for a NUL of the serving cell. The wireless device may determine the first CI based on the second position when a scheduled uplink transmission is for a SUL of the serving cell. The wireless may determine the first CI further based on the cancellation indication size. In an example, the wireless device may determine cancelled uplink resources based on the first CI. The wireless device may determine the cancelled uplink resources based on the first DCI and based on uplink cancellation configuration parameters. In an example, the serving cell specific configuration parameters may comprise an offset parameter indicating an offset from the end of a PDCCH reception where the UE detects the cancellation indication DCI format and a first symbol of cancelled uplink resources, in the unit of OFDM symbols. The wireless device may determine the cancelled uplink resources based on the offset parameter indicating the offset. In an example, the wireless device may determine the cancelled uplink resources based on a processing time (e.g., a processing time of the first DCI (cancellation DCI)). The wireless device may cancel the scheduled uplink transmission based on the first CI.

[0229] In an example embodiment as shown in FIG. 27, 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 configuration parameters may comprise uplink cancellation configuration parameters. An UplinkCancellation IE may be used to configure uplink cancellation configuration parameters and may be used to configure the wireless device to monitor a control channel (PDCCH) for an RNTI associated with uplink cancellation (e.g., CI-RNTI). The uplink cancellation configuration parameters may comprise a cancellation indication RNTI (e.g., CI-RNTI). The uplink cancellation configuration parameters may comprise an identifier of a BWP. In an example, the uplink cancellation configuration parameters may comprise an identifier of a cell comprising a plurality of BWPs including the BWP. The uplink cancellation configuration parameters may comprise a parameter indicating a position in a DCI, wherein the position may be used for determining a cancellation indication in a plurality of cancellation indications of a

cancellation indication DCI, wherein the cancellation indication may be associated with uplink transmissions on the BWP.

[0230] The wireless device may receive a first DCI (cancellation indication DCI) associated with the cancellation indication RNTI (CI-RNTI). The wireless device may receive the first DCI by monitoring a common search space (CSS) configured for monitoring control channels associated with CI-NTI. The wireless device may receive configuration parameters for monitoring the CSS used for monitoring control channels associated with CI-NTI. The first DCI may comprise a plurality of cancellation indications (CIs). The wireless device may determine a first CI in the plurality of CIs of the first DCI. The wireless device may determine the first CI based on the position. The wireless device may determine the first CI based on the position when an uplink transmission is scheduled on the BWP. The wireless device may cancel the scheduled uplink transmission based on the first CI.

[0231] 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 in the flow charts of the present disclosure.

[0232] FIG. 28 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 2810, a wireless device may receive uplink cancellation configuration parameters comprising: a cancellation indication radio network temporary identifier (RNTI); and a sequence of serving cell-specific parameters comprising: an identifier of a serving cell; a first parameter indicating a first position in a downlink control information (DCI) for the serving cell; and a second parameter indicating a second position in a DCI for a supplementary uplink carrier of the serving cell. At 2820, the wireless device may receive a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications. At 2830, the wireless device may determine a first cancellation indication, in the cancellation indications, based on: the

first position when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and the second position when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell. At 2840, the wireless device may cancel the scheduled uplink transmission based on the first cancellation indication.

[0233] In an example embodiment, the determining the first cancellation indication, at 2830, may further be based on a size of the first cancellation indication.

[0234] In an example embodiment, at 2810, the first position may indicate a first starting position, of a cancellation indication, in a first number of bit; and the second position may indicate a second starting position, of a cancellation indication, in a second number of bit. In an example embodiment, the first number of bit may be between one and a payload size of the first DCI; and the second number of bit may be between one and the payload size of the first DCI. In an example embodiment, the uplink cancellation configuration parameters, received at 2810, may further comprise a size parameter indicating the payload size of the first DCI.

[0235] In an example embodiment, the scheduled uplink transmission may be via a physical uplink shared channel.

[0236] In an example embodiment, the scheduled uplink transmission may be a sounding reference signal transmission.

[0237] In an example embodiment, the wireless device may monitor a common search space for a DCI associated with the cancellation indication RNTI.

[0238] In an example embodiment, the wireless device may determine cancelled uplink resources based on the first cancellation indication. In an example embodiment, the sequence of serving cell-specific parameters, received at 2810, may further comprise an offset parameter indicating an offset, in unit of symbol, from an end of a control channel reception where the wireless device detects the first DCI. The wireless device may determine the cancelled uplink resources further based on the offset. In an example embodiment, the determining the cancelled uplink resources may comprise determining a first symbol associated with the cancelled uplink resources based on the offset. In an example embodiment, the determining the cancelled uplink resources may further be based on a processing time associated with the first DCI.

[0239] FIG. 29 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 2910, a wireless device may receive cancellation indication parameters indicating: an identifier of a cell; a first position in a downlink control

information (DCI); and a second position in a DCI. At 2920, the wireless device may receive a first DCI comprising cancellation indications. At 2930, the wireless device may determine a first cancellation indication, in the cancellation indications, based on: the first position when a scheduled uplink transmission is for a normal uplink carrier of the cell; and the second position when a scheduled uplink transmission for a supplementary uplink carrier of the cell. At 2940, the wireless device may cancel the scheduled uplink transmission based on the first cancellation indication.

[0240] In an example embodiment, the cancellation indication parameters, received 2910, may further comprise a cancellation indication radio network temporary identifier (RNTI). The first DCI, received at 2920, may be associated with the cancellation indication RNTI.

[0241] FIG. 30 shows an example flow diagram in accordance with several of various embodiments of the present disclosure. At 3010, a wireless device may receive uplink cancellation configuration parameters comprising: a cancellation indication radio network temporary identifier (RNTI); an identifier of a BWP; and a parameter indicating a position, in a downlink control information (DCI), associated with uplink transmissions on the BWP. At 3020, the wireless device may receive a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications. At 3030, the wireless device may determine a first cancellation indication, in the cancellation indications, based on the position. At 3040, the wireless device may cancel a scheduled uplink transmission on the BWP based on the first cancellation indication.

[0242] In an example embodiment, the uplink cancellation configuration parameters, received 3010, may further comprise an identifier of a cell comprising the BWP.

[0243] 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.

[0244] 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.

[0245] 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.

[0246] 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.

[0247] 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.

[0248] 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}.

[0249] 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.

[0250] 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.

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/SB/424 (12-11)

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:	Uplink Cancellation Indication Signaling		

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 /Alireza Babaei/	Date 11/7/2020
Name (Print/Typed) Alireza Babaei	Practitioner Registration Number 75,833

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 1 forms are submitted.

Privacy Act Statement

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

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

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

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Uplink Cancellation Indication Signaling

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.**

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

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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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	2019-004Ut
	Application Number	
Title of Invention	Uplink Cancellation Indication Signaling	

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	Uplink Cancellation Indication Signaling		
Attorney Docket Number	2019-004Ut	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	30	Suggested Figure for Publication (if any)	26

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2019-004Ut
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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	62932487	2019-11-07

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2019-004Ut
	Application Number	
Title of Invention	Uplink Cancellation Indication Signaling	

Foreign Priority Information:

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

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

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

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

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2019-004Ut
	Application Number	
Title of Invention	Uplink Cancellation Indication Signaling	

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	2019-004Ut
	Application Number	
Title of Invention	Uplink Cancellation Indication Signaling	

Applicant Information:

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

Applicant 1 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☐

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.

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2019-004Ut
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Title of Invention	Uplink Cancellation Indication Signaling	

Assignee 1

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

Remove

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

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

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

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

Signature:

Remove

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

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

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

Signature	/Alireza Babaei/			Date (YYYY-MM-DD)	2020-11-07
First Name	Alireza	Last Name	Babaei	Registration Number	75833

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

PTO/AIA/14 (02-18)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	2019-004Ut
	Application Number	
Title of Invention	Uplink Cancellation Indication Signaling	

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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 CooperationTreaty.

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.

ABSTRACT

A wireless device receives uplink cancellation indication configuration parameters comprising: a cancellation indication RNTI; and a sequence of serving cell-specific parameters comprising: an identifier of a serving cell; a first parameter indicating a first position in a DCI for the serving cell; and a second parameter indicating a second position in a DCI for a SUL carrier of the serving cell. A first DCI, associated with the cancellation indication RNTI, comprising cancellation indications is received. A determination is made of a first cancellation indication, in the cancellation indications, based on: the first position when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and the second position when the scheduled uplink transmission is for the SUL carrier of the serving cell. The scheduled uplink transmission is canceled based on the first cancellation indication.

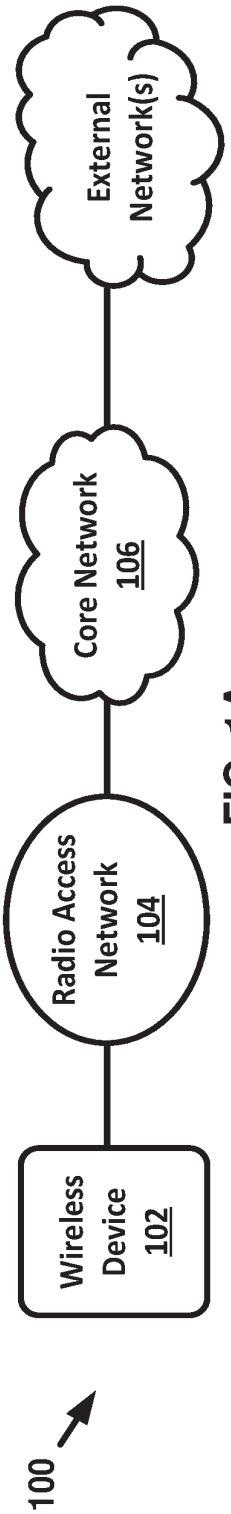

100
Wireless Device 102
Radio Access Network 104
Core Network 106
External Network(s)

FIG. 1A

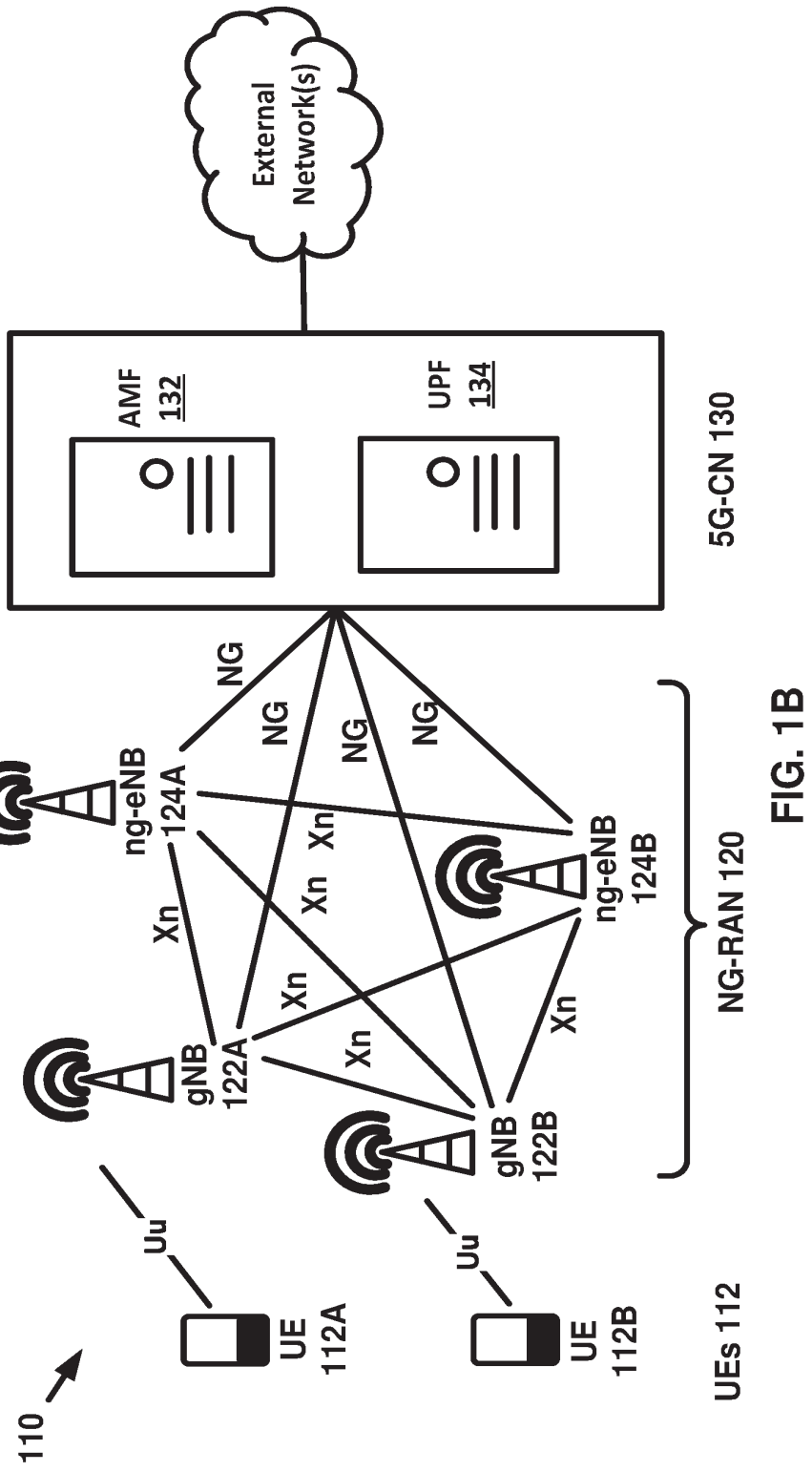

110
UE 112A
UE 112B
Uu
Uu
UEs 112
gNB 122A
gNB 122B
ng-eNB 124A
ng-eNB 124B
Xn
NG
NG-RAN 120
AMF 132
UPF 134
5G-CN 130
External Network(s)

FIG. 1B

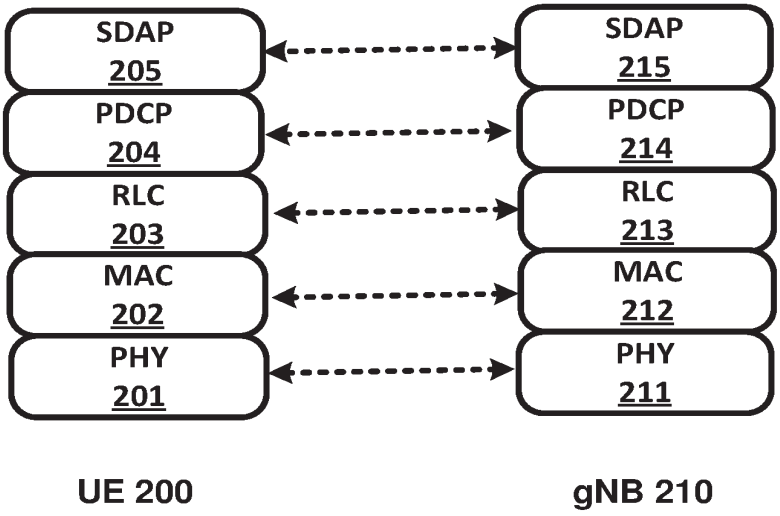

SDAP
205
PDCP
204
RLC
203
MAC
202
PHY
201
SDAP
215
PDCP
214
RLC
213
MAC
212
PHY
211
UE 200
gNB 210

FIG. 2A

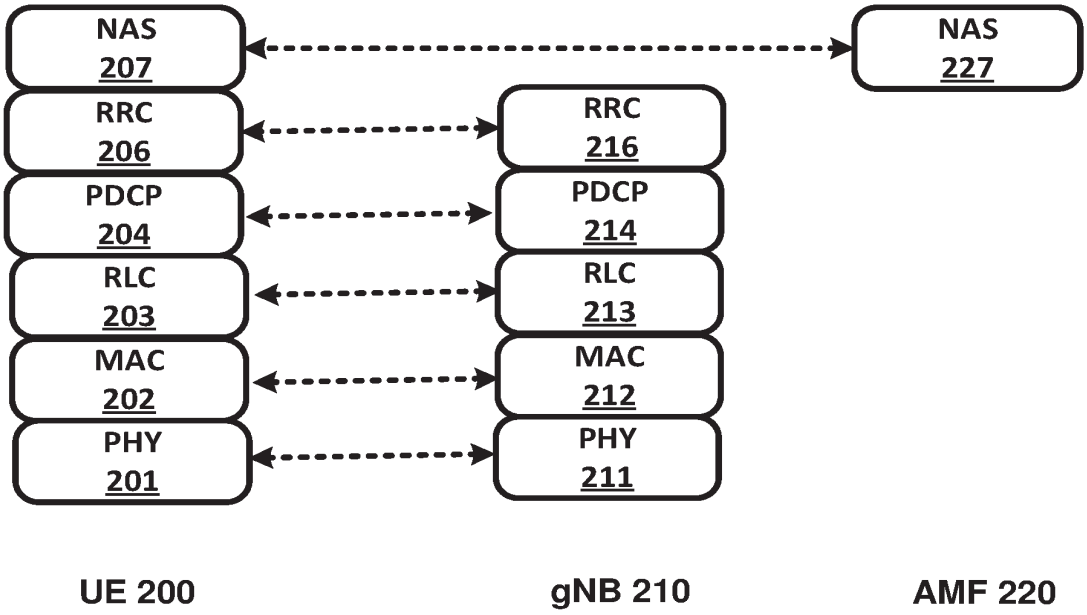

NAS
207
RRC
206
PDCP
204
RLC
203
MAC
202
PHY
201
RRC
216
PDCP
214
RLC
213
MAC
212
PHY
211
NAS
227
UE 200
gNB 210
AMF 220

FIG. 2B

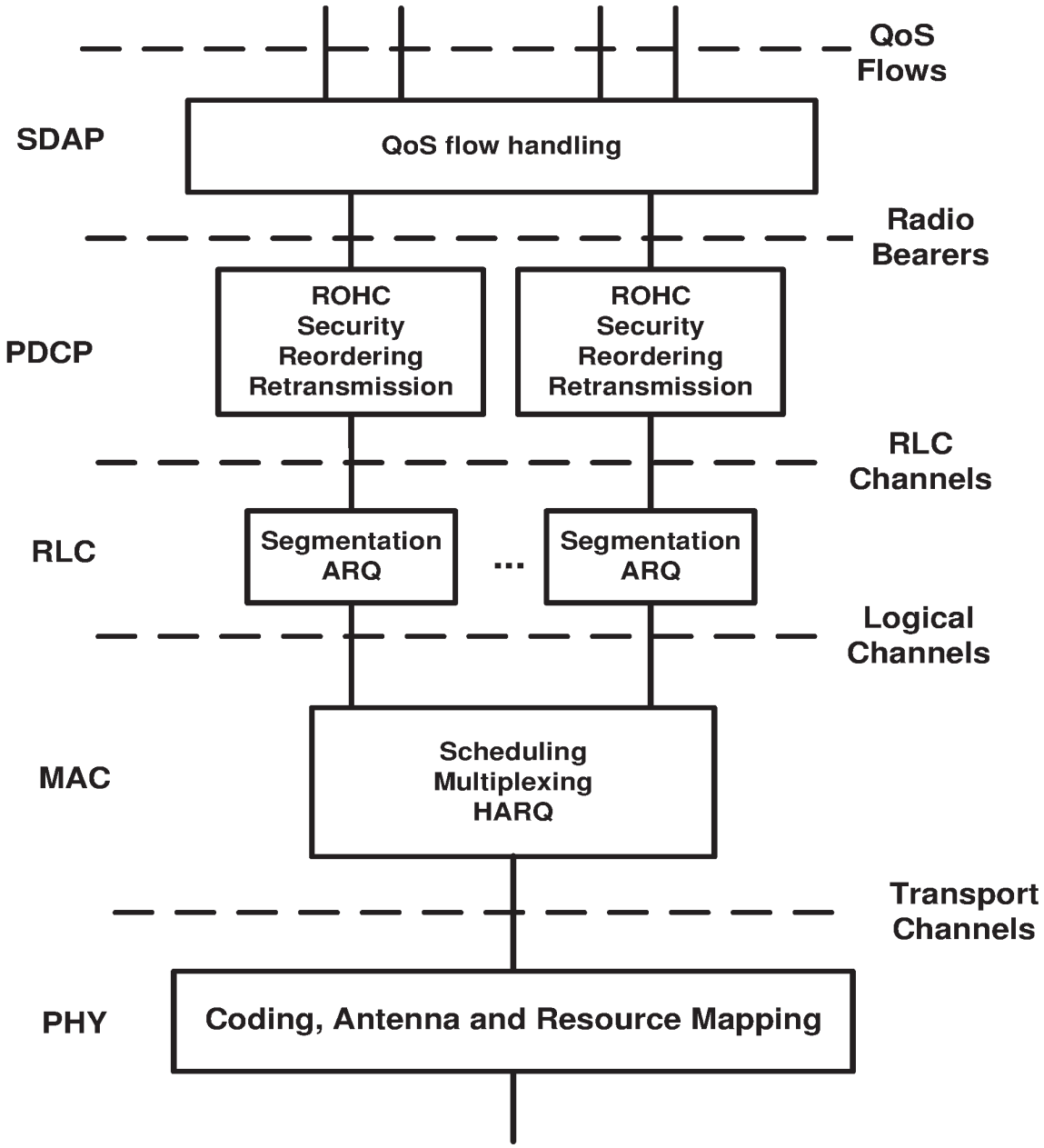

QoS Flows
SDAP
QoS flow handling
Radio Bearers
PDCP
ROHC
Security
Reordering
Retransmission
ROHC
Security
Reordering
Retransmission
RLC Channels
RLC
Segmentation ARQ
...
Segmentation ARQ
Logical Channels
MAC
Scheduling
Multiplexing
HARQ
Transport Channels
PHY
Coding, Antenna and Resource Mapping

FIG. 3

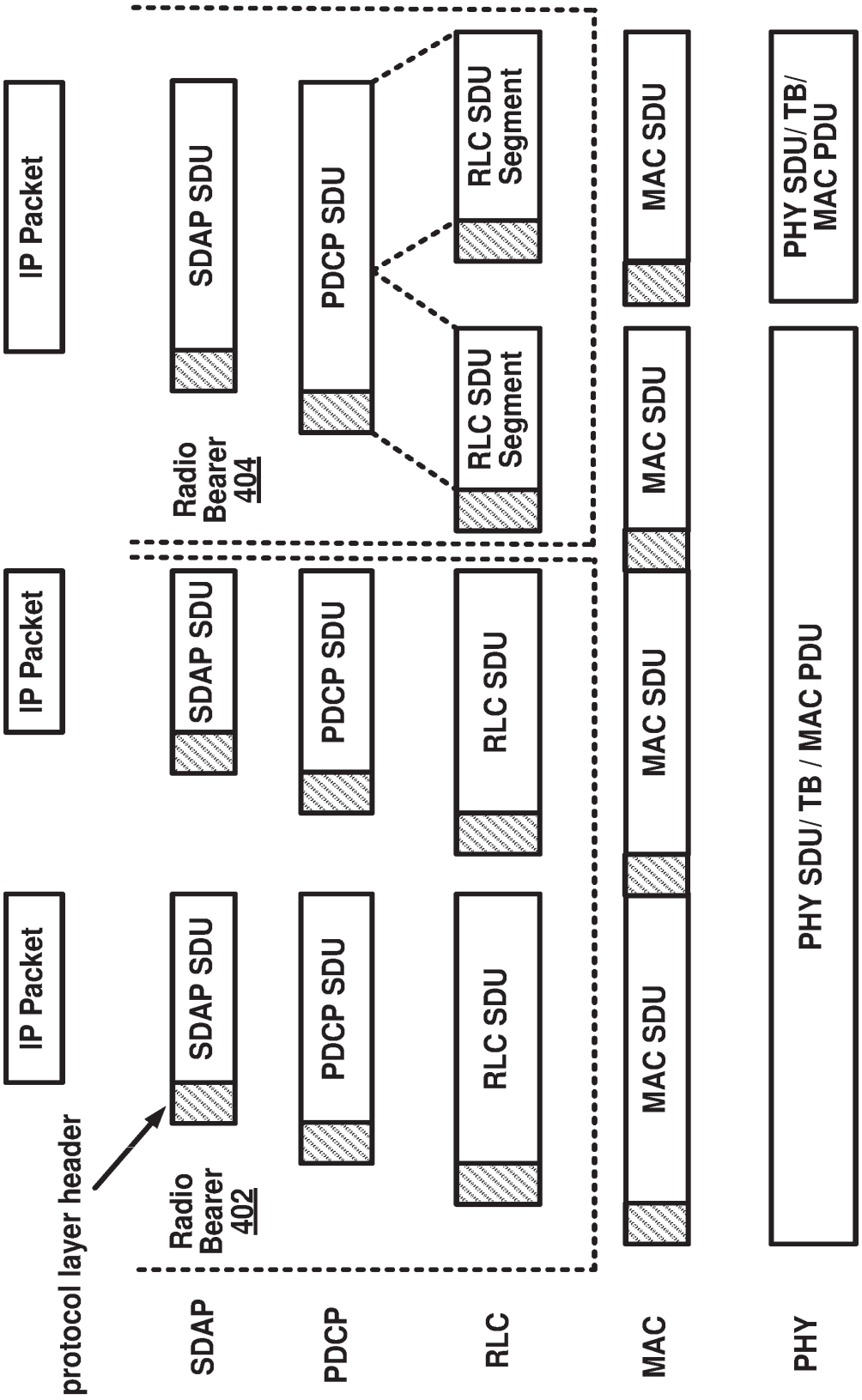

protocol layer header
IP Packet
IP Packet
IP Packet
SDAP SDU
SDAP SDU
SDAP SDU
PDCP SDU
PDCP SDU
PDCP SDU
RLC SDU
RLC SDU
RLC SDU Segment
RLC SDU Segment
MAC SDU
MAC SDU
MAC SDU
PHY SDU/ TB/ MAC PDU
PHY SDU/ TB / MAC PDU
Radio Bearer 402
Radio Bearer 404
SDAP
PDCP
RLC
MAC
PHY

FIG. 4

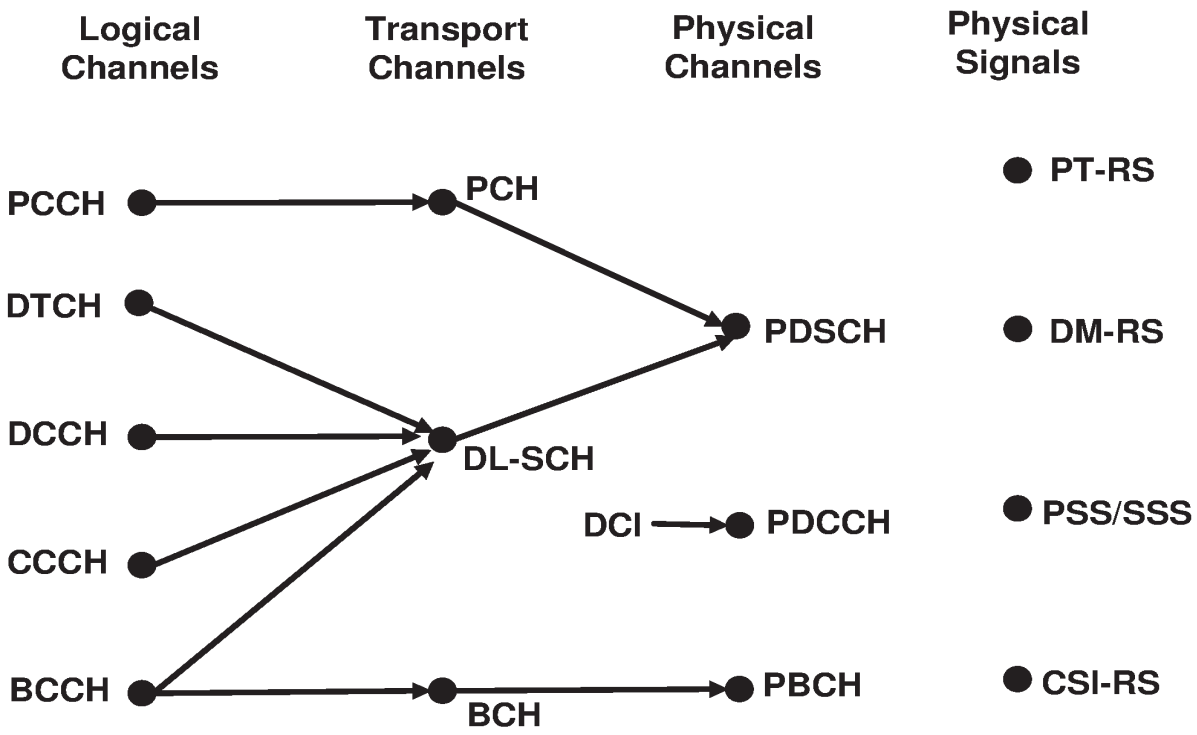

Logical Channels
Transport Channels
Physical Channels
Physical Signals
PCCH
DTCH
DCCH
CCCH
BCCH
PCH
DL-SCH
BCH
PDSCH
DCI
PDCCH
PBCH
PT-RS
DM-RS
PSS/SSS
CSI-RS

FIG. 5A

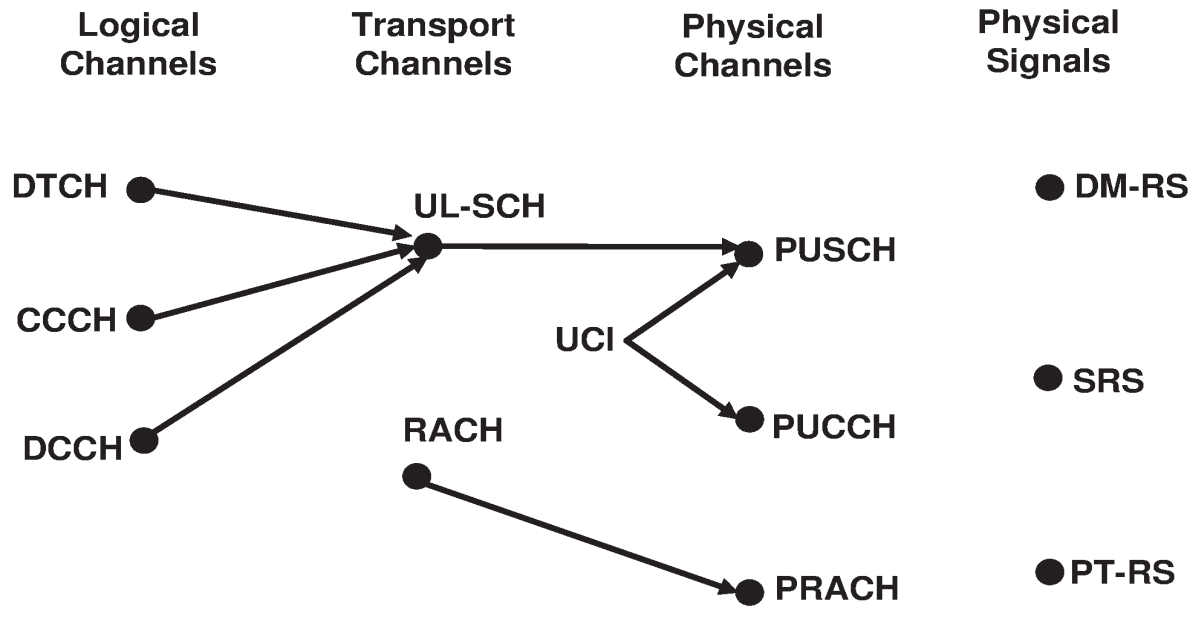

Logical Channels
Transport Channels
Physical Channels
Physical Signals
DTCH
CCCH
DCCH
UL-SCH
RACH
PUSCH
UCI
PUCCH
PRACH
DM-RS
SRS
PT-RS

FIG. 5B

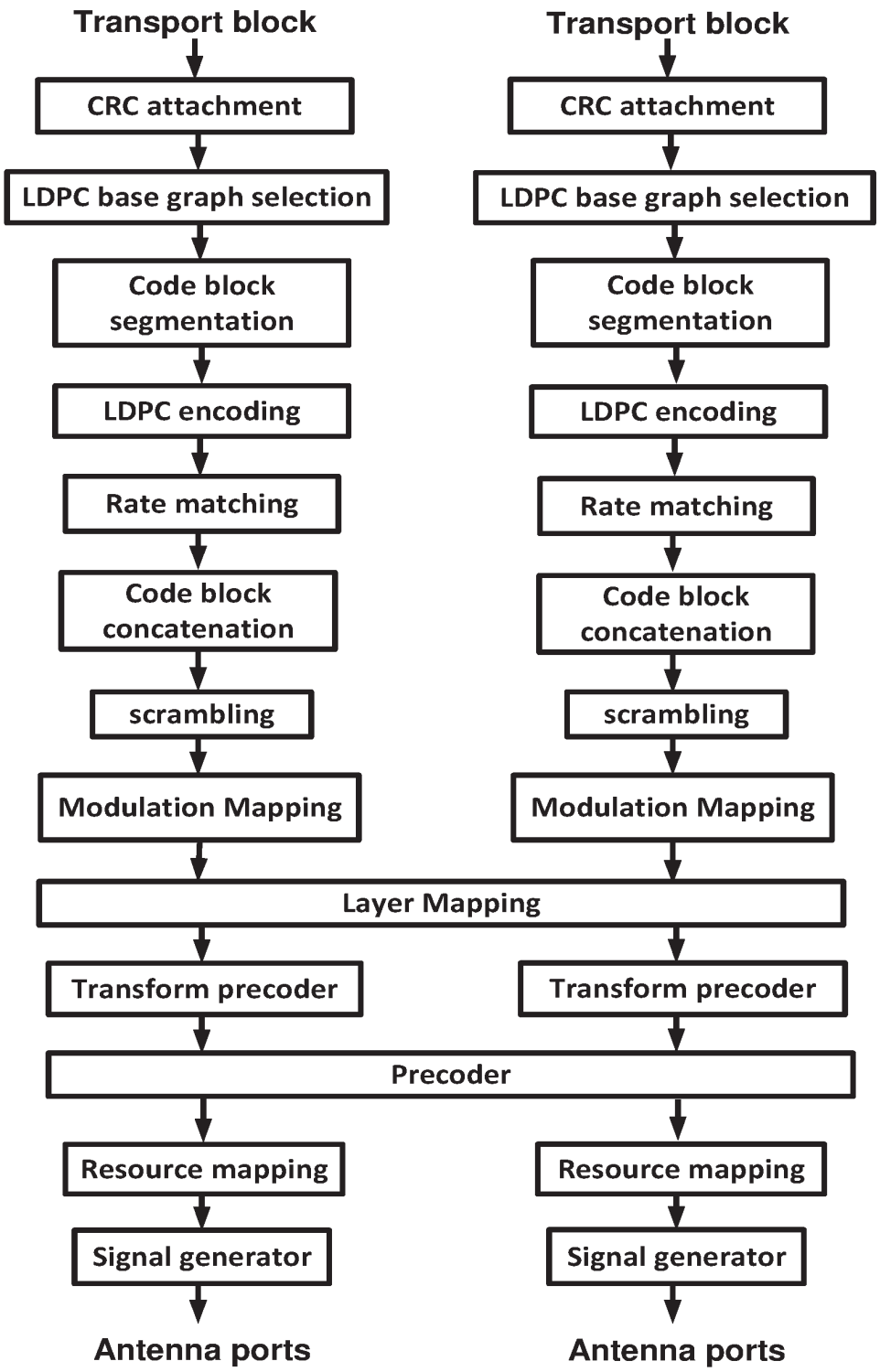

Transport block
CRC attachment
LDPC base graph selection
Code block segmentation
LDPC encoding
Rate matching
Code block concatenation
scrambling
Modulation Mapping
Transport block
CRC attachment
LDPC base graph selection
Code block segmentation
LDPC encoding
Rate matching
Code block concatenation
scrambling
Modulation Mapping
Layer Mapping
Transform precoder
Transform precoder
Precoder
Resource mapping
Signal generator
Resource mapping
Signal generator
Antenna ports
Antenna ports

FIG. 6

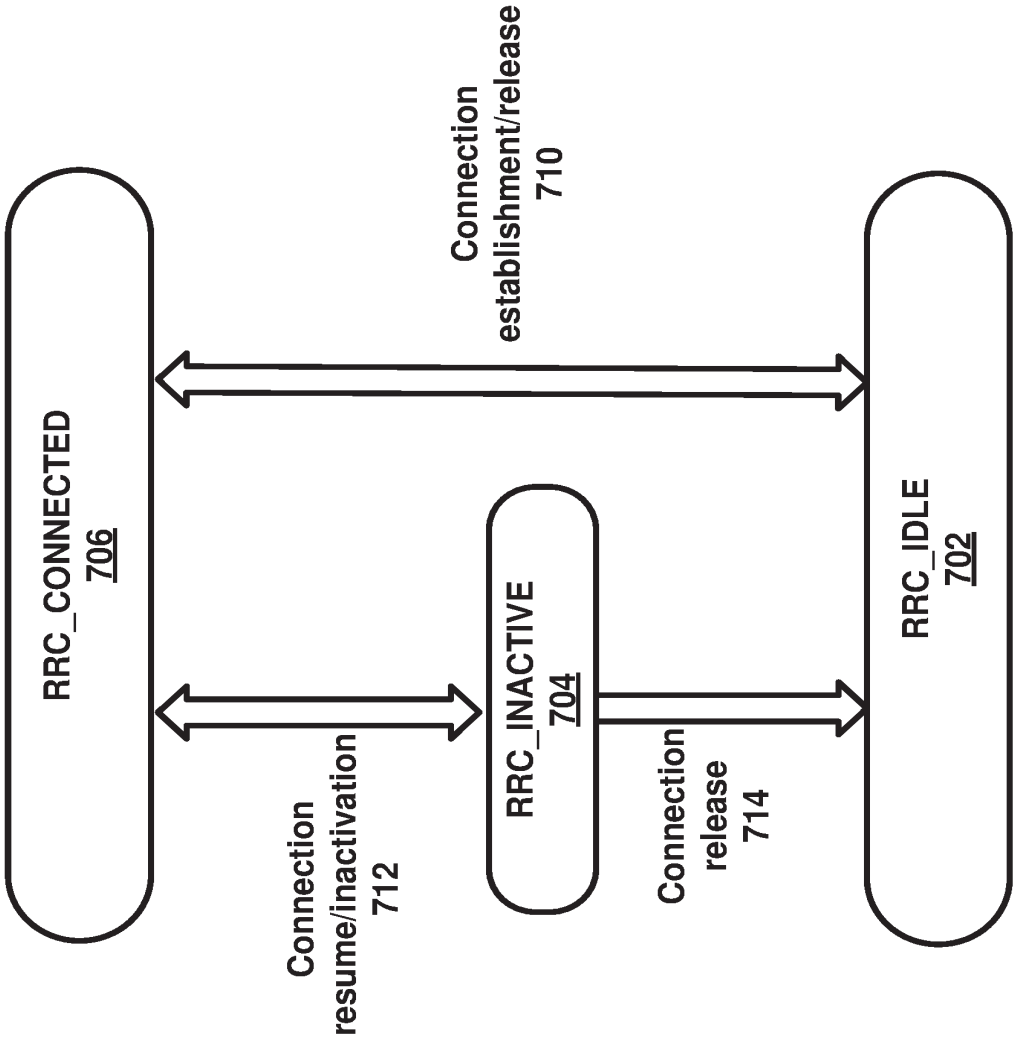

RRC_CONNECTED
706
Connection
establishment/release
710
RRC_INACTIVE
704
RRC_IDLE
702
Connection
resume/inactivation
712
Connection
release
714

FIG. 7

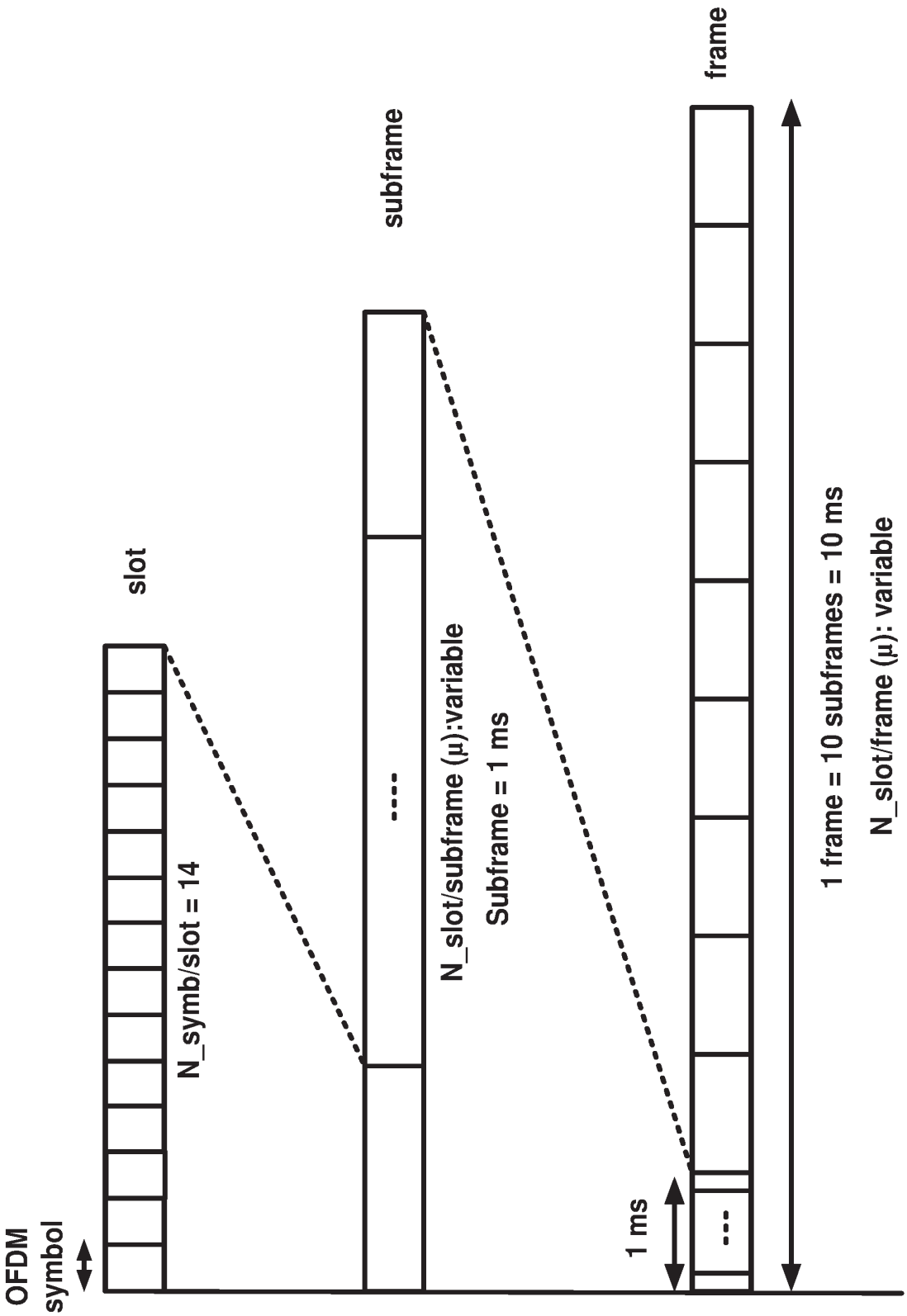

OFDM symbol
slot
N_symb/slot = 14
subframe
N_slot/subframe (μ):variable
Subframe = 1 ms
1 ms
frame
1 frame = 10 subframes = 10 ms
N_slot/frame (μ): variable

FIG. 8

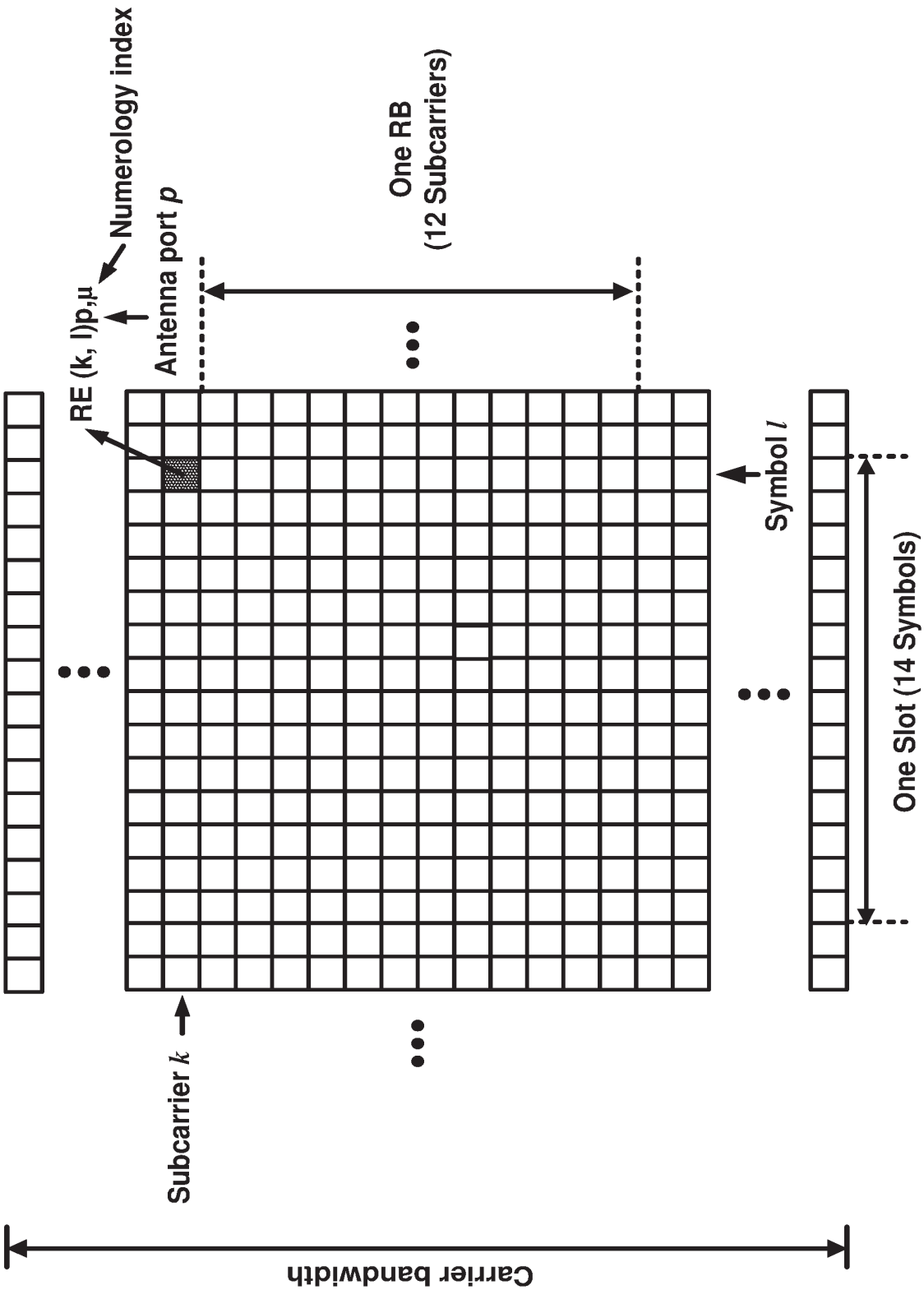

Numerology index
Antenna port p
RE (k, l)p,μ
One RB
(12 Subcarriers)
Symbol l
One Slot (14 Symbols)
Subcarrier k
Carrier bandwidth

FIG. 9

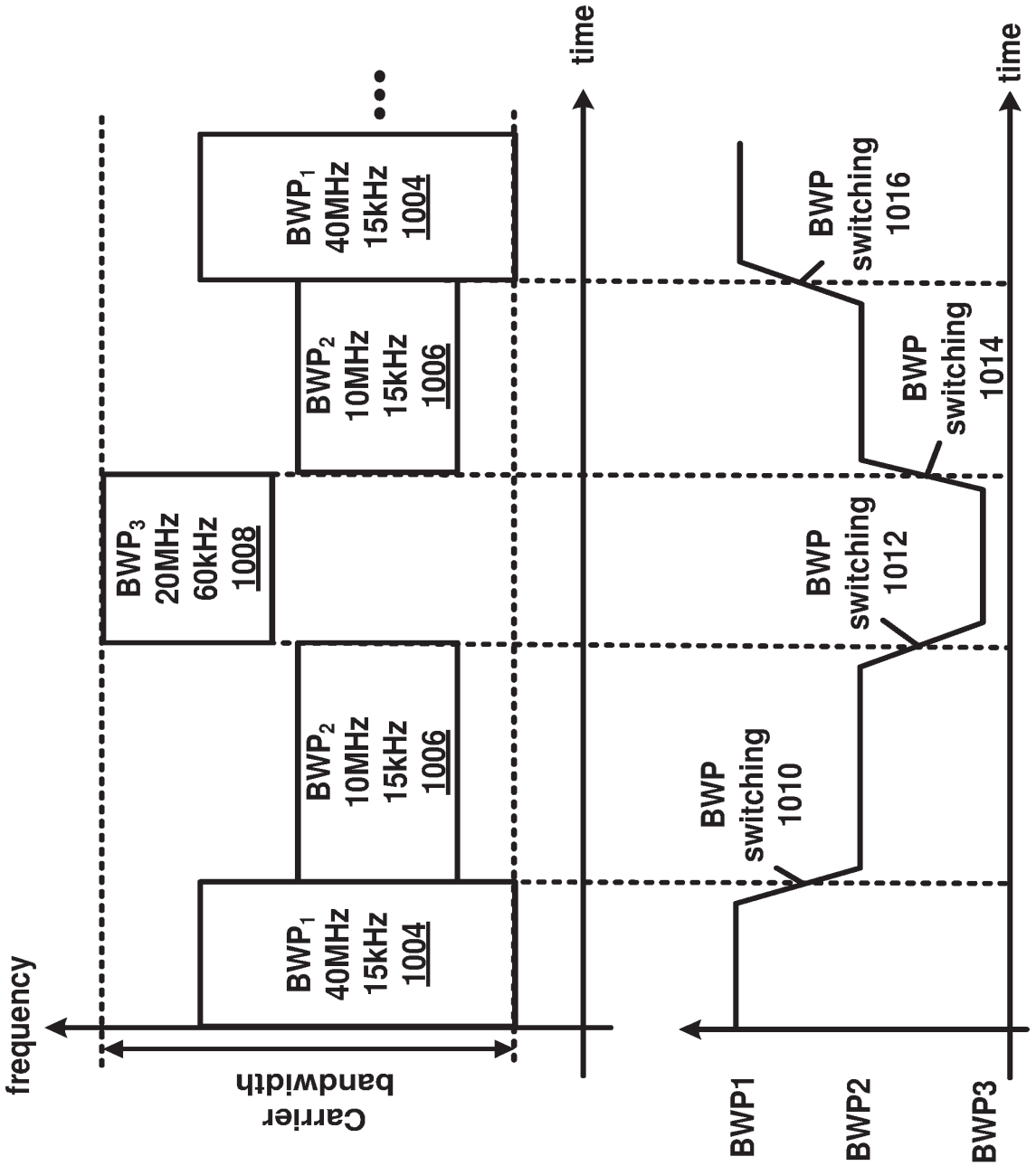

frequency
Carrier bandwidth
time
BWP1 40MHz 15kHz 1004
BWP2 10MHz 15kHz 1006
BWP3 20MHz 60kHz 1008
BWP1 40MHz 15kHz 1004
BWP2 10MHz 15kHz 1006
BWP1
BWP2
BWP3
time
BWP switching 1010
BWP switching 1012
BWP switching 1014
BWP switching 1016

FIG. 10

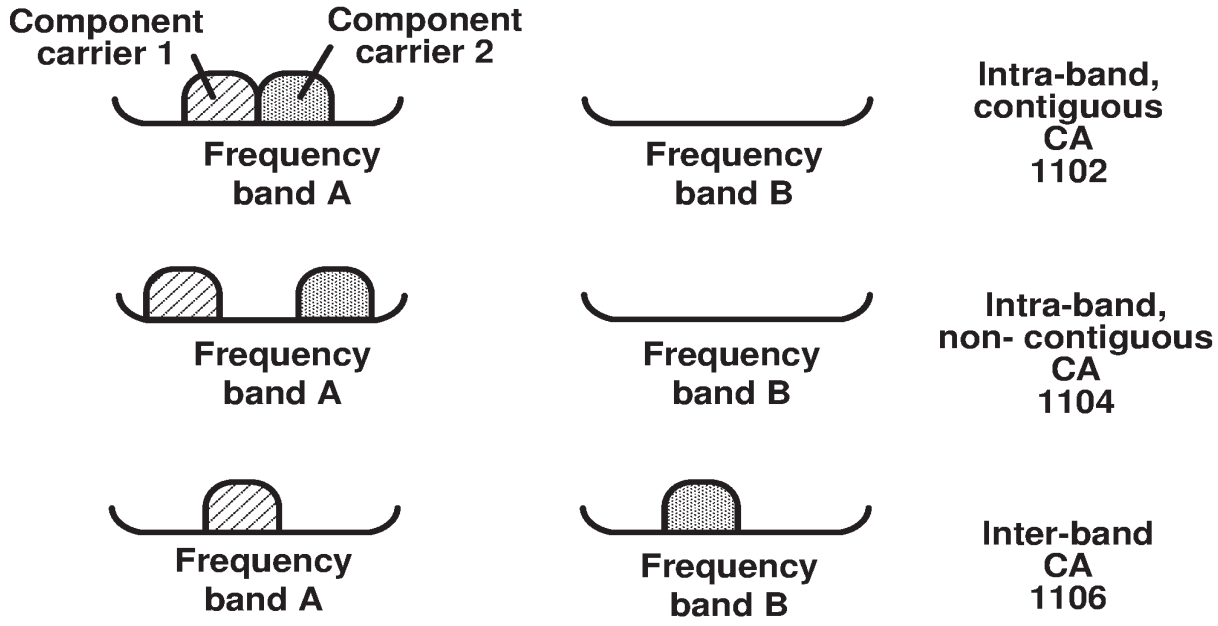


FIG. 11A

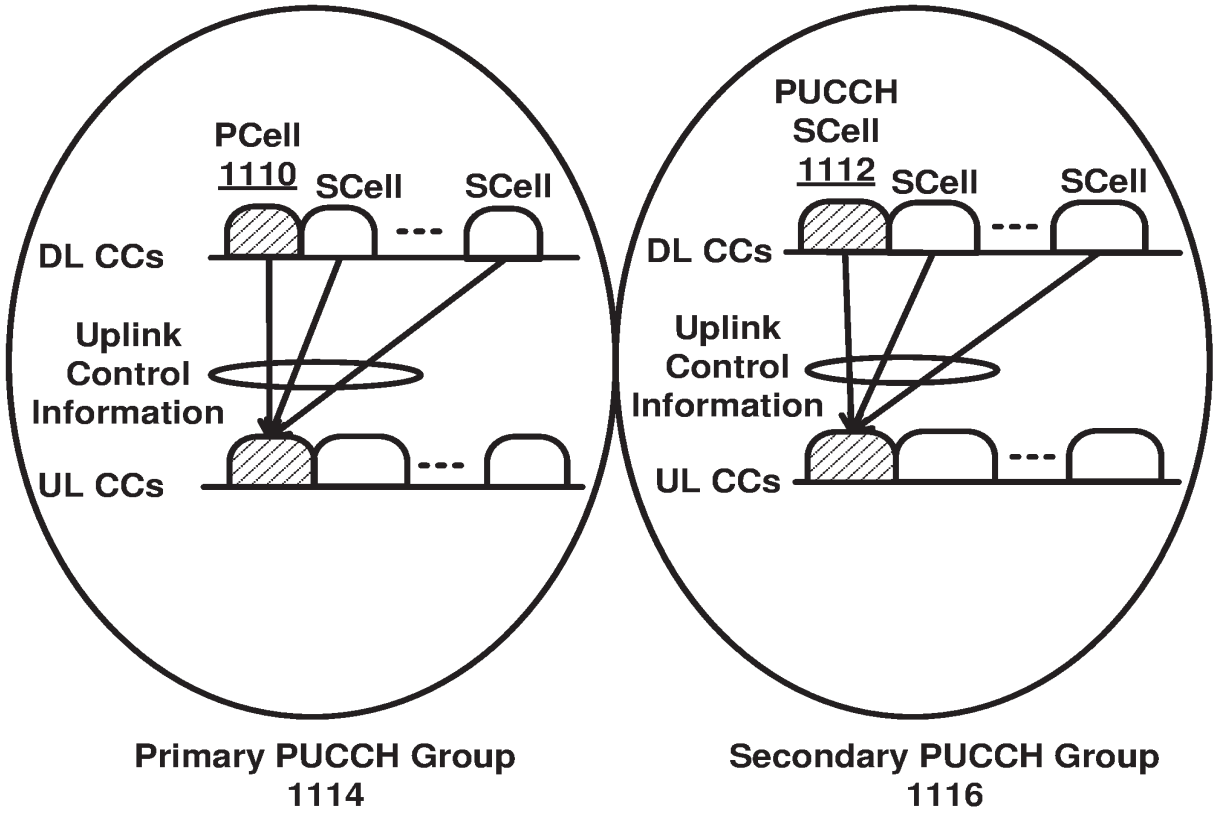


FIG. 11B

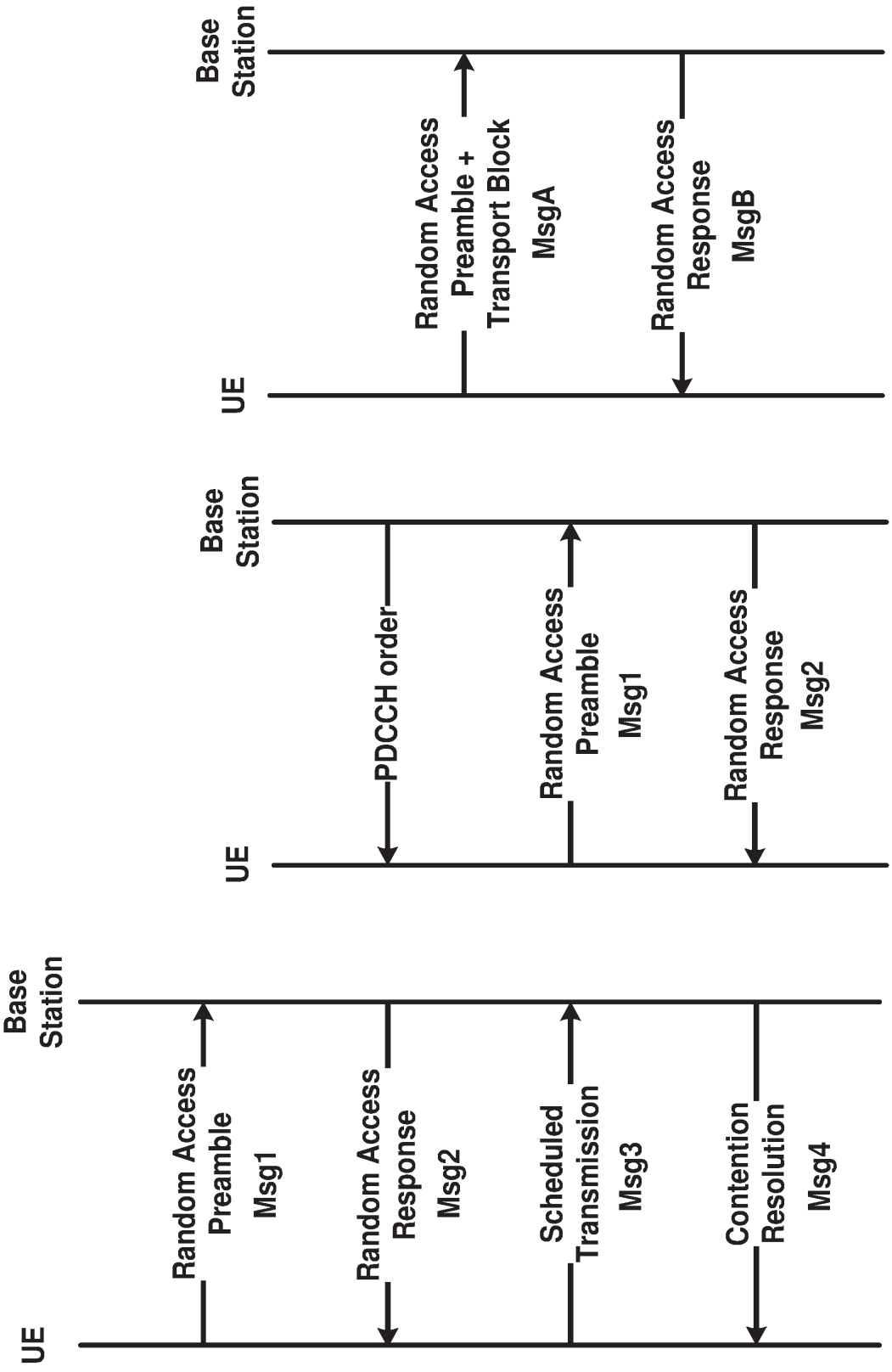


FIG. 12C

FIG. 12B

FIG. 12A

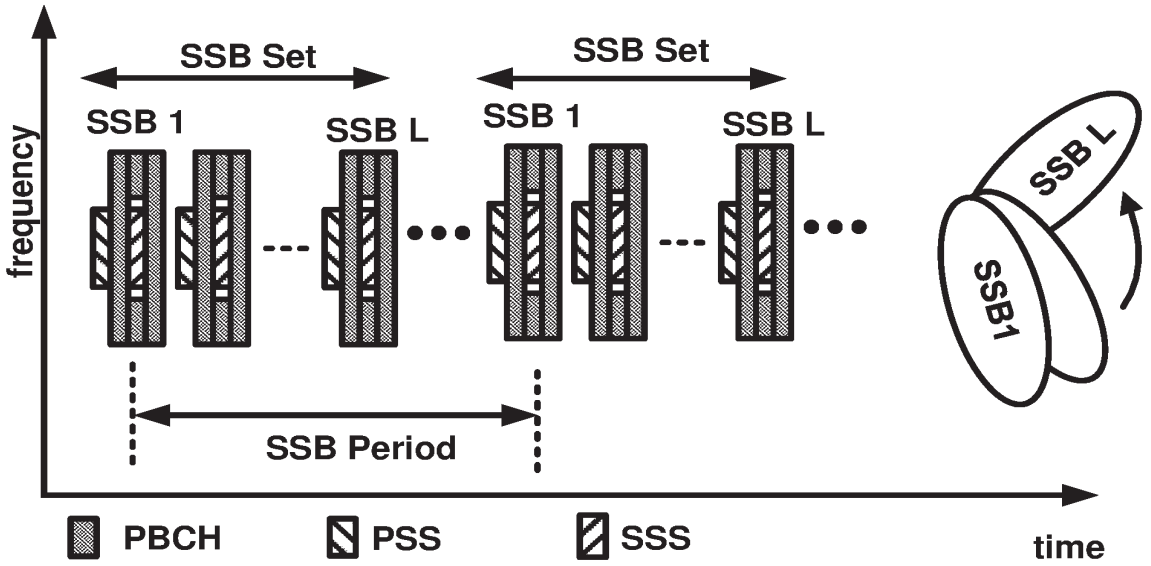


FIG. 13A

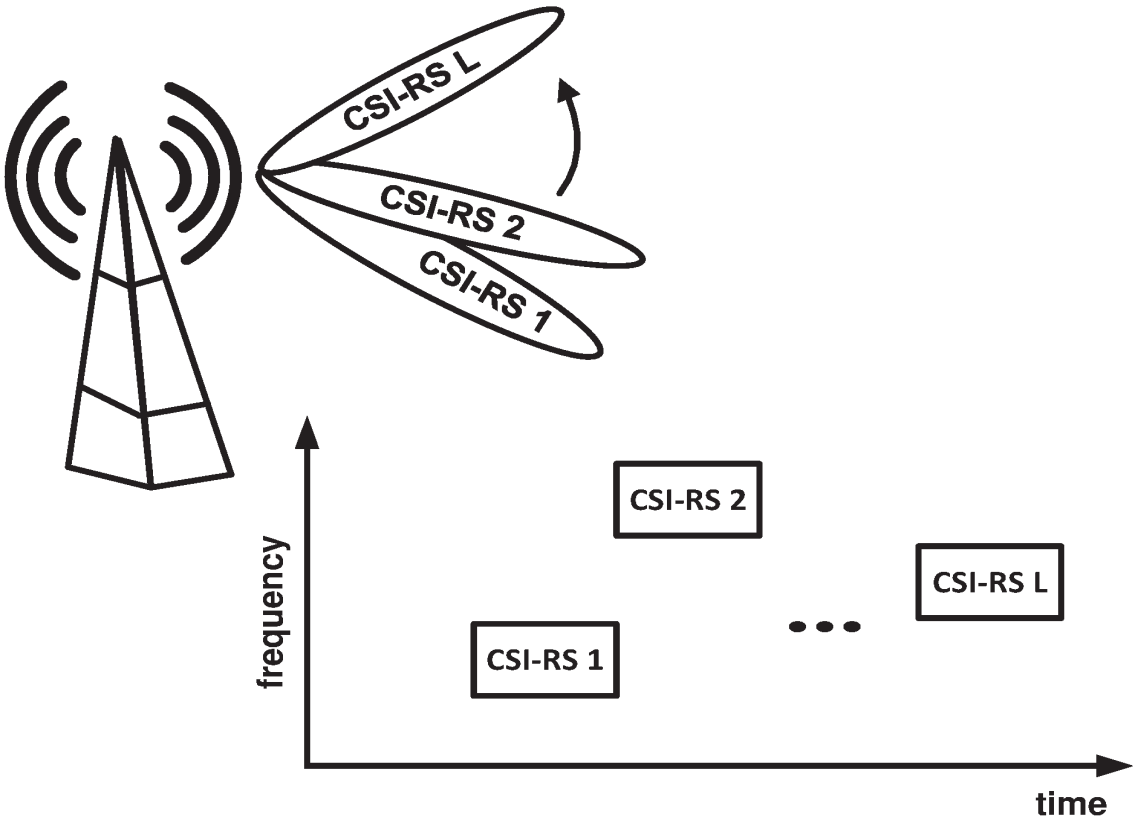


FIG. 13B

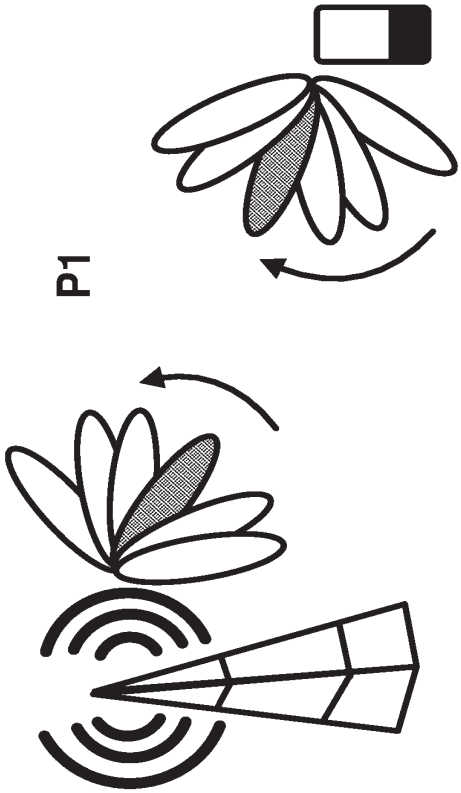


FIG. 14A

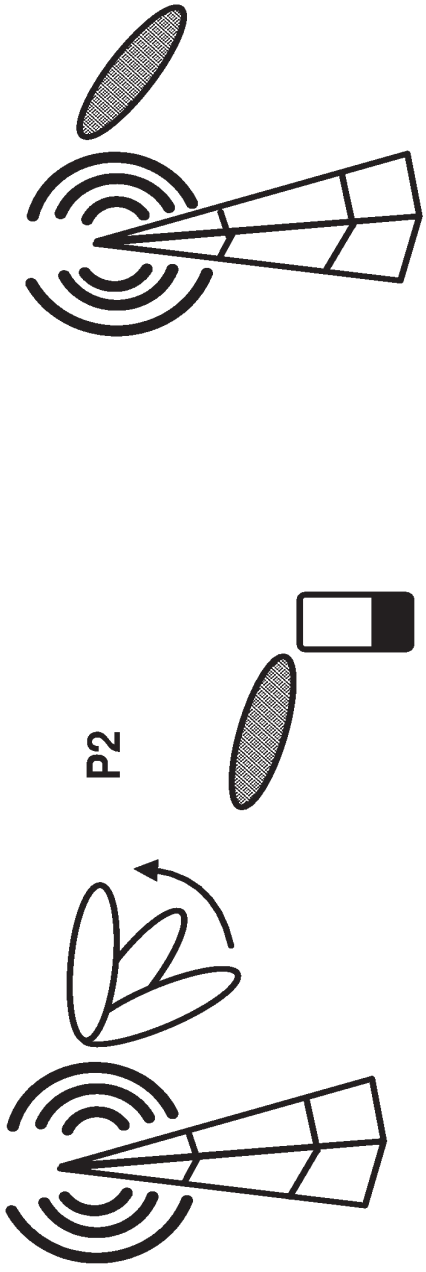


FIG. 14B

FIG. 14C

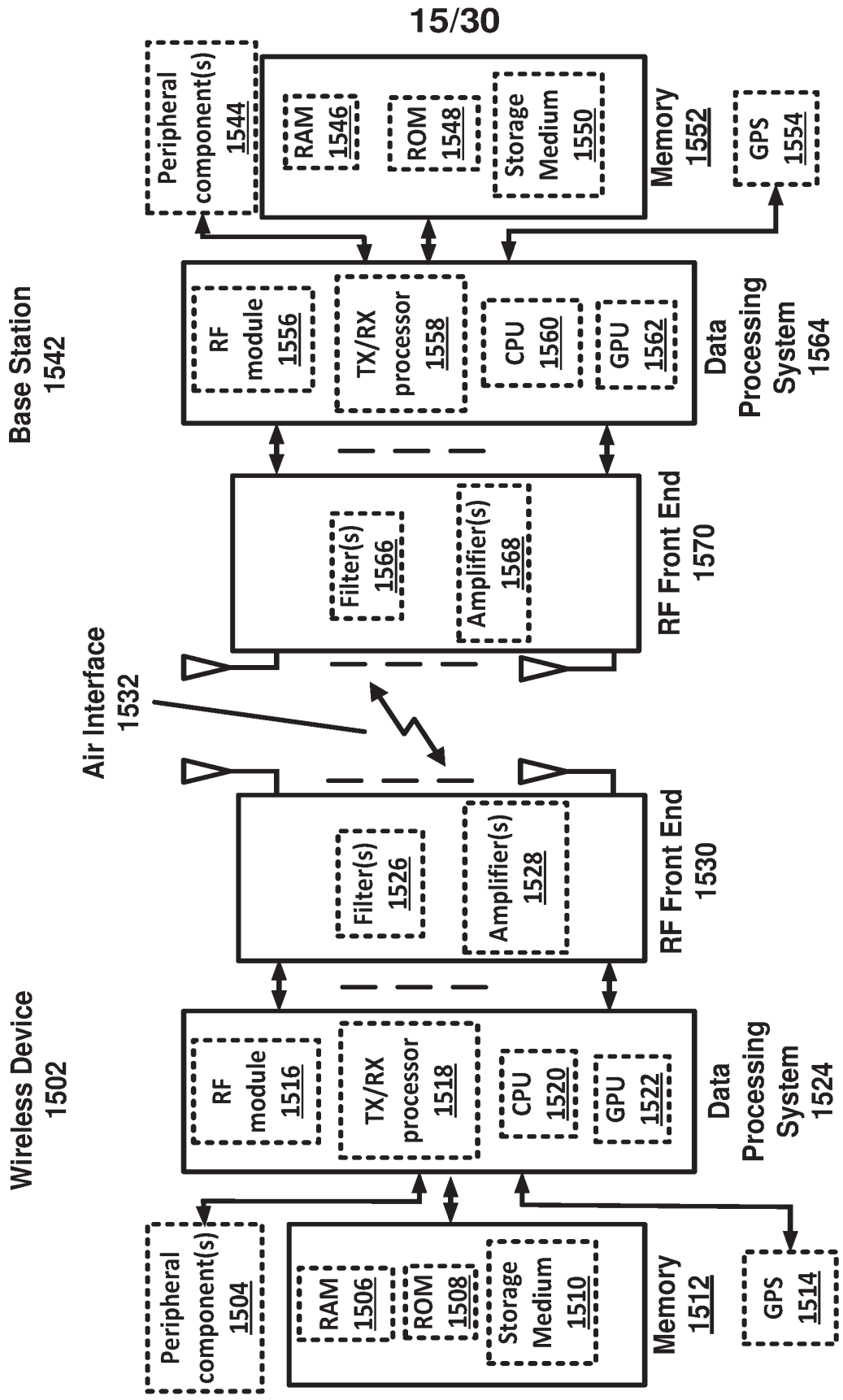

Wireless Device 1502
Peripheral component(s) 1504
RAM 1506
ROM 1508
Storage Medium 1510
Memory 1512
GPS 1514
RF module 1516
TX/RX processor 1518
CPU 1520
GPU 1522
Data Processing System 1524
Filter(s) 1526
Amplifier(s) 1528
RF Front End 1530
Air Interface 1532
Base Station 1542
Peripheral component(s) 1544
RAM 1546
ROM 1548
Storage Medium 1550
Memory 1552
GPS 1554
RF module 1556
TX/RX processor 1558
CPU 1560
GPU 1562
Data Processing System 1564
Filter(s) 1566
Amplifier(s) 1568
RF Front End 1570

FIG. 15

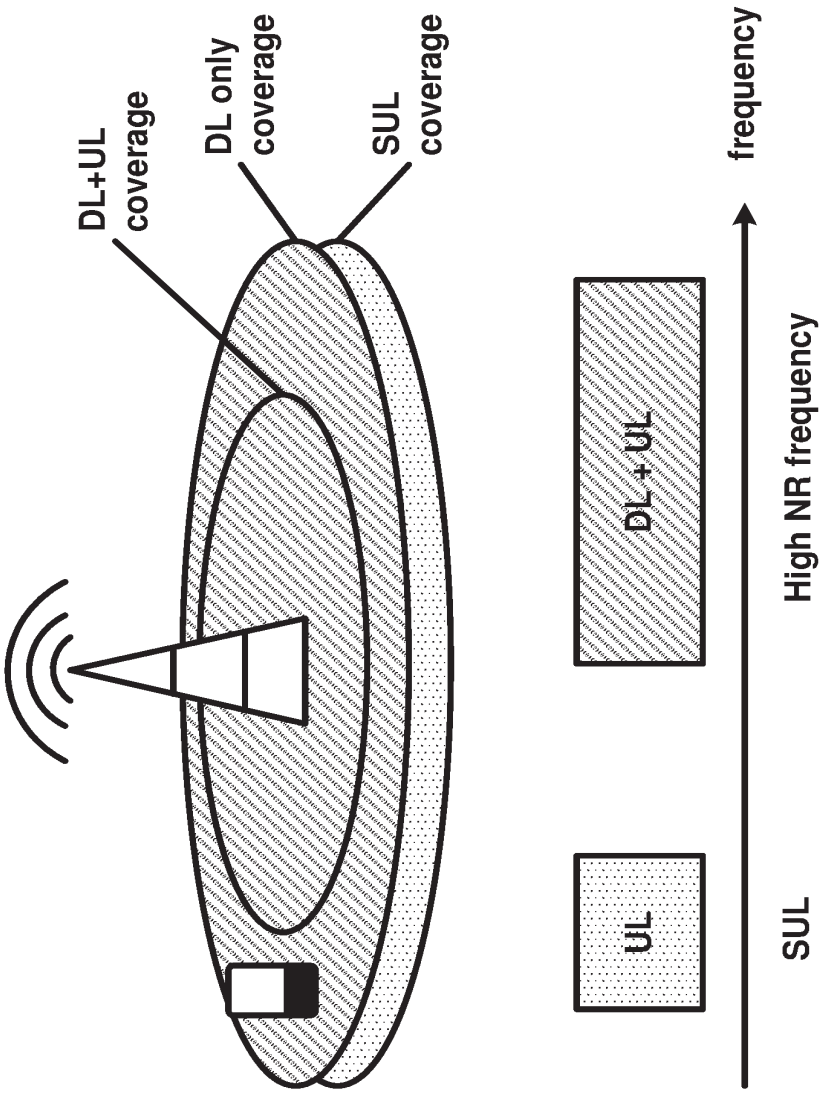

DL+UL coverage
DL only coverage
SUL coverage
UL
DL + UL
SUL
High NR frequency
frequency

FIG. 16

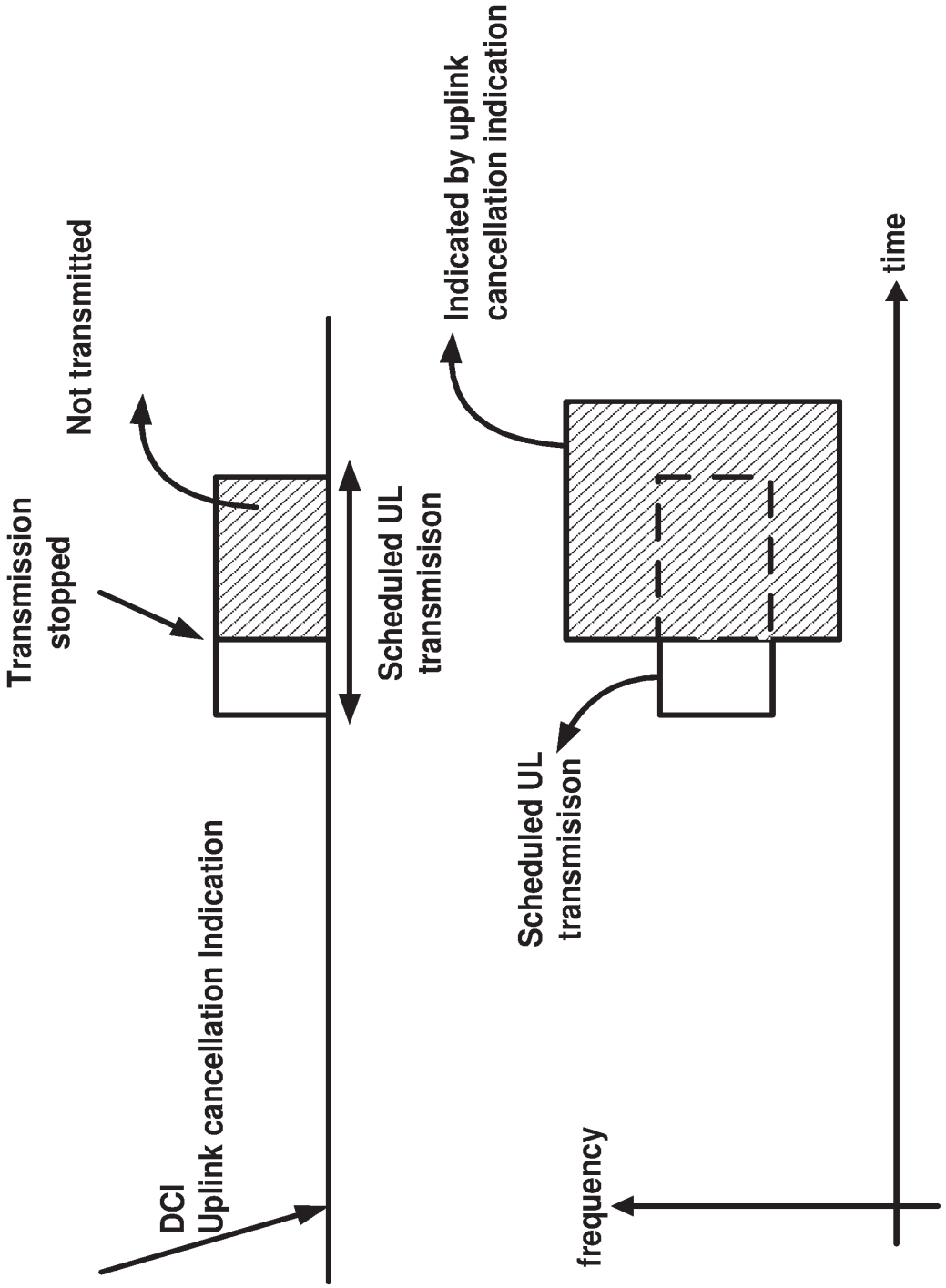

DCI
Uplink cancellation Indication
Transmission stopped
Not transmitted
Scheduled UL transmisison
Indicated by uplink cancellation indication
Scheduled UL transmisison
frequency
time

FIG. 17

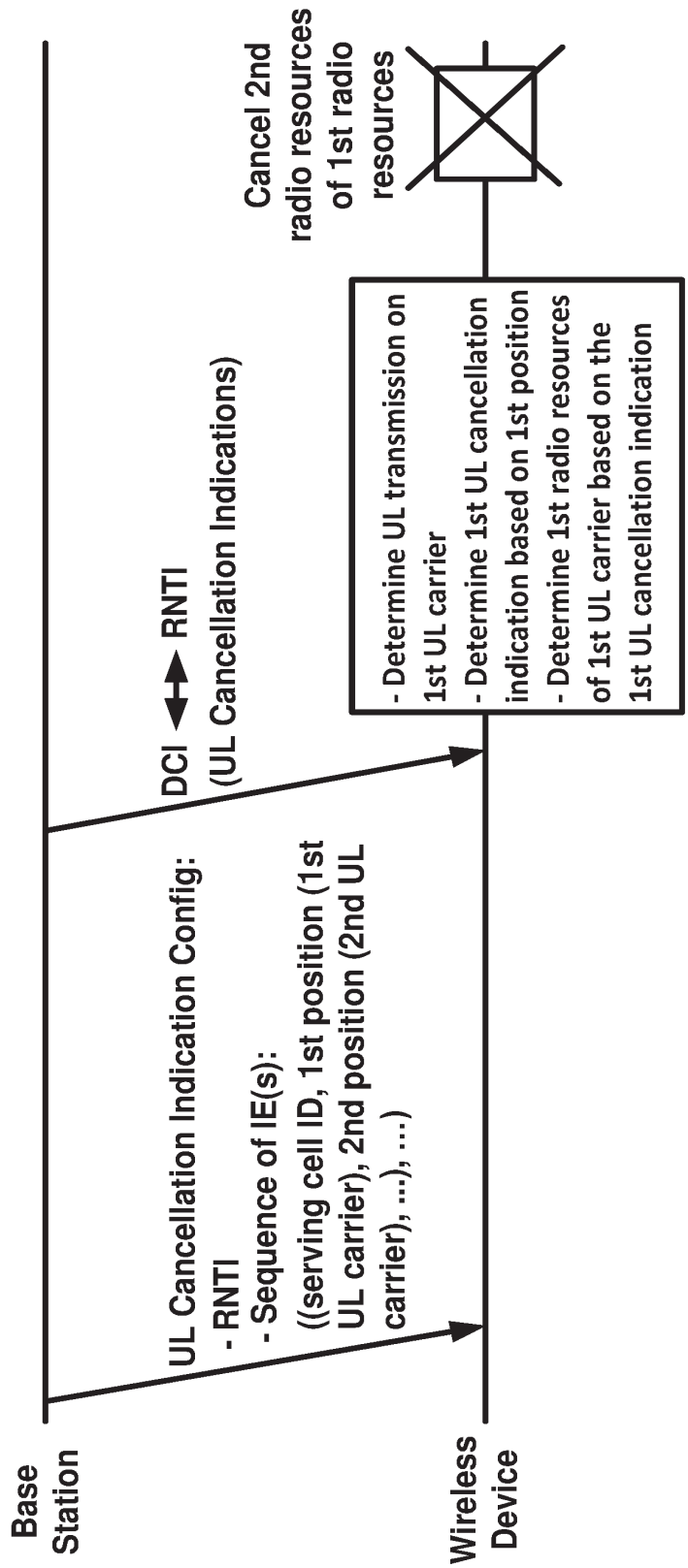

Base Station
Wireless Device
UL Cancellation Indication Config:
- RNTI
- Sequence of IE(s):
((serving cell ID, 1st position (1st UL carrier), 2nd position (2nd UL carrier), ...), ...)
DCI ↔ RNTI
(UL Cancellation Indications)
- Determine UL transmission on 1st UL carrier
- Determine 1st UL cancellation indication based on 1st position
- Determine 1st radio resources of 1st UL carrier based on the 1st UL cancellation indication
Cancel 2nd radio resources of 1st radio resources

FIG. 18

```
UplinkCancellationIndication ::=          SEQUENCE {
    ci-RNTI                                   CI-Value,
    timeFrequencySet                          ENUMERATED {set0, set1},
    dci-PayloadSize                           INTEGER (0..maxINT-DCI-PayloadSize),
    ci-ConfigurationPerServingCell    SEQUENCE (SIZE (1..maxNrofServingCells)) OF
CI-ConfigurationPerServingCell,
    ...
}

CI-ConfigurationPerServingCell ::= SEQUENCE {
    servingCellId                             ServCellIndex,
    positionInDCI                             INTEGER (0..maxINT-DCI-PayloadSize-1)
    positionInDCI-SUL                         INTEGER (0..maxINT-DCI-PayloadSize-1)
}
```

FIG. 19

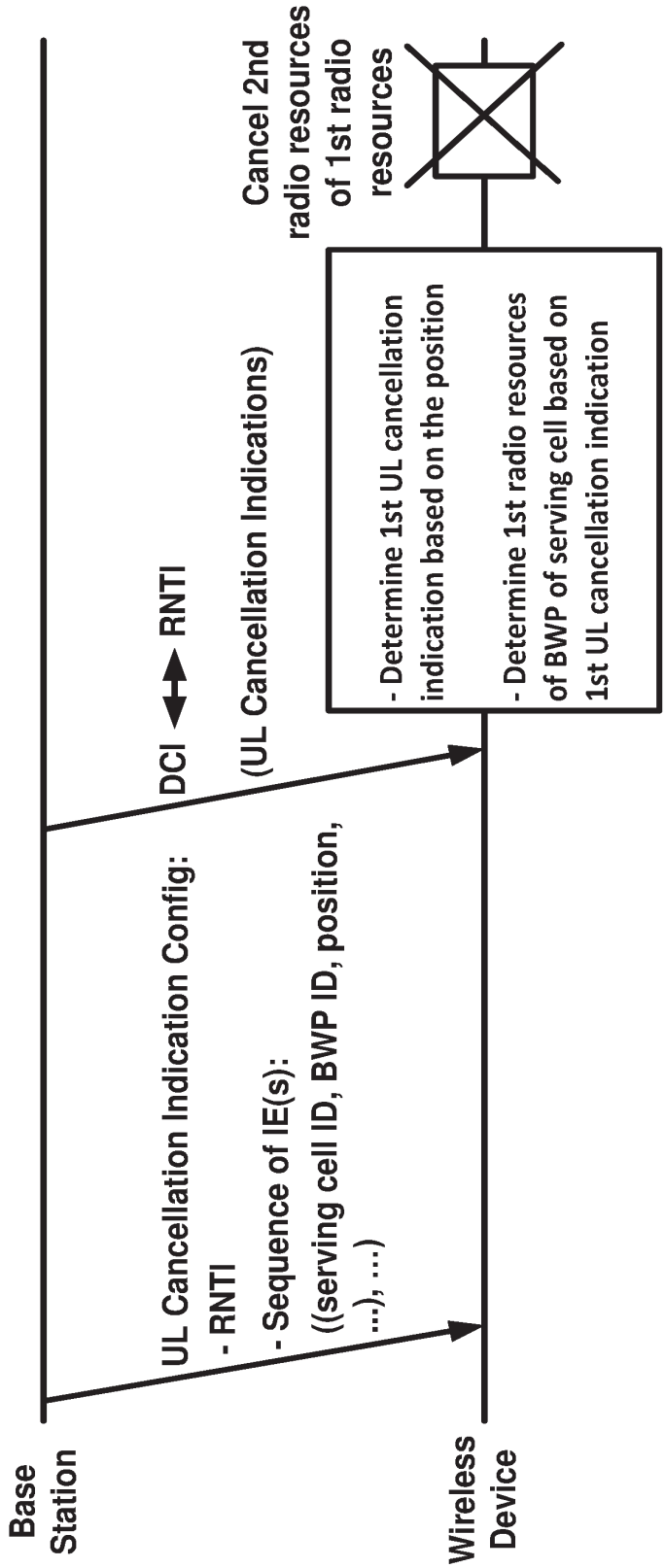

Base Station
Wireless Device
UL Cancellation Indication Config:
- RNTI
- Sequence of IE(s):
((serving cell ID, BWP ID, position, ...), ...)
DCI ↔ RNTI
(UL Cancellation Indications)
- Determine 1st UL cancellation indication based on the position
- Determine 1st radio resources of BWP of serving cell based on 1st UL cancellation indication
Cancel 2nd radio resources of 1st radio resources

FIG. 20

```
UplinkCancellationIndication ::=          SEQUENCE {
    ci-RNTI                                  CI-Value,
    timeFrequencySet                         ENUMERATED {set0, set1},
    dci-PayloadSize                          INTEGER (0..maxINT-DCI-PayloadSize),
    ci-ConfigurationPerServingCell           SEQUENCE (SIZE (1..maxNrofServingCells)) OF
CI-ConfigurationPerServingCell,
    ...
}

CI-ConfigurationPerServingCell ::= SEQUENCE {
    servingCellId                            ServCellIndex,
    bwpId                                    bwp-Id
    positionInDCI                            INTEGER (0..maxINT-DCI-PayloadSize-1)
}
```

FIG. 21

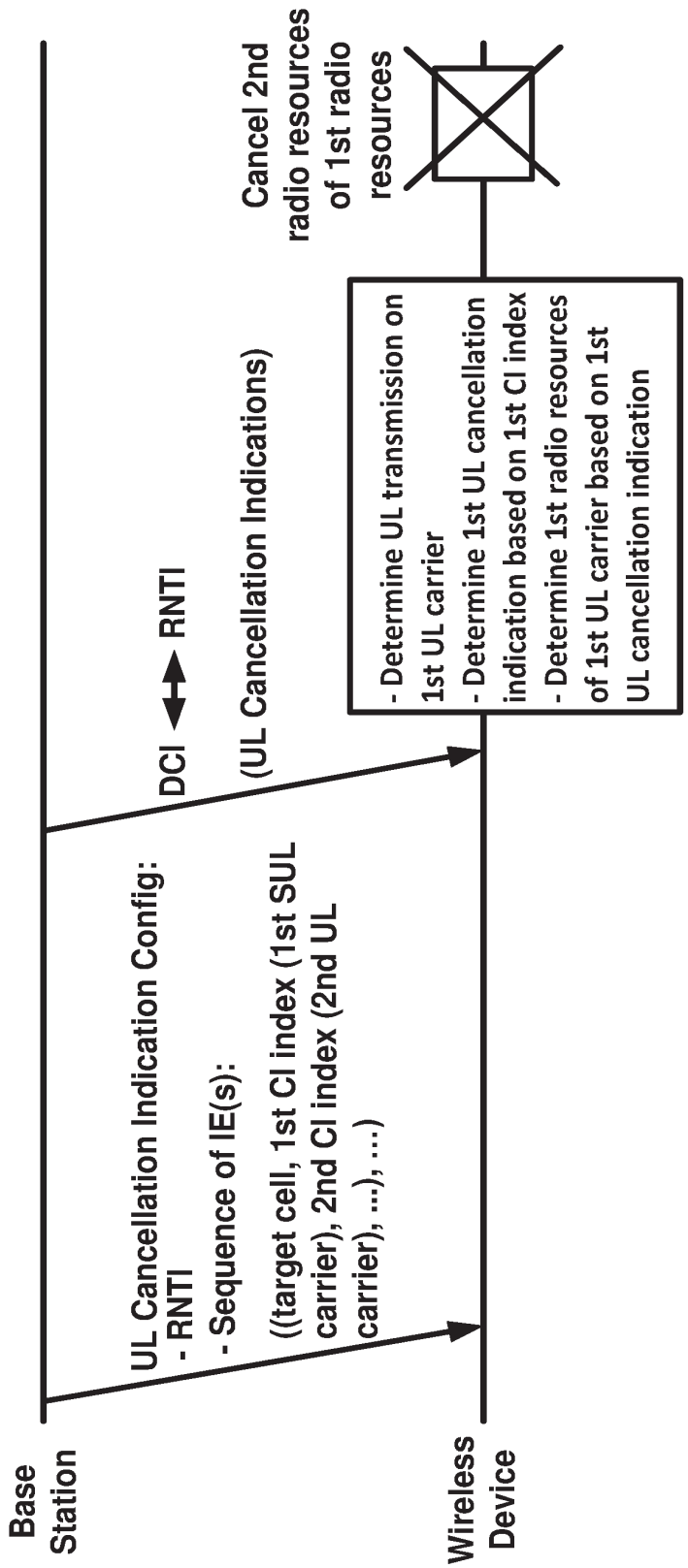

Base Station
Wireless Device
UL Cancellation Indication Config:
- RNTI
- Sequence of IE(s):
((target cell, 1st CI index (1st SUL carrier), 2nd CI index (2nd UL carrier), ...), ...)
DCI ↔ RNTI
(UL Cancellation Indications)
- Determine UL transmission on 1st UL carrier
- Determine 1st UL cancellation indication based on 1st CI index
- Determine 1st radio resources of 1st UL carrier based on 1st UL cancellation indication
Cancel 2nd radio resources of 1st radio resources

FIG. 22

```
CIConfig ::=        SEQUENCE {
    ci-Index            INTEGER (1..15)
    ci-IndexSUL         INTEGER (1..15)
    targetCell           ServCellIndex
    ...
}
```

FIG. 23

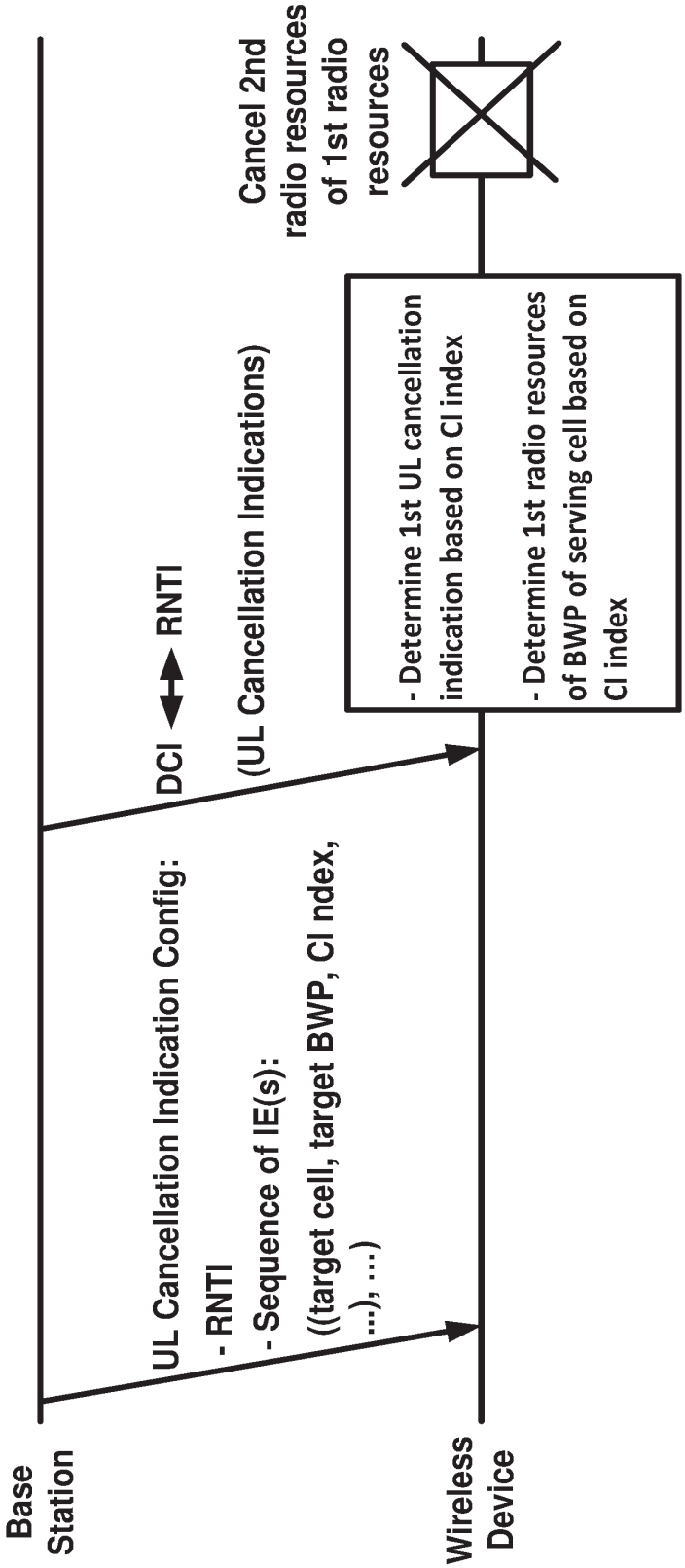

Base Station
Wireless Device
UL Cancellation Indication Config:
- RNTI
- Sequence of IE(s):
((target cell, target BWP, CI ndex, ...), ...)
DCI ↔ RNTI
(UL Cancellation Indications)
- Determine 1st UL cancellation indication based on CI index
- Determine 1st radio resources of BWP of serving cell based on CI index
Cancel 2nd radio resources of 1st radio resources

FIG. 24

```
CIConfig ::=        SEQUENCE {
    ci-Index            INTEGER (1..15)
    targetCell          ServCellIndex
    targetBWP           BWPIndex
    ...
}
```

FIG. 25

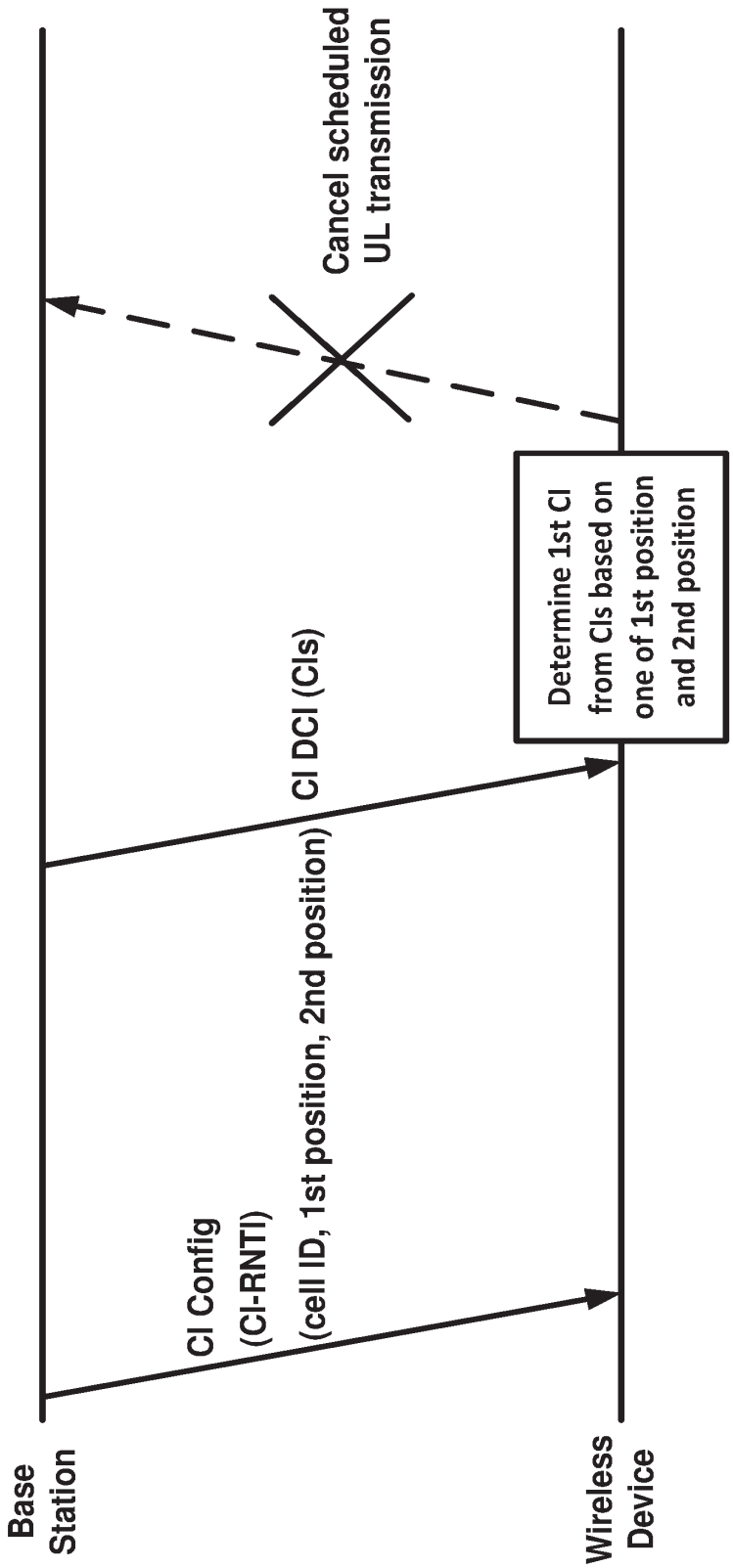

Base Station
Wireless Device
CI Config (CI-RNTI) (cell ID, 1st position, 2nd position)
CI DCI (CIs)
Determine 1st CI from CIs based on one of 1st position and 2nd position
Cancel scheduled UL transmission

FIG. 26

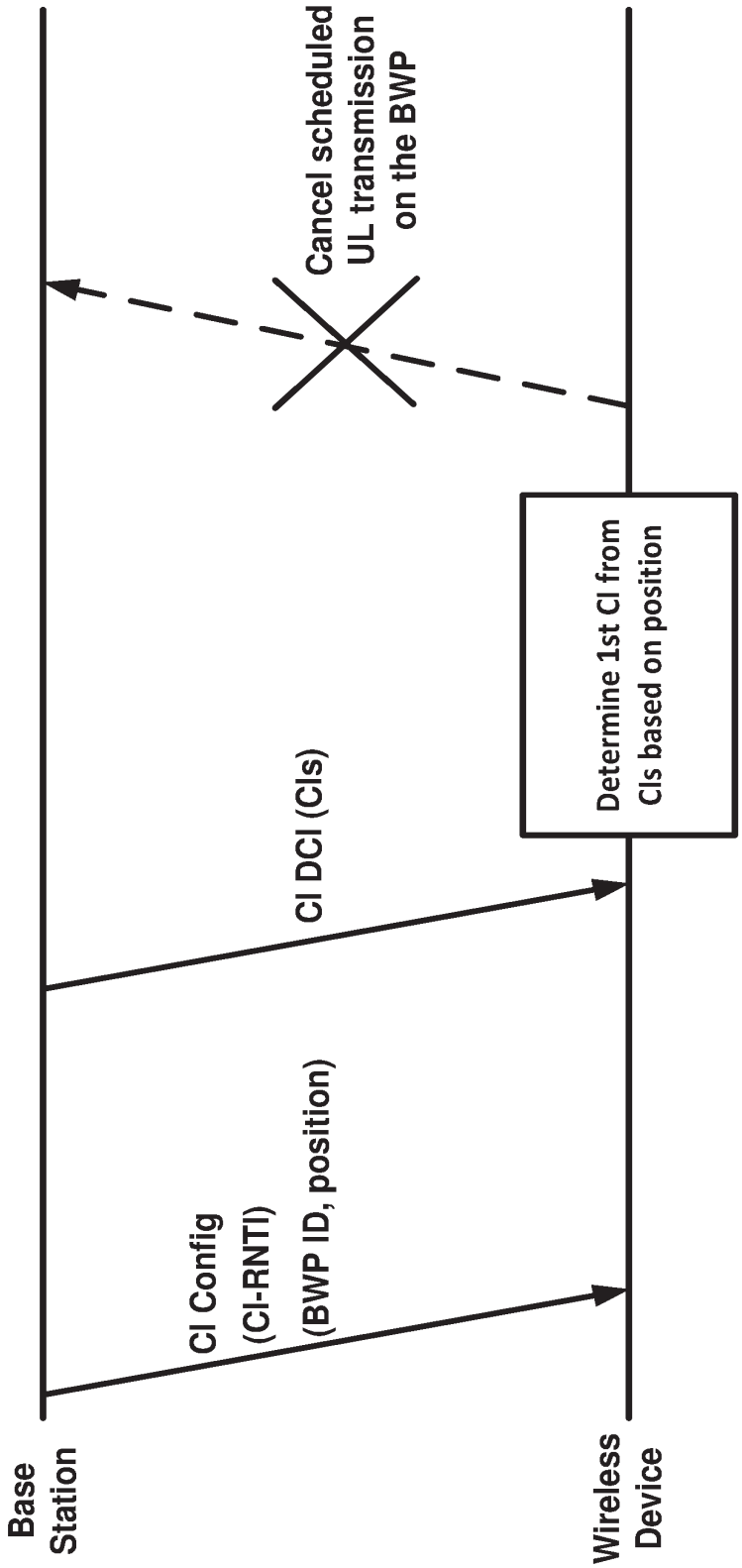

Base Station
Wireless Device
CI Config (CI-RNTI) (BWP ID, position)
CI DCI (CIs)
Determine 1st CI from CIs based on position
Cancel scheduled UL transmission on the BWP

FIG. 27

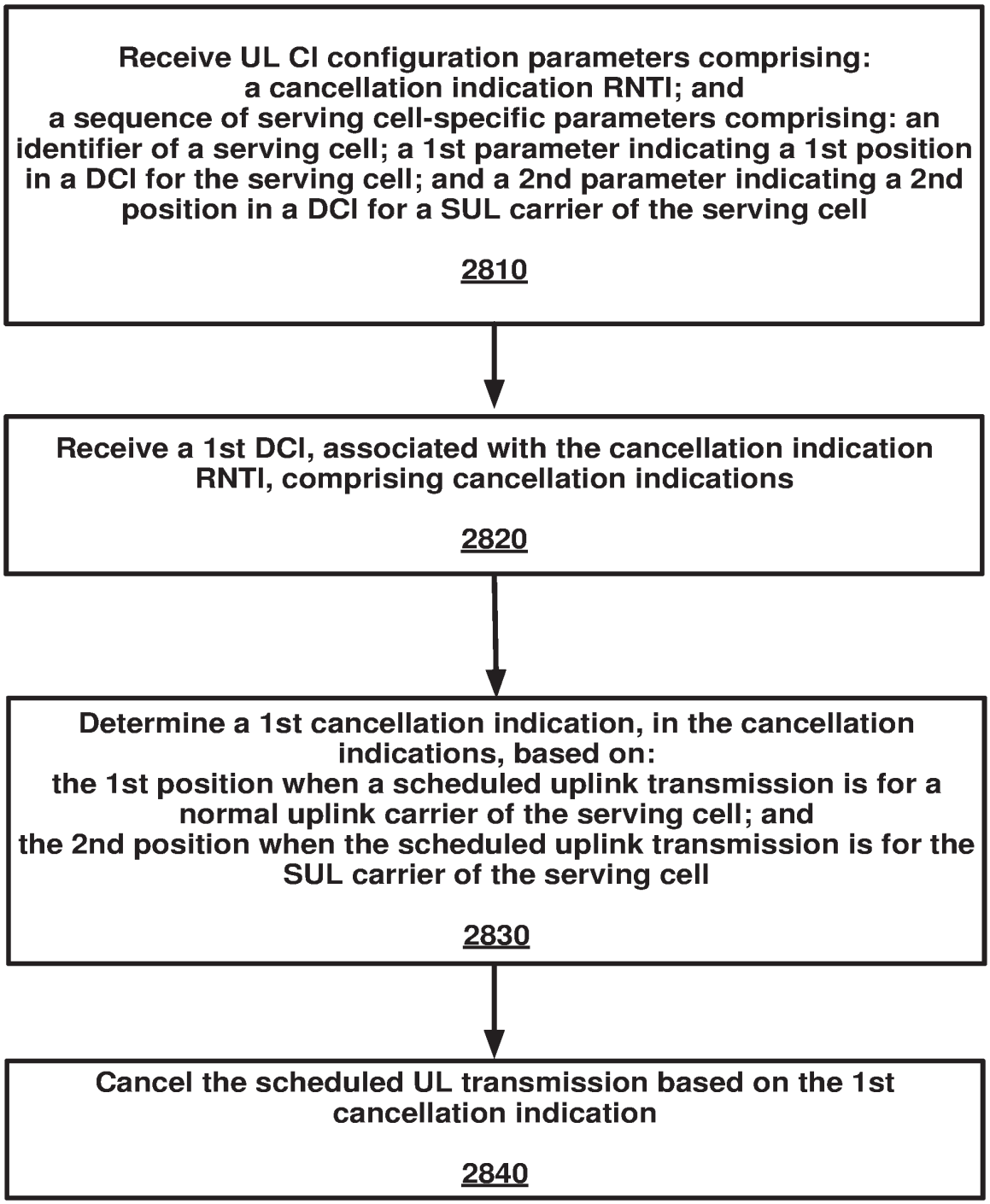

Receive UL CI configuration parameters comprising:
a cancellation indication RNTI; and
a sequence of serving cell-specific parameters comprising: an identifier of a serving cell; a 1st parameter indicating a 1st position in a DCI for the serving cell; and a 2nd parameter indicating a 2nd position in a DCI for a SUL carrier of the serving cell
2810
Receive a 1st DCI, associated with the cancellation indication RNTI, comprising cancellation indications
2820
Determine a 1st cancellation indication, in the cancellation indications, based on:
the 1st position when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and
the 2nd position when the scheduled uplink transmission is for the SUL carrier of the serving cell
2830
Cancel the scheduled UL transmission based on the 1st cancellation indication
2840

FIG. 28

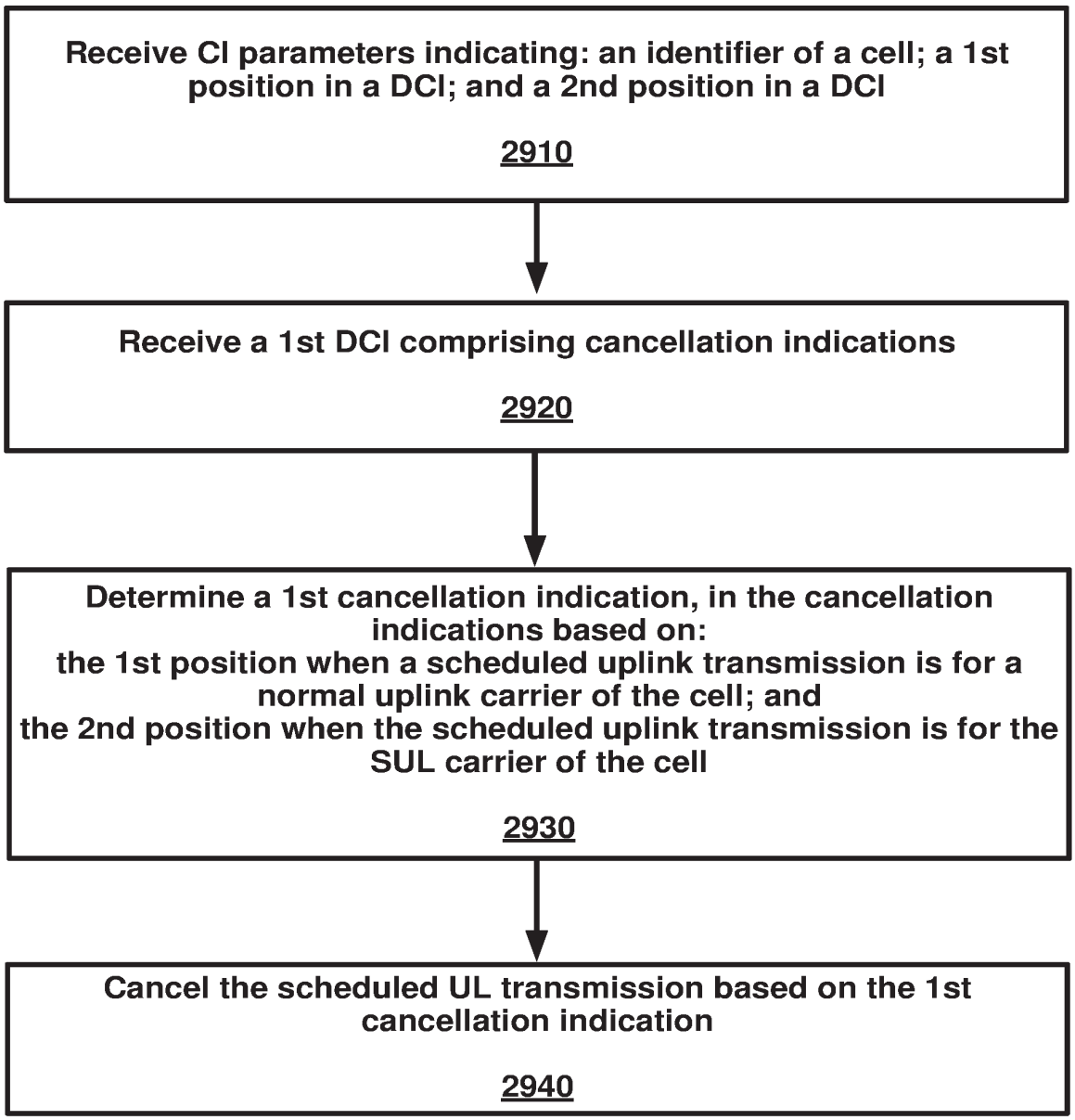

Receive CI parameters indicating: an identifier of a cell; a 1st position in a DCI; and a 2nd position in a DCI
2910
Receive a 1st DCI comprising cancellation indications
2920
Determine a 1st cancellation indication, in the cancellation indications based on:
the 1st position when a scheduled uplink transmission is for a normal uplink carrier of the cell; and
the 2nd position when the scheduled uplink transmission is for the SUL carrier of the cell
2930
Cancel the scheduled UL transmission based on the 1st cancellation indication
2940

FIG. 29

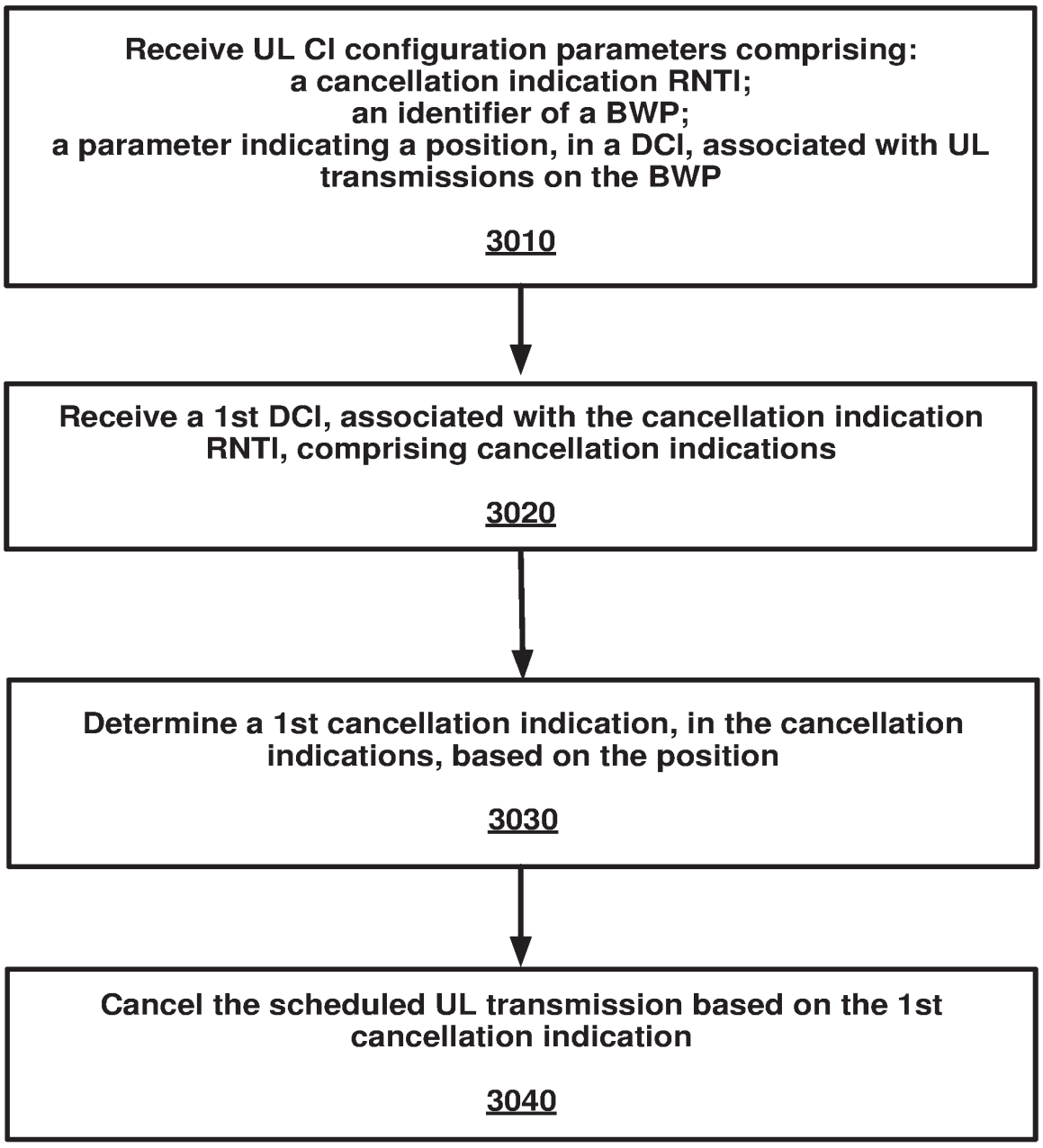

Receive UL CI configuration parameters comprising:
a cancellation indication RNTI;
an identifier of a BWP;
a parameter indicating a position, in a DCI, associated with UL transmissions on the BWP
3010
Receive a 1st DCI, associated with the cancellation indication RNTI, comprising cancellation indications
3020
Determine a 1st cancellation indication, in the cancellation indications, based on the position
3030
Cancel the scheduled UL transmission based on the 1st cancellation indication
3040

FIG. 30

CLAIMS

What is claimed is:

1. A method comprising:

receiving, by a wireless device, uplink cancellation configuration parameters comprising:

a cancellation indication radio network temporary identifier (RNTI); and

a sequence of serving cell-specific parameters comprising:

an identifier of a serving cell;

a first parameter indicating a first position in a downlink control information (DCI) for the serving cell; and

a second parameter indicating a second position in a DCI for a supplementary uplink carrier of the serving cell;

receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications;

determining a first cancellation indication, in the cancellation indications, based on:

the first position when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and

the second position when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell; and

cancelling the scheduled uplink transmission based on the first cancellation indication.

2. The method of claim 1, wherein determining the first cancellation indication is further based on a size of the first cancellation indication.

3. The method of claim 1, wherein:

the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and

the second position indicates a second starting position, of a cancellation indication, in a second number of bit.

4. The method of claim 3, wherein:

the first number of bit is between one and a payload size of the first DCI; and

the second number of bit is between one and the payload size of the first DCI.

5. The method of claim 4, wherein the uplink cancellation configuration parameters further comprise a size parameter indicating the payload size of the first DCI.

6. The method of claim 1, wherein the uplink cancellation configuration parameters further comprise a size parameter indicating a payload size of the first DCI comprising the cancellation indications.

7. The method of claim 1, wherein the scheduled uplink transmission is via a physical uplink shared channel.

8. The method of claim 7, wherein determining the first cancellation indication is further based on a size of the first cancellation indication.

9. The method of claim 7, wherein:

the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and

the second position indicates a second starting position, of a cancellation indication, in a second number of bit.

10. The method of claim 1, wherein the scheduled uplink transmission is a sounding reference signal transmission.

11. The method of claim 10, wherein determining the first cancellation indication is further based on a size of the first cancellation indication.

12. The method of claim 10, wherein:

the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and

the second position indicates a second starting position, of a cancellation indication, in a second number of bit.

13. The method of claim 1, further comprising monitoring a common search space for a DCI associated with the cancellation indication RNTI.

14. The method of claim 1, further comprising determining cancelled uplink resources based on the first cancellation indication.

15. The method of claim 14, wherein:

the sequence of serving cell-specific parameters further comprise an offset parameter indicating an offset, in unit of symbol, from an end of a control channel reception where the wireless device detects the first DCI; and

the determining the cancelled uplink resources is further based on the offset.

16. The method of claim 15, wherein the determining the cancelled uplink resources comprises determining a first symbol associated with the cancelled uplink resources based on the offset.

17. The method of claim 14, wherein the determining the cancelled uplink resources is further based on a processing time associated with the first DCI.

18. The method of claim 14, wherein:

the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and

the second position indicates a second starting position, of a cancellation indication, in a second number of bit.

19. The method of claim 18, wherein:

the first number of bit is between one and a payload size of the first DCI; and

the second number of bit is between one and the payload size of the first DCI.

20. The method of claim 19, wherein the uplink cancellation configuration parameters further comprise a size parameter indicating the payload size of the first DCI.

Electronic Acknowledgement Receipt	
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International Application Number:	
Confirmation Number:	8842
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Customer Number:	148908
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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	Application Number	17092244
	Filing Date	2020-11-07
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-004Ut

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	Examiner Name	
	Attorney Docket Number	2019-004Ut

	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	R1-1907973; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Rep, 26th – 30th August 2019; Source: MCC Support; Title: Final Report of 3GPP TSG RAN WG1 #97 v1.0.0; (Reno, USA, 13th – 17th May 2019); Document for: Approval	
	10	R1-1908055; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26 – 30, 2019; Agenda Item: 7.2.6.5; Source: Huawei, HiSilicon; Title: UL inter-UE transmission prioritization and multiplexing; Document for: Discussion and Decision	
	11	R1-1908125; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26-30, 2019; Agenda Item: 7.2.6.5; Source: Ericsson; Title: Inter-UE Prioritization and Multiplexing of UL Transmissions; Document for: Discussion, Decision	

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	Filing Date	2020-11-07
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-004Ut

	12	R1-1908162; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: vivo; Title: UL inter-UE Tx prioritization for URLLC; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	13	R1-1908281; 3GPP TSG RAN WG1 #98; Prague, Czech Republic, 26th – 30th August, 2019; Agenda Item: 7.2.6.5; Source: NEC; Title: Enhanced inter-UE Tx prioritisation and multiplexing; Document for: Discussion/Decision	
	14	R1- 1908412; 3GPP TSG RAN1 WG1 Meeting #98; Prague, Czech, August 26th – 30th, 2019; Agenda item: 7.2.6.5; Title: On uplink inter-UE transmission prioritization and multiplexing; Source: MediaTek Inc.; Document for: Discussion and Decision	
	15	R1-1908545; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.5; Source: LG Electronics; Title: Discussion on UL inter UE Tx prioritization; Document for: Discussion and decision	
	16	R1-1908649; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Source: Intel Corporation; Title: Enhanced inter-UE Tx prioritization/multiplexing; Agenda item: 7.2.6.5; Document for: Discussion and Decision	
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	18	R1- 1908868; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda item: 7.2.6.5; Source: CMCC; Title: Discussion on UL inter UE Tx prioritization/multiplexing; Document for: Discussion and Decision	
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	23	R1-1909453; 3GPP TSG RAN WG1 #98; Prague, Czech, August 26th – 30th, 2019; Agenda Item: 7.2.6.5; Source: InterDigital Inc.; Title: Enhanced Inter UE Transmit prioritization/multiplexing for eURLLC; Document for: Discussion and Decision	
	24	R1-1910070; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14-20, 2019; Agenda Item: 7.2.6.5; Source: Huawei, HiSilicon; Title: UL inter-UE transmission prioritization and multiplexing; Document for: Discussion and Decision	
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	29	R1-1910487; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda item: 7.2.6.5; Source: Samsung; Title: UL inter-UE multiplexing/prioritization; Document for: Discussion and Decision	
	30	R1-1910522; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: Panasonic; Title: On inter UE Tx prioritization/multiplexing enhancements for NR URLLC; Agenda Item: 7.2.6.5; Document for: Discussion	
	31	R1-1910530; 3GPP TSG RAN WG1 #98bis; Chongqing, China, 14th – 18th October, 2019; Agenda Item: 7.2.6.5; Source: NEC; Title: Enhanced inter-UE Tx prioritisation and multiplexing; Document for: Discussion/Decision	
	32	R1-1910549; 3GPP TSG-RAN WG1 Meeting #98bis; Chongqing, China, 14th – 20th October 2019; Agenda Item: 7.2.6.5; Source: Ericsson; Title: Inter-UE Prioritization and Multiplexing of UL Transmissions; Document for: Discussion, Decision	
	33	R1-1910623; 3GPP TSG RAN WG1 #98bis; Chongqing, China, Oct. 14th – 20th, 2019; Source: OPPO; Title: Inter UE Tx prioritization and multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision;	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17092244
	Filing Date	2020-11-07
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-004Ut

	34	R1-1910664; 3GPP TSG RAN WG1 #98bis; Chongqing, China, 14th – 20th October, 2019; Source: Intel Corporation; Title: Enhancements to inter-UE multiplexing; Agenda item: 7.2.6.5; Document for: Discussion and Decision	
	35	R1-1910772; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: Sony; Title: UL Inter UE transmission prioritisation & multiplexing; Document for: Discussion / decision	
	36	R1-1910830; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: LG Electronics; Title: Discussion on UL inter UE Tx prioritization; Document for: Discussion and decision	
	37	R1-1910868; 3GPP TSG RAN WG1 Meeting #98-Bis; Chongqing, China, October 14-20, 2019; Agenda item: 7.2.6.5; Source: Nokia, Nokia Shanghai Bell; Title: UL inter-UE eMBB and URLLC multiplexing enhancements; Document for: Discussion and Decision	
	38	R1- 1910937; 3GPP TSG RAN WG1 Meeting #98b; Chongqing, China, 14th October - 20th October, 2019; Source: Sharp; Title: UL cancelation indication design for enhanced inter UE Tx prioritization/multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	39	R1-1911000; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: ETRI; Title: Enhanced inter UE Tx prioritization/multiplexing; Agenda Item: 7.2.6.5 Enhanced inter UE Tx prioritization/multiplexing; Document for: Discussion	
	40	R1-1911082; 3GPP TSG RAN1 WG1 Meeting #98bis; Chongqing, China, October 14th - 20th, 2019; Agenda item: 7.2.6.5; Title: On uplink inter-UE transmission prioritization and multiplexing; Source: MediaTek Inc.; Document for: Discussion and Decision	
	41	R1- 1911122; 3GPP TSG-RAN WG1 #98b; October 14th-20th, 2019; Chongqing, China; Agenda item: 7.2.6.5; Source: Qualcomm Incorporated; Title: Uplink Inter-UE Tx Multiplexing and Prioritization; Document for: Discussion/Decision	
	42	R1-1911179; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: NTT DOCOMO, INC.; Title: UL inter-UE transmission prioritization/multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	43	R1-1911252; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: KT Corp.; Title: Considerations on Enhanced inter UE Tx prioritization/multiplexing; Document for: Discussion and Decision	
	44	R1- 1911300; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: Motorola Mobility, Lenovo; Title: Enhanced inter UE Tx prioritization/multiplexing for URLLC; Document for: Discussion	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17092244
	Filing Date	2020-11-07
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-004Ut

	45	R1-1911307; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: Sequans; Title: Considerations on UL inter-UE multiplexing for URLLC; Document for: Discussion and decision	
	46	R1-1911318; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: WILUS Inc.; Title: On UL cancellation scheme for NR URLLC; Agenda item: 7.2.6.5; Document for: Discussion/Decision	
	47	R1-1911327; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Source: CAICT Title: Enhanced inter UE Tx prioritization/multiplexing for URLLC; Agenda Item: 7.2.6.5; Document for: Discussion / Decision	
	48	R1-1911337; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: InterDigital Inc.; Title: Enhanced Inter UE Transmit prioritization/multiplexing for eURLLC; Document for: Discussion and Decision	

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

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17092244
	Filing Date	2020-11-07
	First Named Inventor	Alireza Babaei
	Art Unit	
	Examiner Name	
	Attorney Docket Number	2019-004Ut

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)	2020-11-15
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.**

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 record s.

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.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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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
17/092,244	11/07/2020		830	2019-004Ut	20	1

CONFIRMATION NO. 8842

148908
ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

FILING RECEIPT



Date Mailed: 11/18/2020

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 62/932,487 11/07/2019

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: 11/17/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/092,244**

Projected Publication Date: 05/13/2021

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Uplink Cancellation Indication Signaling

Preliminary Class

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

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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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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/092,244

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	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	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 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			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	830		TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT A

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

AMENDMENT B

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

148908 7590 12/09/2020

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

EXAMINER	
ART UNIT	PAPER NUMBER
2414	
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.

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 17/092,244	**Applicant(s)** Babaei, Alireza	
	Examiner TERRI S JOHNSON	**Art Unit** OPET	**AIA (FITF) Status** Yes

1. THE REQUEST FILED 07 November 2020 IS **GRANTED** .

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

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

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

A. filing a **petition for extension of time** to extend the time period for filing a reply;

B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;

C. filing a **request for continued examination** ;

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

H. completion of examination as defined in 37 CFR 41.102; or

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to TERRI JOHNSON at (571)272 -2991. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/TERRI S JOHNSON/ Paralegal Specialist, OPET	

U.S. Patent and Trademark Office
PTO-2298 (Rev. 02-2012)

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	0	(uplink near5 cancellation near5 configuration near5 parameter) AND rnti AND dci AND cell AND (supplemental near5 uplink near5 carrier)	US-PGPUB; USPAT	OR	ON	ON	2020/12/29 02:29 PM
L2	0	(uplink near5 cancellation near5 configuration near5 parameter) AND rnti AND dci AND cell	US-PGPUB; USPAT	OR	ON	ON	2020/12/29 02:30 PM
L3	1977	(uplink AND cancellation AND configuration AND parameter) AND rnti AND dci AND cell	US-PGPUB; USPAT	OR	ON	ON	2020/12/29 02:32 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	**Art Unit**
	JOHN PEZZLO	2465

✓	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	12/31/2020								
	1	✓								
	2	✓								
	3	✓								
	4	O								
	5	O								
	6	O								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	O								
	16	O								
	17	✓								
	18	✓								
	19	O								
	20	O								

Bibliographic Data

Application No: 17/092,244

Foreign Priority claimed: ○ Yes ◉ No

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

Verified and Acknowledged: /JOHN PEZZLO/ Examiner's Signature | Initials

Title: Uplink Cancellation Indication Signaling

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/07/2020	370	2465	2019-004Ut
RULE			

APPLICANTS

INVENTORS

Alireza Babaei, Fairfax, VA, UNITED STATES

CONTINUING DATA

This application has PRO of 62932487 11/07/2019

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ADDRESS

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032
UNITED STATES

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$3,000

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17092244
Filing Date	2020-11-07
First Named Inventor	Alireza Babaei
Art Unit	
Examiner Name	
Attorney Docket Number	2019-004Ut

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.P/

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	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	R1-1907973; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Rep, 26th – 30th August 2019; Source: MCC Support; Title: Final Report of 3GPP TSG RAN WG1 #97 v1.0.0; (Reno, USA, 13th – 17th May 2019); Document for: Approval	
	10	R1-1908055; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26 – 30, 2019; Agenda Item: 7.2.6.5; Source: Huawei, HiSilicon; Title: UL inter-UE transmission prioritization and multiplexing; Document for: Discussion and Decision	
	11	R1-1908125; 3GPP TSG RAN WG1 Meeting #98; Prague, Czech Republic, August 26-30, 2019; Agenda Item: 7.2.6.5; Source: Ericsson; Title: Inter-UE Prioritization and Multiplexing of UL Transmissions; Document for: Discussion, Decision	

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	Attorney Docket Number	2019-004Ut

	12	R1-1908162; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: vivo; Title: UL inter-UE Tx prioritization for URLLC; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	13	R1-1908281; 3GPP TSG RAN WG1 #98; Prague, Czech Republic, 26th – 30th August, 2019; Agenda Item: 7.2.6.5; Source: NEC; Title: Enhanced inter-UE Tx prioritisation and multiplexing; Document for: Discussion/Decision	
	14	R1- 1908412; 3GPP TSG RAN1 WG1 Meeting #98; Prague, Czech, August 26th – 30th, 2019; Agenda item: 7.2.6.5; Title: On uplink inter-UE transmission prioritization and multiplexing; Source: MediaTek Inc.; Document for: Discussion and Decision	
	15	R1-1908545; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.5; Source: LG Electronics; Title: Discussion on UL inter UE Tx prioritization; Document for: Discussion and decision	
	16	R1-1908649; 3GPP TSG RAN WG1 Meeting #98; Prague, CZ, August 26th – 30th, 2019; Source: Intel Corporation; Title: Enhanced inter-UE Tx prioritization/multiplexing; Agenda item: 7.2.6.5; Document for: Discussion and Decision	
	17	R1-1908671; 3GPP TSG RAN WG1 #98; Prague, Czech, August 26th – 30th, 2019; Source: OPPO; Title: Inter UE Tx prioritization and multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	18	R1- 1908868; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda item: 7.2.6.5; Source: CMCC; Title: Discussion on UL inter UE Tx prioritization/multiplexing; Document for: Discussion and Decision	
	19	R1-1908969; 3GPP TSG RAN WG1 #98; Prague, USCZA, 26th – 30th August, 2019; Source: Panasonic; Title: On inter UE Tx prioritization/multiplexing enhancements for NR URLLC; Agenda Item: 7.2.6.5; Document for: Discussion	
	20	R1-1909149; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Agenda Item: 7.2.6.5; Source: Motorola Mobility, Lenovo; Title: Enhanced inter UE Tx prioritization/multiplexing for URLLC; Document for: Discussion	
	21	R1-1909197; 3GPP TSG RAN WG1 #98; Prague, CZ, August 26th – 30th, 2019; Source: NTT DOCOMO, INC.; Title: UL inter-UE transmission prioritization/multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	22	R1- 1909268; 3GPP TSG-RAN WG1 #98; August 26th-30th, 2019; Prague, Czech Republic; Agenda item: 7.2.6.5; Source: Qualcomm Incorporated; Title: Uplink inter-UE Tx Multiplexing and Prioritization; Document for: Discussion/ Decision	

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	Attorney Docket Number	2019-004Ut

	23	R1-1909453; 3GPP TSG RAN WG1 #98; Prague, Czech, August 26th – 30th, 2019; Agenda Item: 7.2.6.5; Source: InterDigital Inc.; Title: Enhanced Inter UE Transmit prioritization/multiplexing for eURLLC; Document for: Discussion and Decision	
	24	R1-1910070; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14-20, 2019; Agenda Item: 7.2.6.5; Source: Huawei, HiSilicon; Title: UL inter-UE transmission prioritization and multiplexing; Document for: Discussion and Decision	
	25	R1-1910104; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th - 20th, 2019; Source: ZTE; Title: UL inter-UE multiplexing between eMBB and URLLC; Agenda item: 7.2.6.5; Document for: Discussion and Decision	
	26	R1- 1910168; 3GPP TSG RAN WG1 #98 bis; Chongqing, China, October 14th – 20th, 2019; Agenda item: 7.2.6.5; Source: CMCC; Title: Discussion on UL inter UE Tx prioritization/multiplexing; Document for: Discussion and Decision	
	27	R1-1910225; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: vivo; Title: UL inter-UE Tx prioritization for URLLC; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	28	R1- 1910345; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Source: CATT; Title: Discussion on inter-UE UL multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	29	R1-1910487; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda item: 7.2.6.5; Source: Samsung; Title: UL inter-UE multiplexing/prioritization; Document for: Discussion and Decision	
	30	R1-1910522; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: Panasonic; Title: On inter UE Tx prioritization/multiplexing enhancements for NR URLLC; Agenda Item: 7.2.6.5; Document for: Discussion	
	31	R1-1910530; 3GPP TSG RAN WG1 #98bis; Chongqing, China, 14th – 18th October, 2019; Agenda Item: 7.2.6.5; Source: NEC; Title: Enhanced inter-UE Tx prioritisation and multiplexing; Document for: Discussion/Decision	
	32	R1-1910549; 3GPP TSG-RAN WG1 Meeting #98bis; Chongqing, China, 14th – 20th October 2019; Agenda Item: 7.2.6.5; Source: Ericsson; Title: Inter-UE Prioritization and Multiplexing of UL Transmissions; Document for: Discussion, Decision	
	33	R1-1910623; 3GPP TSG RAN WG1 #98bis; Chongqing, China, Oct. 14th – 20th, 2019; Source: OPPO; Title: Inter UE Tx prioritization and multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision;	

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	Examiner Name	
	Attorney Docket Number	2019-004Ut

	34	R1-1910664; 3GPP TSG RAN WG1 #98bis; Chongqing, China, 14th – 20th October, 2019; Source: Intel Corporation; Title: Enhancements to inter-UE multiplexing; Agenda item: 7.2.6.5; Document for: Discussion and Decision	
	35	R1-1910772; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: Sony; Title: UL Inter UE transmission prioritisation & multiplexing; Document for: Discussion / decision	
	36	R1-1910830; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: LG Electronics; Title: Discussion on UL inter UE Tx prioritization; Document for: Discussion and decision	
	37	R1-1910868; 3GPP TSG RAN WG1 Meeting #98-Bis; Chongqing, China, October 14-20, 2019; Agenda item: 7.2.6.5; Source: Nokia, Nokia Shanghai Bell; Title: UL inter-UE eMBB and URLLC multiplexing enhancements; Document for: Discussion and Decision	
	38	R1- 1910937; 3GPP TSG RAN WG1 Meeting #98b; Chongqing, China, 14th October - 20th October, 2019; Source: Sharp; Title: UL cancelation indication design for enhanced inter UE Tx prioritization/multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	39	R1-1911000; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: ETRI; Title: Enhanced inter UE Tx prioritization/multiplexing; Agenda Item: 7.2.6.5 Enhanced inter UE Tx prioritization/multiplexing; Document for: Discussion	
	40	R1-1911082; 3GPP TSG RAN1 WG1 Meeting #98bis; Chongqing, China, October 14th - 20th, 2019; Agenda item: 7.2.6.5; Title: On uplink inter-UE transmission prioritization and multiplexing; Source: MediaTek Inc.; Document for: Discussion and Decision	
	41	R1- 1911122; 3GPP TSG-RAN WG1 #98b; October 14th-20th, 2019; Chongqing, China; Agenda item: 7.2.6.5; Source: Qualcomm Incorporated; Title: Uplink Inter-UE Tx Multiplexing and Prioritization; Document for: Discussion/Decision	
	42	R1-1911179; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: NTT DOCOMO, INC.; Title: UL inter-UE transmission prioritization/multiplexing; Agenda Item: 7.2.6.5; Document for: Discussion and Decision	
	43	R1-1911252; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: KT Corp.; Title: Considerations on Enhanced inter UE Tx prioritization/multiplexing; Document for: Discussion and Decision	
	44	R1- 1911300; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: Motorola Mobility, Lenovo; Title: Enhanced inter UE Tx prioritization/multiplexing for URLLC; Document for: Discussion	

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	Attorney Docket Number	2019-004Ut

	45	R1-1911307; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: Sequans; Title: Considerations on UL inter-UE multiplexing for URLLC; Document for: Discussion and decision	
	46	R1-1911318; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Source: WILUS Inc.; Title: On UL cancellation scheme for NR URLLC; Agenda item: 7.2.6.5; Document for: Discussion/Decision	
	47	R1-1911327; 3GPP TSG RAN WG1 Meeting #98bis; Chongqing, China, October 14th – 20th, 2019; Source: CAICT Title: Enhanced inter UE Tx prioritization/multiplexing for URLLC; Agenda Item: 7.2.6.5; Document for: Discussion / Decision	
	48	R1-1911337; 3GPP TSG RAN WG1 #98bis; Chongqing, China, October 14th – 20th, 2019; Agenda Item: 7.2.6.5; Source: InterDigital Inc.; Title: Enhanced Inter UE Transmit prioritization/multiplexing for eURLLC; Document for: Discussion and Decision	

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EXAMINER SIGNATURE

Examiner Signature	/JOHN PEZZLO/	Date Considered	12/29/2020

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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.

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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)	2020-11-15
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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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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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L3	1977	(uplink AND cancellation AND configuration AND parameter) AND rnti AND dci AND cell	US-PGPUB; USPAT	OR	ON	ON	2020/12/29 02:32 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L4	53	L3 AND (supplemental AND uplink AND carrier)	US-PGPUB; USPAT	OR	ON	ON	2020/12/30 07:03 AM
L5	16	(uplink near5 cancellation near5 indication)	US-PGPUB; USPAT	OR	ON	ON	2020/12/30 11:21 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Notice of References Cited	Application/Control No. 17/092,244	Applicant(s)/Patent Under Reexamination Babaei, Alireza	
	Examiner JOHN PEZZLO	Art Unit 2465	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-20200359447-A1	11-2020	YANG; Wei	H04W24/08	1/1
*	B	US-20200351897-A1	11-2020	Fakoorian; Seyed Ali Akbar	H04L5/1469	1/1
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

148908 7590 01/04/2021

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4525 Gilbertson Road
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EXAMINER
PEZZLO, JOHN

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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.

Office Action Summary	Application No. 17/092,244	Applicant(s) Babaei, Alireza	
	Examiner JOHN PEZZLO	Art Unit 2465	AIA (FITF) Status Yes

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

Period for Reply

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

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

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

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

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-3,7-14 and 17-18 is/are rejected.

8) ☑ Claim(s) 4-6,15-16 and 19-20 is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 11/7/20 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 11/15/20.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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 § 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.

I. Claims 1-3, 7-14, 17, and 18 are rejected under 35 U.S.C. 103 as being unpatentable over Yang et al. (US 2020/0359447 A1) hereinafter Yang in view of Fakoorian et al. (US 2020/0351897 A1) hereinafter Fakoorian.

1. Regarding claim 1 – Yang discloses receiving, by a wireless device, uplink cancellation configuration parameters comprising, refer to Figure 11 and paragraphs [0006], [0010] to [0012], [0103].

Yang does not explicitly disclose a cancellation indication radio network temporary identifier (RNTI).

Fakoorian discloses a cancellation indication radio network temporary identifier (RNTI), refer to Figures 5, 14 and paragraphs [0078], [0118].

It would have obvious to an ordinary person of skill in the art before the effective filing date of the application to combine Yang with Fakoorian to provide Yang with a cancellation indication radio network temporary identifier (RNTI).

The suggestion/motivation for doing so would have been that Yang discloses physical cell identifier (PCI) the which is also identified in Fakoorian which is equivalent to an RNTI, refer to paragraph [0063].

The benefit being the cell and the base station and the UE can be uniquely identified to improve the system reliability.

Yang discloses a sequence of serving cell-specific parameters comprising: an identifier of a serving cell, refer to paragraph [0063].

Yang discloses a first parameter indicating a first position in a downlink control information (DCI) for the serving cell, refer to paragraphs [0010] to [0012].

Yang discloses a second parameter indicating a second position in a DCI for a supplementary uplink carrier of the serving cell, refer to paragraphs [0010] to [0012].

Yang discloses receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications, refer to above (Yang and Fakoorian combination) and Figures 6, 11, and paragraphs [0010], [0063], [0082], [0090].

Yang discloses determining a first cancellation indication, in the cancellation indications, based on: the first position when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and the second position when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell, refer to paragraphs [0010] to [0012].

Yang discloses cancelling the scheduled uplink transmission based on the first cancellation indication, refer to Figures 13, 15 to 17, and paragraphs [0009], [0057], [0076], [0081], [0082], [0148].

2. Regarding claims 2, 8, and 11 - Yang discloses on a size of the first cancellation indication, refer to Figure 11 and paragraphs [0084], [0085], [0086], [0103], [0157], [0188], [0212], and claim 52.

3. Regarding claims 3, 9, 12, and 18 - Yang discloses the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and the second position indicates a second starting position, of a cancellation indication, in a second number of bit, refer to Figure 6 and paragraphs [0084] to [0086].

4. Regarding claim 7 – Yang discloses the scheduled uplink transmission is via a physical uplink shared channel, refer to Figures 6, 8, 9, 14, and paragraphs [0085], [0088], [0090], [0098], [0100], [0102], [0127], [0139].

5. Regarding claim 10 – Yang discloses the scheduled uplink transmission is a sounding reference signal transmission, refer to Figures 6, 8, 9, 14, 18, and paragraph [0090], [0098], [0100], [0127], [0139].

6. Regarding claim 13 – Yang discloses receiving, by a wireless device, uplink cancellation configuration parameters comprising, refer to Figure 11 and paragraphs [0006], [0010] to [0012], [0103].

Yang does not explicitly disclose monitoring a common search space for a DCI associated with the cancellation indication RNTI.

Fakoorian discloses monitoring a common search space for a DCI associated with the cancellation indication RNTI, refer to Figures 5, 14 and paragraphs [0078], [0102], [0118], [0119], [0126], [0127].

It would have obvious to an ordinary person of skill in the art before the effective filing date of the application to combine Yang with Fakoorian to provide Yang with monitoring a common search space for a DCI associated with the cancellation indication RNTI.

The suggestion/motivation for doing so would have been that Yang discloses common signaling, refer to paragraphs [0004], [0105].

The benefit being Yang could search a common space to receive the DLCI information.

7. Regarding claim 14 – Yang discloses determining cancelled uplink resources based on the first cancellation indication, refer to Figures 11, 12, and paragraphs [0103], [0106], [0108].

8. Regarding claim 17 – Yang discloses determining the cancelled uplink resources is further based on a processing time associated with the first DCI, refer to Figure 5, 8, 9 and paragraphs [0007], [0008], [0078], [0079].

Allowable Subject Matter

Claims 4-6, 15, 16, 19, and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Pezzlo whose telephone number is (571) 272-3090. The examiner can normally be reached on Monday to Friday from 8:30 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha Banks-Harold, can be reached on (571) 272-7905. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2600.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C.

or faxed to:

(571) 273-8300

For informal or draft communications, please label "PROPOSED" or "DRAFT"

Hand delivered responses should be brought to:

Jefferson Building

2A15

500 Dulany Street

Alexandria, VA, 22313

John Pezzlo

31 December 2020

/John Pezzlo/

Primary Examiner, Art Unit 2465

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	Art Unit
	JOHN PEZZLO	2465

CPC - Searched*		
Symbol	Date	Examiner
H04W 72/1268, 76/36	12/31/2020	JP

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
370	252, 329, 386, 430	12/31/2020	JP

* 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
Search Plan - uplink cancellation indication, DCI and RNTI, SUL and NUL.	12/31/2020	JP
CAT tool	12/31/2020	JP
IDS filed 11/15/20	12/31/2020	JP
PE2E search	12/31/2020	JP

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

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	0	(uplink near5 cancellation near5 configuration near5 parameter) AND rnti AND dci AND cell AND (supplemental near5 uplink near5 carrier)	US-PGPUB; USPAT	OR	ON	ON	2020/12/29 02:29 PM
L2	0	(uplink near5 cancellation near5 configuration near5 parameter) AND rnti AND dci AND cell	US-PGPUB; USPAT	OR	ON	ON	2020/12/29 02:30 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

UNITED STATES PATENT AND TRADEMARK OFFICE

USPTO Automated Interview Request (AIR)

Jan 18 2021

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:
17092244

Confirmation Number:
8842

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

Phone Number:
+1 7037980675

Proposed Time of Interview:
2-18-2021 11:00 AM ET

Prefered Interview Type:
Telephonic

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

Topic for Discussion:
2019-004Ut | Interview request to discuss rejections. Please contact me at ar.babaei@gmail.com to confirm.

uspto UNITED STATES PATENT AND TRADEMARK OFFICE

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/092,244	Filing Date 11/07/2020	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $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	02/22/2021	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	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) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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".	/NICOLE L NICHOLSON/
*** 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.	:	17/092,244	Filed	:	11/07/2020
Confirmation No.:		8842	Art Unit	:	2465
Docket No.	:	2019-004Ut	Examiner	:	John Pezzlo
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 January 4, 2021 (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 6 of this paper.

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, uplink cancellation configuration parameters comprising:

a cancellation indication radio network temporary identifier (RNTI); and

a sequence of serving cell-specific parameters comprising:

an identifier of a serving cell;

a first parameter indicating a first starting position in a downlink control information (DCI) for the serving cell; and

a second parameter indicating a second starting position in a DCI for a supplementary uplink carrier of the serving cell;

receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications;

determining a first cancellation indication, in the cancellation indications, based on:

the first starting position, in a first number of bit, when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and

the second starting position, in a second number of bit, when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell; ~~and~~

wherein the first number of bit and the second number of bit are based on a payload size of the first DCI; and

cancelling the scheduled uplink transmission based on the first cancellation indication.

2. (Original) The method of claim 1, wherein determining the first cancellation indication is further based on a size of the first cancellation indication.

3. (Currently Amended) The method of claim 1, wherein the receiving the first DCI is via a common search space.~~:~~

~~the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and~~

~~the second position indicates a second starting position, of a cancellation indication, in a second number of bit.~~

4. (Currently Amended) The method of claim ~~3~~1, wherein:

the first number of bit identifies a first bit within a payload ~~is between one and a payload size~~ of the first DCI; and

the second number of bit identifies a second bit within the payload ~~is between one and the payload size~~ of the first DCI.

5. (Original) The method of claim 4, wherein the uplink cancellation configuration parameters further comprise a size parameter indicating the payload size of the first DCI.

6. (Currently Amended) The method of claim 1, wherein the uplink cancellation configuration parameters further comprise a size parameter indicating [[a]]the payload size of the first DCI ~~comprising the cancellation indications~~.

7. (Original) The method of claim 1, wherein the scheduled uplink transmission is via a physical uplink shared channel.

8. (Currently Amended) The method of claim 7, wherein the determining the first cancellation indication is further based on a size of the first cancellation indication.

9. (Currently Amended) The method of claim 7, wherein the receiving the first DCI is via a common search space.~~:~~

~~the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and~~

~~the second position indicates a second starting position, of a cancellation indication, in a second number of bit.~~

10. (Original) The method of claim 1, wherein the scheduled uplink transmission is a sounding reference signal transmission.

11. (Currently Amended) The method of claim 10, wherein the determining the first cancellation indication is further based on a size of the first cancellation indication.

12. (Currently Amended) The method of claim 10, wherein the receiving the first DCI is via a common search space.~~:~~

~~the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and~~

~~the second position indicates a second starting position, of a cancellation indication, in a second number of bit.~~

13. (Original) The method of claim 1, further comprising monitoring a common search space for a DCI associated with the cancellation indication RNTI.

14. (Original) The method of claim 1, further comprising determining cancelled uplink resources based on the first cancellation indication.

15. (Original) The method of claim 14, wherein:

the sequence of serving cell-specific parameters further comprise an offset parameter indicating an offset, in unit of symbol, from an end of a control channel reception where the wireless device detects the first DCI; and

the determining the cancelled uplink resources is further based on the offset.

16. (Original) The method of claim 15, wherein the determining the cancelled uplink resources comprises determining a first symbol associated with the cancelled uplink resources based on the offset.

17. (Original) The method of claim 14, wherein the determining the cancelled uplink resources is further based on a processing time associated with the first DCI.

18. (Currently Amended) The method of claim 14, wherein the receiving the first DCI is via a common search space.~~:~~

~~the first position indicates a first starting position, of a cancellation indication, in a first number of bit; and~~

~~the second position indicates a second starting position, of a cancellation indication, in a second number of bit.~~

19. (Currently Amended) The method of claim 18, wherein:

the first number of bit identifies a first bit within a payload ~~is between one and a payload size~~ of the first DCI; and

the second number of bit identifies a second bit within the payload ~~is between one and the payload size~~ of the first DCI.

20. (Original) The method of claim 19, wherein the uplink cancellation configuration parameters further comprise a size parameter indicating the payload size of the first DCI.

REMARKS

I. Status of Claims

a. Claims 1-20 are pending in this application.

b. Claim 1 is an independent claim.

c. Claims 1, 3-4, 6, 8-9, 11-12, 18-19 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 Pezzlo for the courtesy of a telephonic interview (hereinafter "Interview") with Inventor and Applicant's representative Dr. Alireza Babaei on February 18, 2021. Prior to the Interview, the Applicant provided an Interview Agenda comprising a draft amendment to independent claim 1. Examiner Pezzlo agreed that the outstanding rejection would be overcome by the draft amendment but advised that further search would be required before a decision is made.

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

III. Allowable Claims

Claims 4-6, 15-16 and 19-20 are objected as being dependent upon a rejected claim (Office Action, page 6). The Applicant thanks the Office for the identification of allowable subject matter.

IV. Rejections under 35 U.S.C. § 103

Claims 1-3, 7-14, 17 and 18 are rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Yang et al. (US 2020/0359447 A1) hereinafter Yang in view of Fakoorian et al. (US 2020/0351897 A1) hereinafter Fakoorian. 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, uplink cancellation configuration parameters comprising:
a cancellation indication radio network temporary identifier (RNTI); and
a sequence of serving cell-specific parameters comprising:
an identifier of a serving cell;
a first parameter indicating a first starting position in a downlink control information (DCI) for the serving cell; and
a second parameter indicating a second starting position in a DCI for a supplementary uplink carrier of the serving cell;
receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications;
determining a first cancellation indication, in the cancellation indications, based on:
the first starting position, in a first number of bit, when a scheduled uplink transmission is for a normal uplink carrier of the serving cell; and
the second starting position, in a second number of bit, when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell;
wherein the first number of bit and the second number of bit are based on a payload size of the first DCI; and
cancelling the scheduled uplink transmission based on the first cancellation indication.

The 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 at least to the current amendments to independent claim 1. During the Interview, the Examiner agreed that the outstanding rejection would be overcome by the present amendment.

For at least the above reasons, independent claim 1 is patentable over the cited art. Claims 2-20 are further patentable over the cited art for at least the same reasons as the independent claim 1 from which they depend, and further in view of their own features.

Accordingly, Applicant respectfully requests the rejection of claims 1-3, 7-14, 17 and 18 under 35 U.S.C. § 103 be reconsidered and withdrawn.

V. Claim Objections

Claims 4-6, 15-16 and 19-20 are objected as being dependent upon a rejected claim but are otherwise allowable. The objections are respectfully traversed. Claims 4-6, 15-16 and 19-20 are dependent upon independent claim 1. Claim 1 is patentable for at least the reasons discussed above. Consequently, claims 4-6, 15-16 and 19-20 are patentable for at least the same reasons as independent claim 1 and further in view of their own features. Accordingly, Applicant respectfully requests the claim objections to be reconsidered and withdrawn.

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

Electronic Acknowledgement Receipt	
EFS ID:	41984990
Application Number:	17092244
International Application Number:	
Confirmation Number:	8842
Title of Invention:	Uplink Cancellation Indication Signaling
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
Filer Authorized By:	
Attorney Docket Number:	2019-004Ut
Receipt Date:	22-FEB-2021
Filing Date:	07-NOV-2020
Time Stamp:	15:25:40
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		2019-004Ut_2021-02-22_ResponseToNFOA.pdf	57364 919ded85236355efd380f1c63598794ac2618d44	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	6	8
	Claims	2	5
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	57364	

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

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

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UNITED STATES DEPARTMENT OF COMMERCE
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

148908 7590 02/22/2021

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

EXAMINER
PEZZLO, JOHN

ART UNIT	PAPER NUMBER
2465	

MAIL DATE	DELIVERY MODE
02/22/2021	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.

Applicant-Initiated Interview Summary	**Application No.** 17/092,244	**Applicant(s)** Babaei, Alireza		
	Examiner JOHN PEZZLO	**Art Unit** 2465	**AIA (First Inventor to File) Status** Yes	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
JOHN PEZZLO	Primary Examiner	Telephonic
Dr. Alireza Babaei	Attorney of Record	

Date of Interview: 18 February 2021

Issues Discussed:

35 U.S.C. 103

The applicant's draft amendment overcomes the prior art. After the amendment is officially received the examiner will update the search and call the applicant new prior art is found before issuing an action.

/JOHN PEZZLO/ Primary Examiner, Art Unit 2465	2/18/21

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

Applicant recordation instructions: 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.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	**Art Unit**
	JOHN PEZZLO	2465

✓	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	12/31/2020	03/02/2021							
	1	✓	=							
	2	✓	=							
	3	✓	=							
	4	O	=							
	5	O	=							
	6	O	=							
	7	✓	=							
	8	✓	=							
	9	✓	=							
	10	✓	=							
	11	✓	=							
	12	✓	=							
	13	✓	=							
	14	✓	=							
	15	O	=							
	16	O	=							
	17	✓	=							
	18	✓	=							
	19	O	=							
	20	O	=							

PE2E SEARCH - Search History (Prior Art)

There are no Prior Art searches to show.

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	1	H04W72/1268,76/36.cpc. AND L7	US-PGPUB; USPAT	OR	ON	ON	2021/03/02 09:31 AM
N2	0	370/252,329,386,430.ccls . AND L7	US-PGPUB; USPAT	OR	ON	ON	2021/03/02 09:31 AM

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 03/11/2021

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

EXAMINER
PEZZLO, JOHN

ART UNIT	PAPER NUMBER
2465	

DATE MAILED: 03/11/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

TITLE OF INVENTION: Uplink Cancellation Indication Signaling

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	06/11/2021

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 03/11/2021

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.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

TITLE OF INVENTION: Uplink Cancellation Indication Signaling

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	06/11/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
PEZZLO, JOHN	2465	370-329000

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

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

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

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

1 _____
2 _____
3 _____

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

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

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

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

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

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

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

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

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

148908 7590 03/11/2021

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

EXAMINER	
PEZZLO, JOHN	
ART UNIT	PAPER NUMBER
2465	

DATE MAILED: 03/11/2021

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. 17/092,244	Applicant(s) Babaei, Alireza	
	Examiner JOHN PEZZLO	Art Unit 2465	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 claims filed 2/22/21.
   ☐ 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 _____.

/JOHN PEZZLO/
Primary Examiner, Art Unit 2465

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.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance: Applicants have claimed uniquely distinct features in the application, which are not found in the prior art, either singularly or in combination. The independent claim identifies the following uniquely distinct features:

1. Regarding claim 1 – A method comprising: receiving, by a wireless device, uplink cancellation configuration parameters comprising: a cancellation indication radio network temporary identifier (RNTI), and a sequence of serving cell-specific parameters comprising: an identifier of a serving cell, a first parameter indicating a first starting position in a downlink control information (DCI) for the serving cell, and a second parameter indicating a second starting position in a DCI for a supplementary uplink carrier of the serving cell, receiving a first DCI, associated with the cancellation indication RNTI, comprising cancellation indications, determining a first cancellation indication, in the cancellation indications, based on: the first starting position, in a first number of bit, when a scheduled uplink transmission is for a normal uplink carrier of the serving cell, and the second starting position, in a second number of

bit, when the scheduled uplink transmission is for the supplementary uplink carrier of the serving cell, and wherein the first number of bit and the second number of bit are based on a payload size of the first DCI, and cancelling the scheduled uplink transmission based on the first cancellation indication.

The closest prior art, either singularly or in combination, fail to anticipate or render the above limitations obvious.

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

Allowable Subject Matter

Claims 1-20 are allowable over the prior art of record.

Conclusion

Claims 1-20 being allowable, **Prosecution On The Merits Is Closed** in this application.

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

1. Islam et al. (US 2020/0389876 A1) discloses uplink cancelation indication.

2. Hosseini et al. (US 2020/0367278 A1) discloses communication preemption applicability techniques.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Pezzlo whose telephone number is (571) 272-3090. The examiner can normally be reached on Monday to Friday from 8:30 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha Harold-Banks, can be reached on (571) 272-7905. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2600.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C.

or faxed to:

(571) 273-8300

For informal or draft communications, please label "PROPOSED" or "DRAFT"

Hand delivered responses should be brought to:

Jefferson Building

2A15

500 Dulany Street

Alexandria, VA, 22313.

John Pezzlo

2 March 2021

/John Pezzlo/

Primary Examiner, Art Unit 2465

Notice of References Cited	Application/Control No. 17/092,244	Applicant(s)/Patent Under Reexamination Babaei, Alireza	
	Examiner JOHN PEZZLO	Art Unit 2465	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-20200389876-A1	12-2020	Islam; Toufiqul	H04L5/0048	1/1
*	B	US-20200367278-A1	11-2020	Hosseini; Seyedkianoush	H04L5/0048	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Bibliographic Data

Application No: 17/092,244

Foreign Priority claimed: ○ Yes ◉ No

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

Verified and Acknowledged: /JOHN PEZZLO/ (Examiner's Signature) ____ (Initials)

Title: Uplink Cancellation Indication Signaling

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/07/2020	370	2465	2019-004Ut
RULE			

APPLICANTS

INVENTORS

Alireza Babaei, Fairfax, VA, UNITED STATES

CONTINUING DATA

This application has PRO of 62932487 11/07/2019

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

11/17/2020

** SMALL ENTITY **

STATE OR COUNTRY

UNITED STATES

ADDRESS

ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032
UNITED STATES

FILING FEE RECEIVED

$3,000

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	**Art Unit**
	JOHN PEZZLO	2465

CPC						
Symbol					**Type**	**Version**
H04W	/	76	/	36	F	2018-02-01
H04W	/	72	/	042	I	2013-01-01
H04W	/	72	/	0453	I	2013-01-01
H04W	/	76	/	11	I	2018-02-01
H04W	/	24	/	08	I	2013-01-01
H04W	/	72	/	1268	I	2013-01-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/JOHN PEZZLO/ Primary Examiner, Art Unit 2465	02 March 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	18

U.S. Patent and Trademark Office — Part of Paper No.: 20210302

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	**Art Unit**
	JOHN PEZZLO	2465

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04L	/	12	/	28	

NON-CLAIMED					
H04J	/	1	/	16	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
370	252

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					
370	329	386		430		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/JOHN PEZZLO/ Primary Examiner, Art Unit 2465	02 March 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	18

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	**Art Unit**
	JOHN PEZZLO	2465

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

CLAIMS

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/JOHN PEZZLO/ Primary Examiner, Art Unit 2465	02 March 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	18

U.S. Patent and Trademark Office — Part of Paper No.: 20210302

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	Art Unit
	JOHN PEZZLO	2465

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04W 72/1268, 76/36	12/31/2020	JP
H04W 72/1268, 76/36	03/02/2021	JP

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

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
370	252, 329, 386, 430	12/31/2020	JP
370	252, 329, 386, 430	03/02/2021	

* 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**
Search Plan - uplink cancellation indication, DCI and RNTI, SUL and NUL.	12/31/2020	JP
CAT tool	12/31/2020	JP
IDS filed 11/15/20	12/31/2020	JP
PE2E	12/31/2020	JP
Search Plan - uplink cancellation indication, DCI and RNTI, payload, and starting position.	03/02/2021	JP
CAT tool	03/02/2021	JP
PE2E search	03/02/2021	JP

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/092,244	Babaei, Alireza
	Examiner	Art Unit
	JOHN PEZZLO	2465

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
H04W	72/1268, 76/36	03/02/2021	JP
370	252, 329, 386, 430	03/02/2021	JP

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L7	6	(uplink near5 cancellation near5 (configuration OR paramenter)) AND rnti AND (serv$3 near5 cell) AND dci	US-PGPUB; USPAT	OR	ON	ON	2021/03/02 08:20 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Electronic Acknowledgement Receipt	
EFS ID:	42224541
Application Number:	17092244
International Application Number:	
Confirmation Number:	8842
Title of Invention:	Uplink Cancellation Indication Signaling
First Named Inventor/Applicant Name:	Alireza Babaei
Customer Number:	148908
Filer:	Alireza Babaei
Filer Authorized By:	
Attorney Docket Number:	2019-004Ut
Receipt Date:	19-MAR-2021
Filing Date:	07-NOV-2020
Time Stamp:	09:20:44
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	E20213I023043848
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)	2019-004Ut_IssueFee.pdf	107149 616f5e20d065aecaa2f99bae6c610dfb9629e55d	no	1
Warnings:					
Information:					
2	Post Allowance Communication - Incoming	2019-004Ut_2021-03-19_Comments.pdf	16776 7519dfb32fafbfa46c77a208e977fe8c7864cf6b	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	29914 c1e02f2c73f31442381b87e75269243f4ed86ab8	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	153839		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Patent Application Fee Transmittal

Application Number:	17092244
Filing Date:	07-Nov-2020
Title of Invention:	Uplink Cancellation Indication Signaling
First Named Inventor/Applicant Name:	Alireza Babaei
Filer:	Alireza Babaei
Attorney Docket Number:	2019-004Ut

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**

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 03/11/2021

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.
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut	8842

TITLE OF INVENTION: Uplink Cancellation Indication Signaling

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	06/11/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
PEZZLO, JOHN	2465	370-329000

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

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

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

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

1 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 2021-03-19

Typed or printed name Alireza Babaei Registration No. 75,833

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. :	17/092,244	Filed :	11/07/2020
Confirmation No.:	8842	Art Unit :	2465
Docket No. :	2019-004Ut	Examiner :	John Pezzlo
First Inventor :	Alireza Babaei	Customer No. :	148908

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

Comments on Statement of Reasons for Allowance

Sir:

Applicant gratefully acknowledges and accepts the Notice of Allowance dated 03/11/2021 with respect to the present application. In brief response to the Statement of Reasons for Allowance, Applicant respectfully submits that the specific reasons cited in the Statement do not apply to the full claim language for all claims and are not necessarily the only reasons for distinguishing the claims from the various references, as there are many other features in the independent and dependent claims. It is believed that each of the allowed claims are patentable in their own right and/or for other reasons raised during the prosecution and/or explained in the specification of this application. Further, Applicant believes that the claimed subject matter represents but one possible set of allowable claims from the disclosed subject matter and that additional scope and depth is both contemplated and obtainable. Applicant looks forward to continuing work with the Examiner to seek additional claims from the disclosed subject matter.

Should there be any matters which need to be resolved in the present application, the Examiner is respectfully requested to contact Alireza Babaei, Registration Number 75,833.

Respectfully Submitted,

/Alireza Babaei/

Alireza Babaei

Registration No. 75,833

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/092,244	04/20/2021	10986695	2019-004Ut	8842

148908 7590 03/31/2021

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.

IR103 (Rev. 10/09)

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/092,244	11/07/2020	Alireza Babaei	2019-004Ut

CONFIRMATION NO. 8842

148908
ALIREZA BABAEI
4525 Gilbertson Road
Fairfax, VA 22032

PUBLICATION NOTICE

OC000000125571516

Title: Uplink Cancellation Indication Signaling

Publication No.US-2021-0144799-A1
Publication Date:05/13/2021

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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