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(54) **RESOURCE SKIPPING FOR MULTIPLE GRANTS**

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H04W 72/14 (2009.01)
H04L 5/00 (2006.01)
H04W 72/21 (2023.01)
H04W 72/23 (2023.01)

(52) **U.S. Cl.**
CPC *H04W 72/23* (2023.01); *H04L 5/0012* (2013.01); *H04W 72/21* (2023.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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(Continued)

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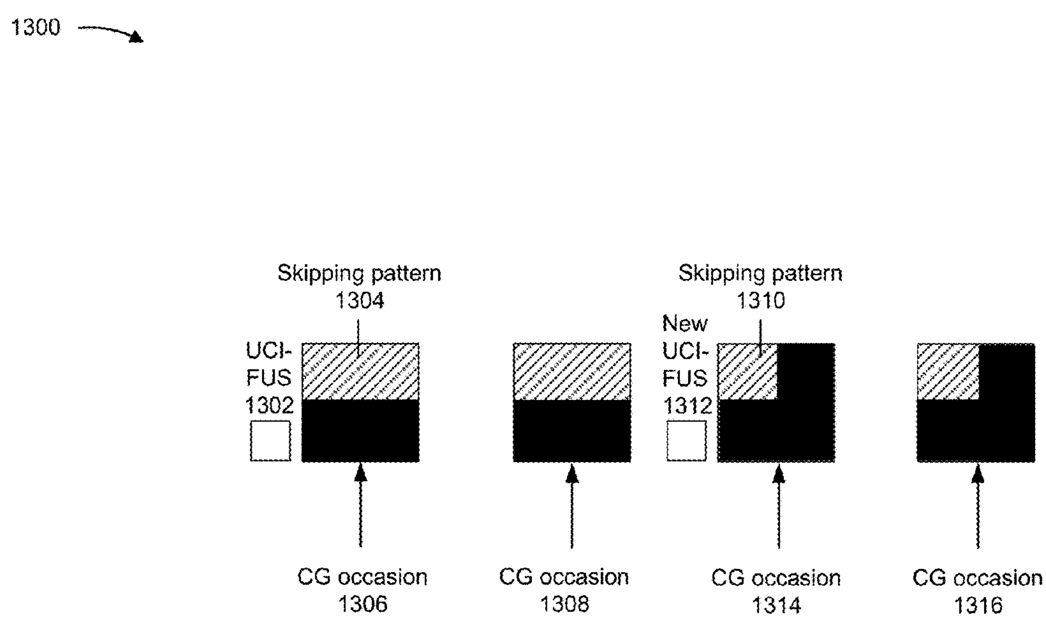
(57) **ABSTRACT**

Various aspects of the present disclosure generally relate to wireless communication. In some aspects, a user equipment (UE) may select first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel. The UE may transmit uplink control information (UCI) that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions. The UE may transmit the communications in the multiple grant occasions using the second resources and not the first resources. Numerous other aspects are described.

30 Claims, 19 Drawing Sheets



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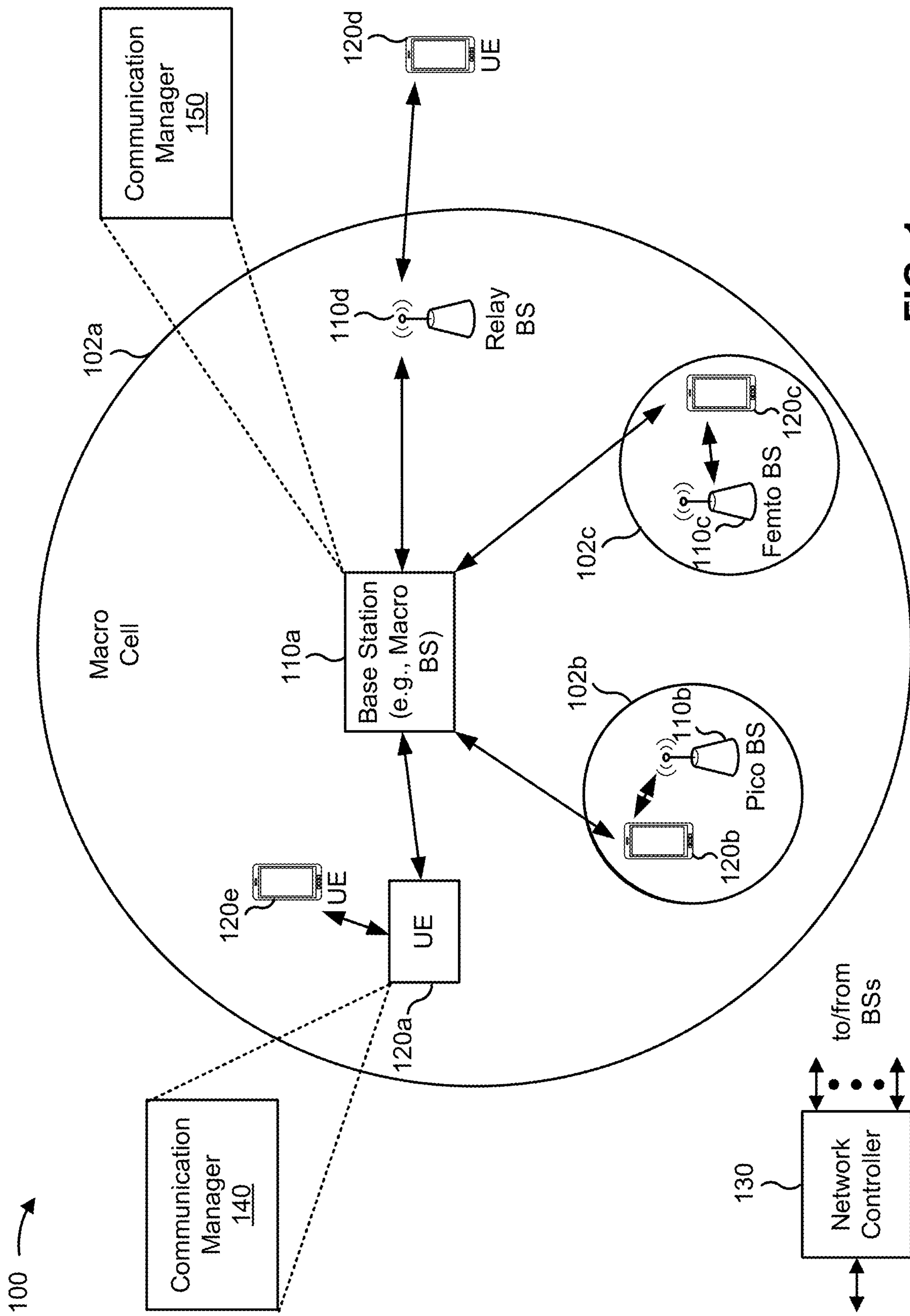
100
Communication Manager 150
Communication Manager 140
102a
Macro Cell
110a
Base Station (e.g., Macro BS)
110d
Relay BS
120d
UE
102c
110c
Femto BS
120c
102b
110b
Pico BS
120b
120e
UE
UE
120a
130
Network Controller
to/from BSs

FIG. 1

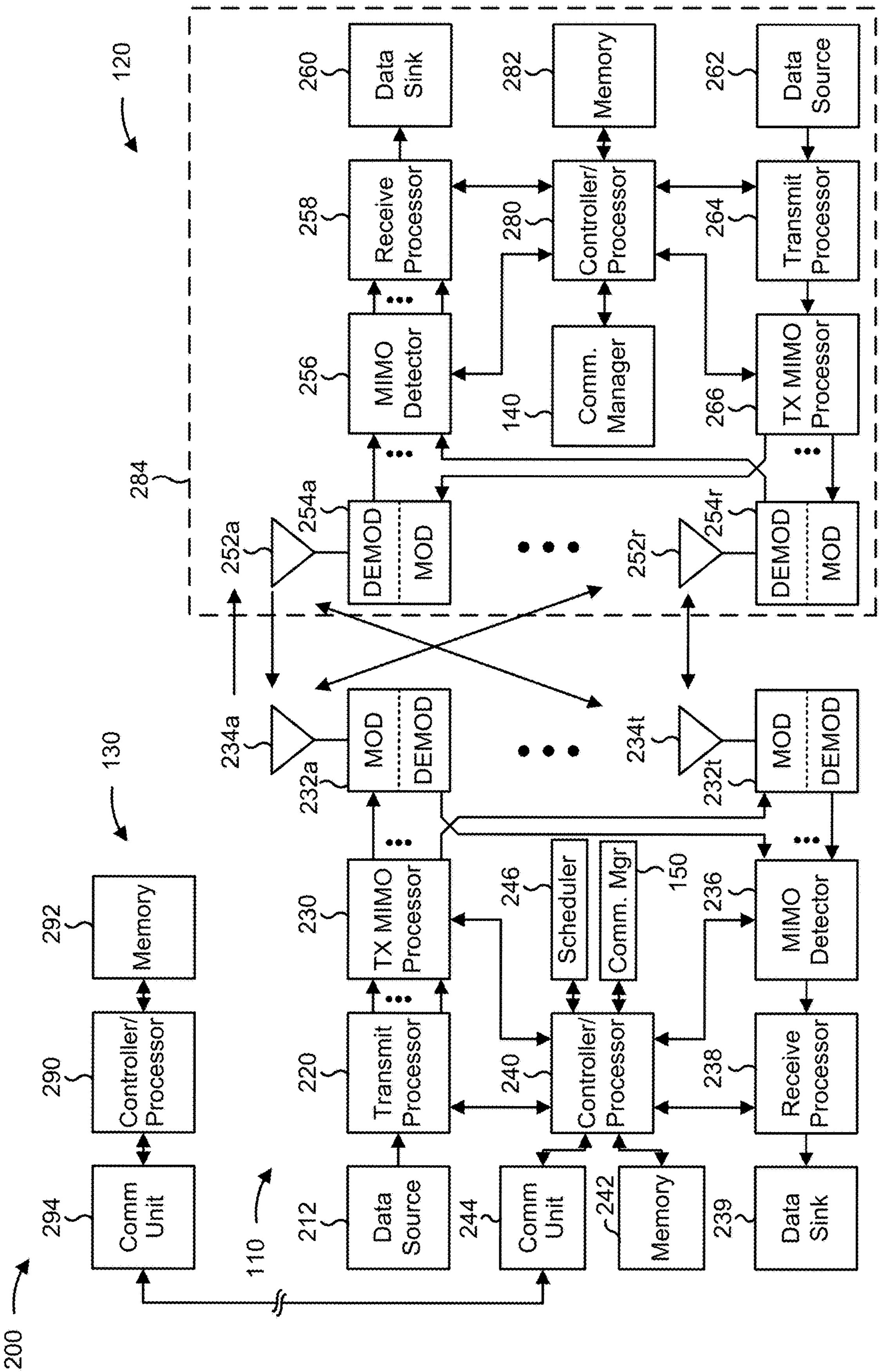
200
110
120
130
284
Data Sink
Memory
Data Source
Receive Processor
Controller/ Processor
Transmit Processor
MIMO Detector
Comm. Manager
TX MIMO Processor
DEMOD
MOD
Scheduler
Comm. Mgr
Comm Unit
Data Sink
260
282
262
258
280
264
256
140
266
254a
254r
252a
252r
234a
234t
232a
232t
230
246
150
236
220
240
238
212
244
242
239
290
292
294

FIG. 2

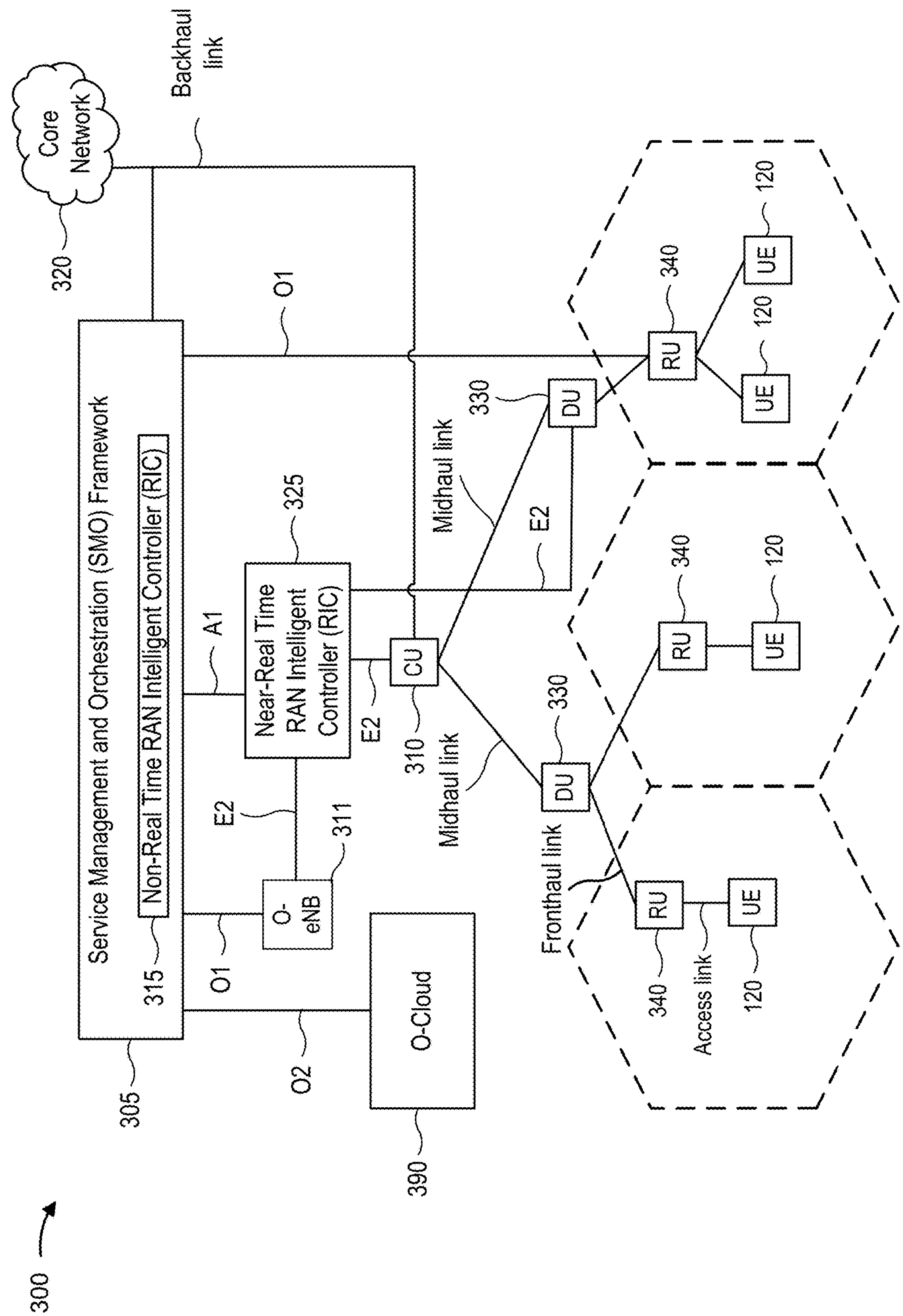
300
Core Network
320
Backhaul link
Service Management and Orchestration (SMO) Framework
Non-Real Time RAN Intelligent Controller (RIC)
315
305
O1
O1
O2
A1
E2
E2
E2
E2
Near-Real Time RAN Intelligent Controller (RIC)
325
O-eNB
311
O-Cloud
390
CU
310
Midhaul link
Midhaul link
DU
330
DU
330
Fronthaul link
RU
340
RU
340
RU
340
UE
120
UE
120
UE
120
UE
120
Access link

FIG. 3

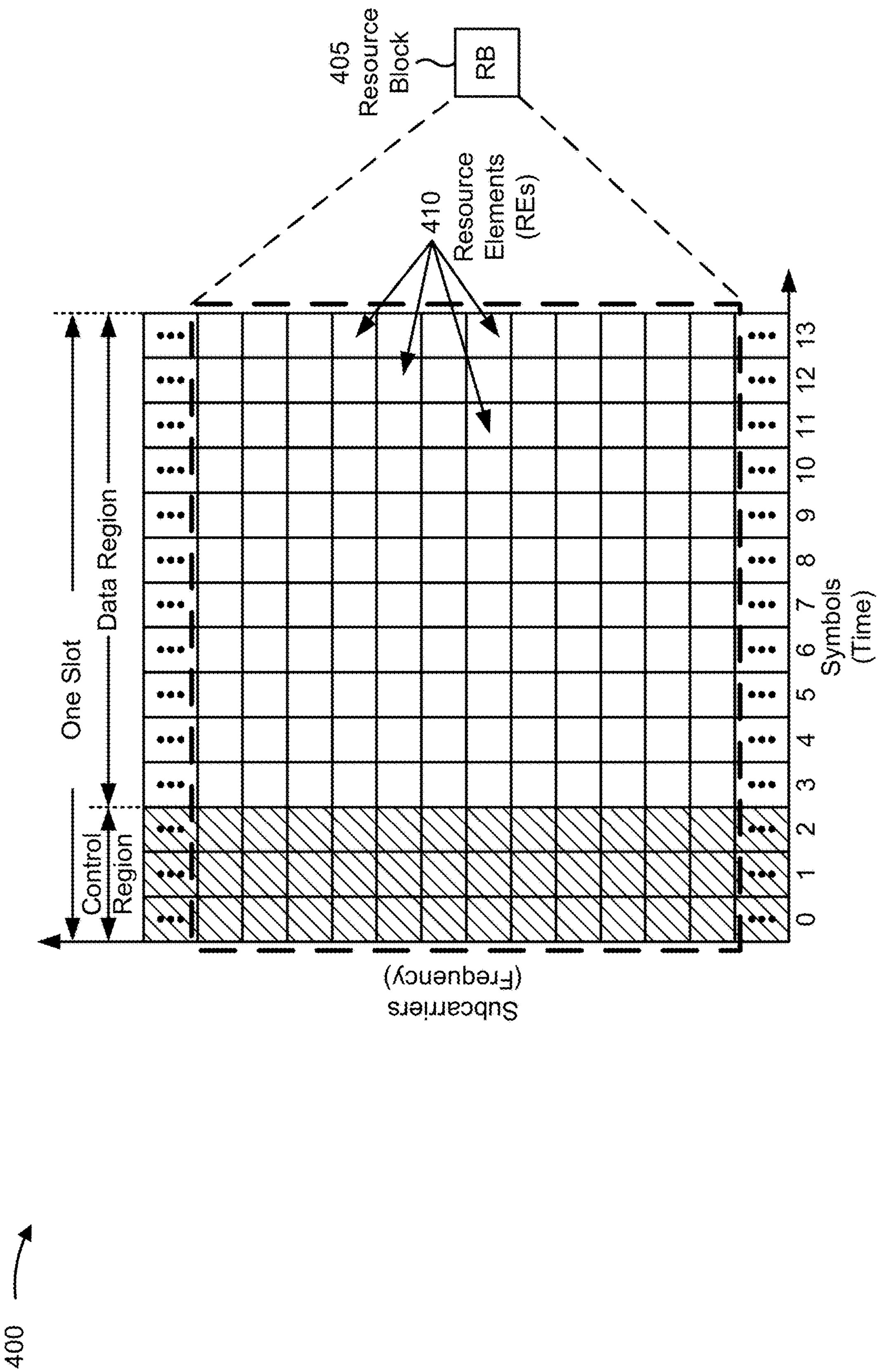
400
405 Resource Block
RB
410 Resource Elements (REs)
One Slot
Control Region
Data Region
Subcarriers (Frequency)
Symbols (Time)
0 1 2 3 4 5 6 7 8 9 10 11 12 13

FIG. 4

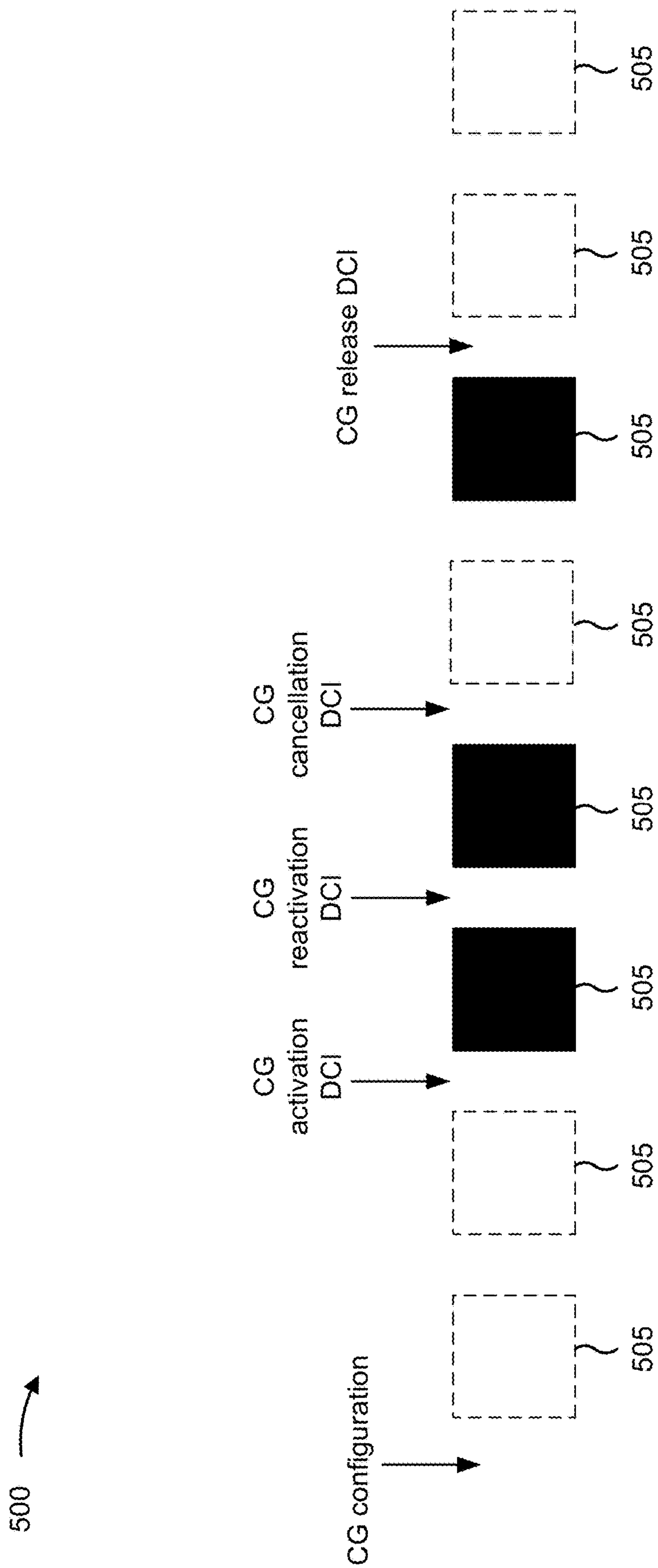
500
CG configuration
CG activation DCI
CG reactivation DCI
CG cancellation DCI
CG release DCI
505

FIG. 5

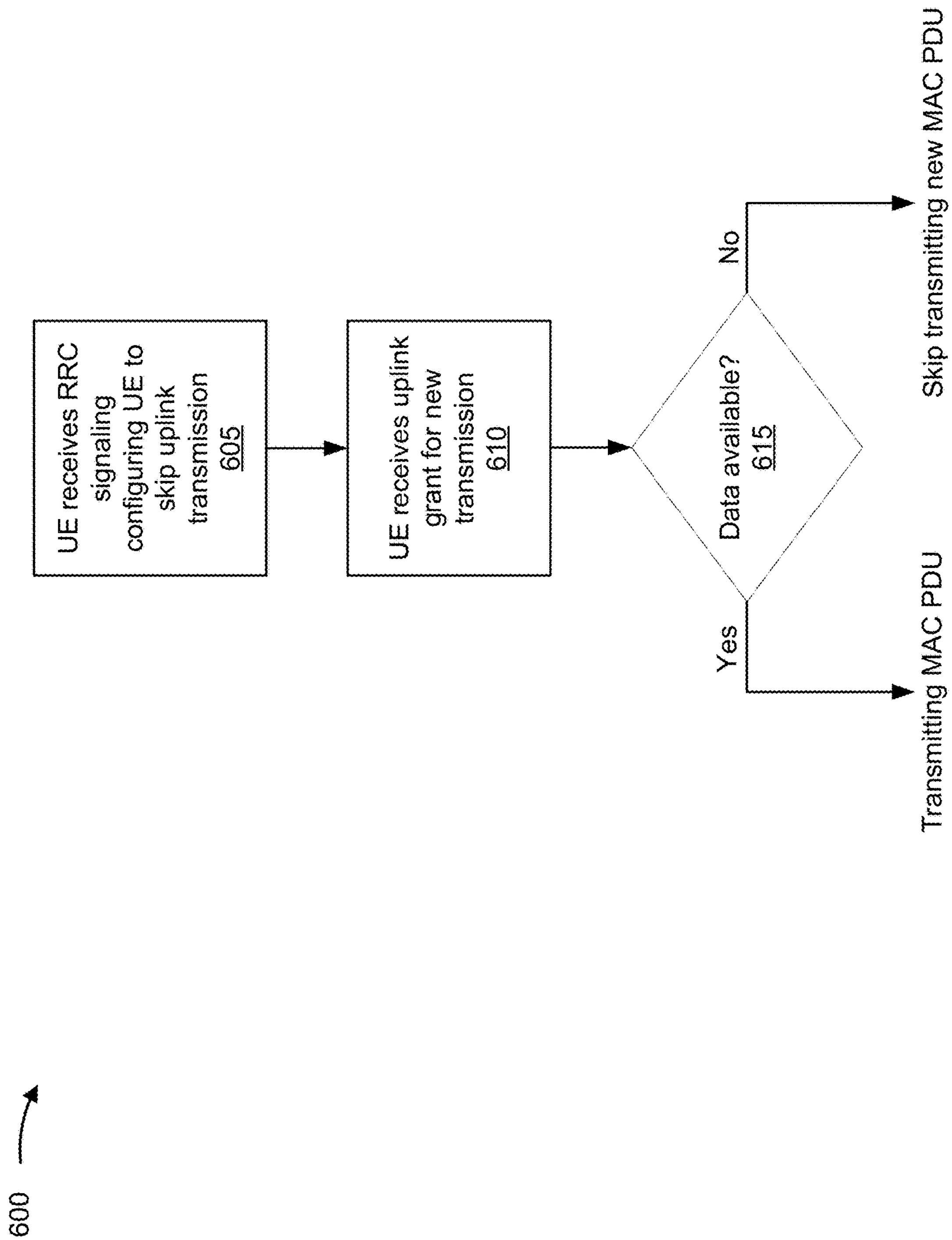
UE receives RRC signaling configuring UE to skip uplink transmission
605
UE receives uplink grant for new transmission
610
Data available?
615
Yes
No
Transmitting MAC PDU
Skip transmitting new MAC PDU
600

FIG. 6

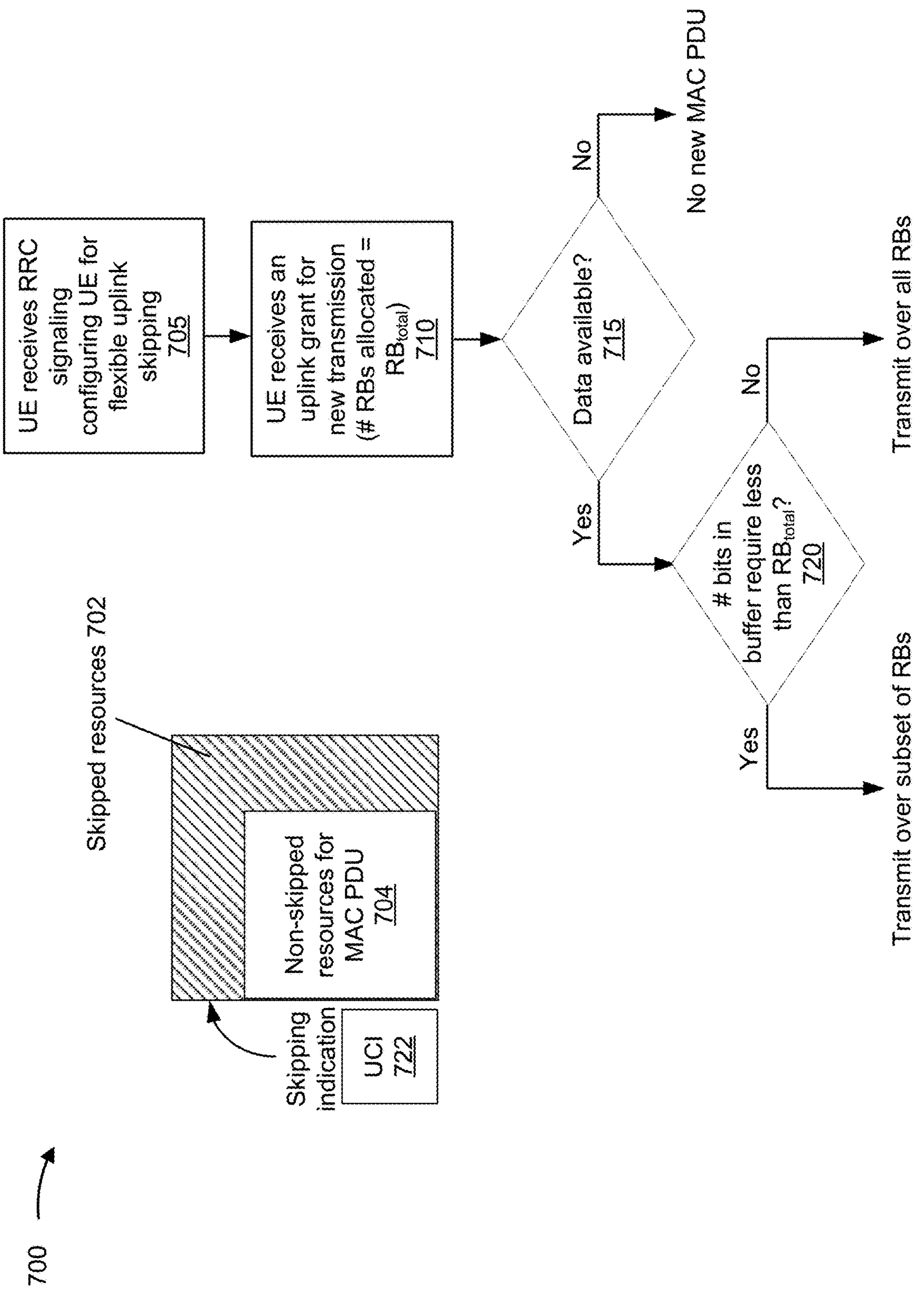
700
UE receives RRC signaling configuring UE for flexible uplink skipping 705
UE receives an uplink grant for new transmission (# RBs allocated = RB_{total}) 710
Data available? 715
No
No new MAC PDU
Yes
bits in buffer require less than RB_{total}? 720
Yes
Transmit over subset of RBs
No
Transmit over all RBs
Skipped resources 702
Non-skipped resources for MAC PDU 704
Skipping indication
UCI 722

FIG. 7

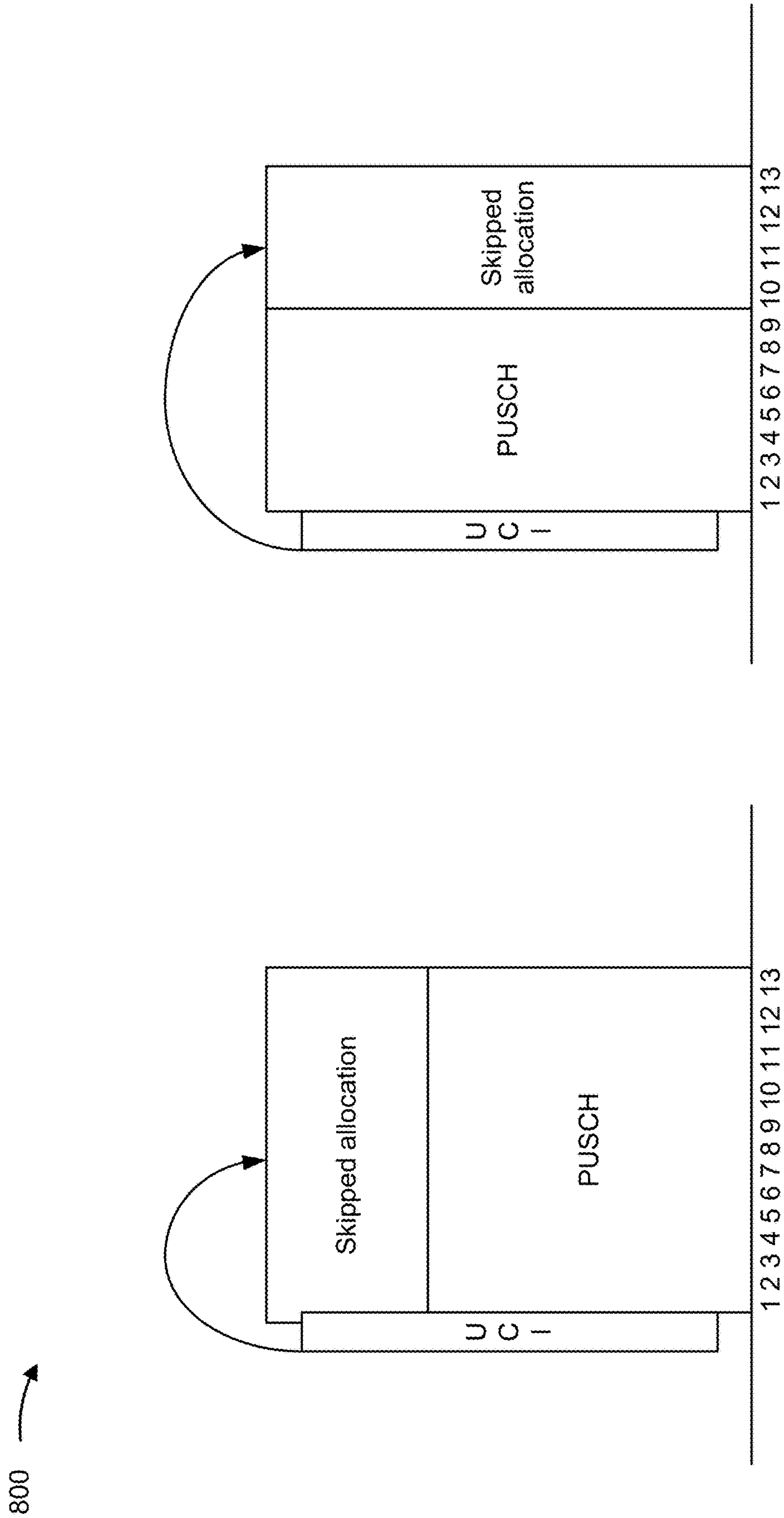
800
Skipped allocation
PUSCH
UCI
1 2 3 4 5 6 7 8 9 10 11 12 13
Skipped allocation
PUSCH
UCI
1 2 3 4 5 6 7 8 9 10 11 12 13

FIG. 8

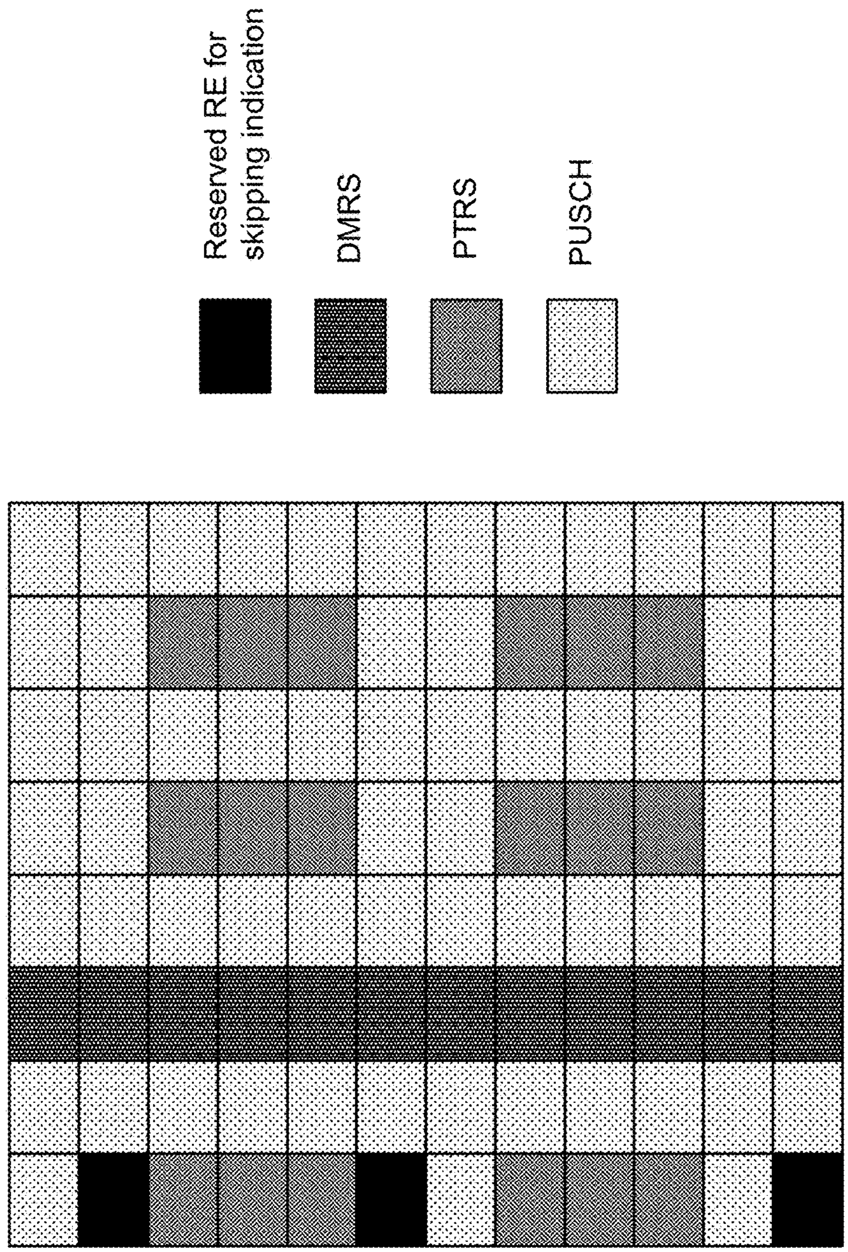

FIG. 9

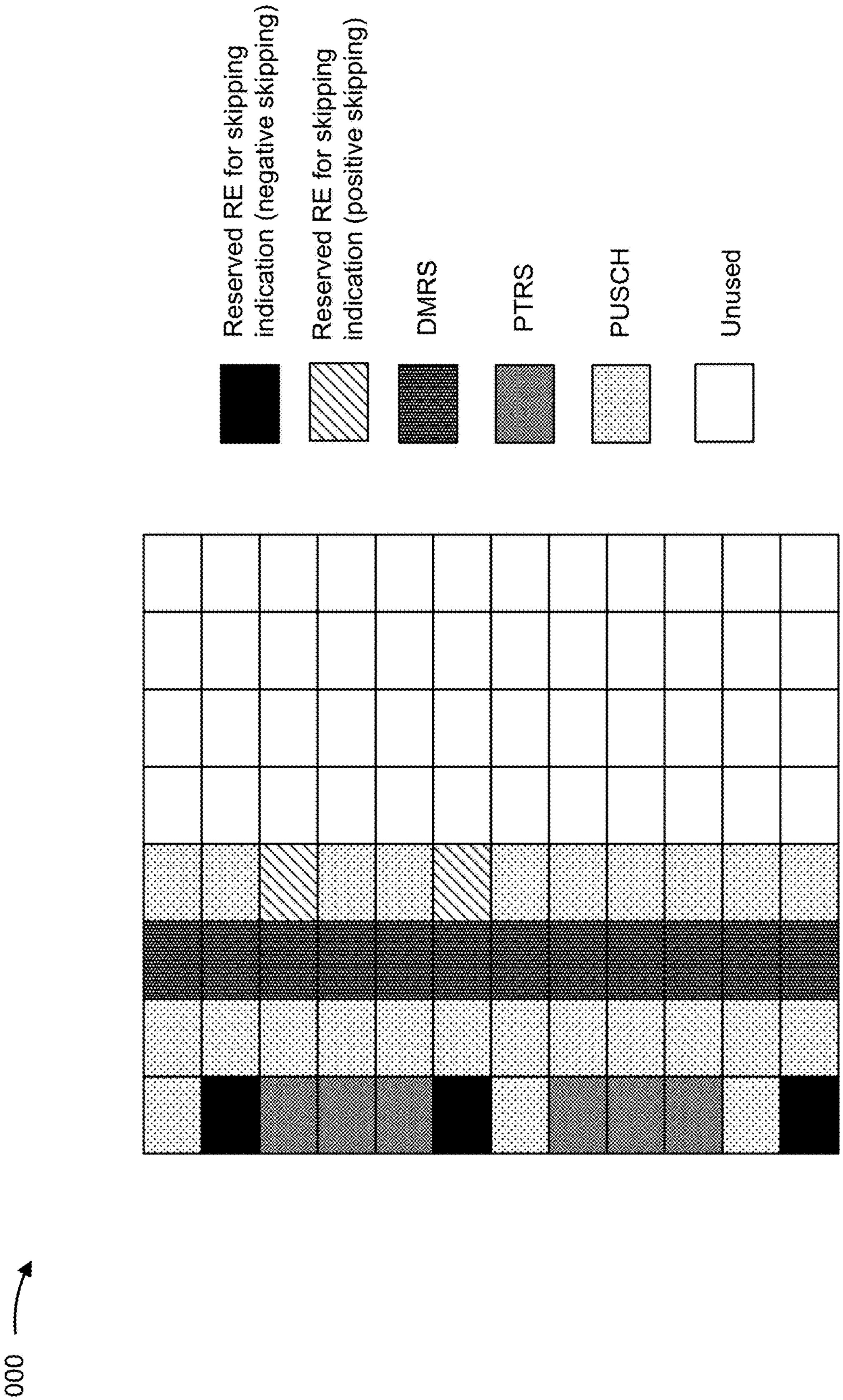
Reserved RE for skipping indication (negative skipping)
Reserved RE for skipping indication (positive skipping)
DMRS
PTRS
PUSCH
Unused
1000

FIG. 10

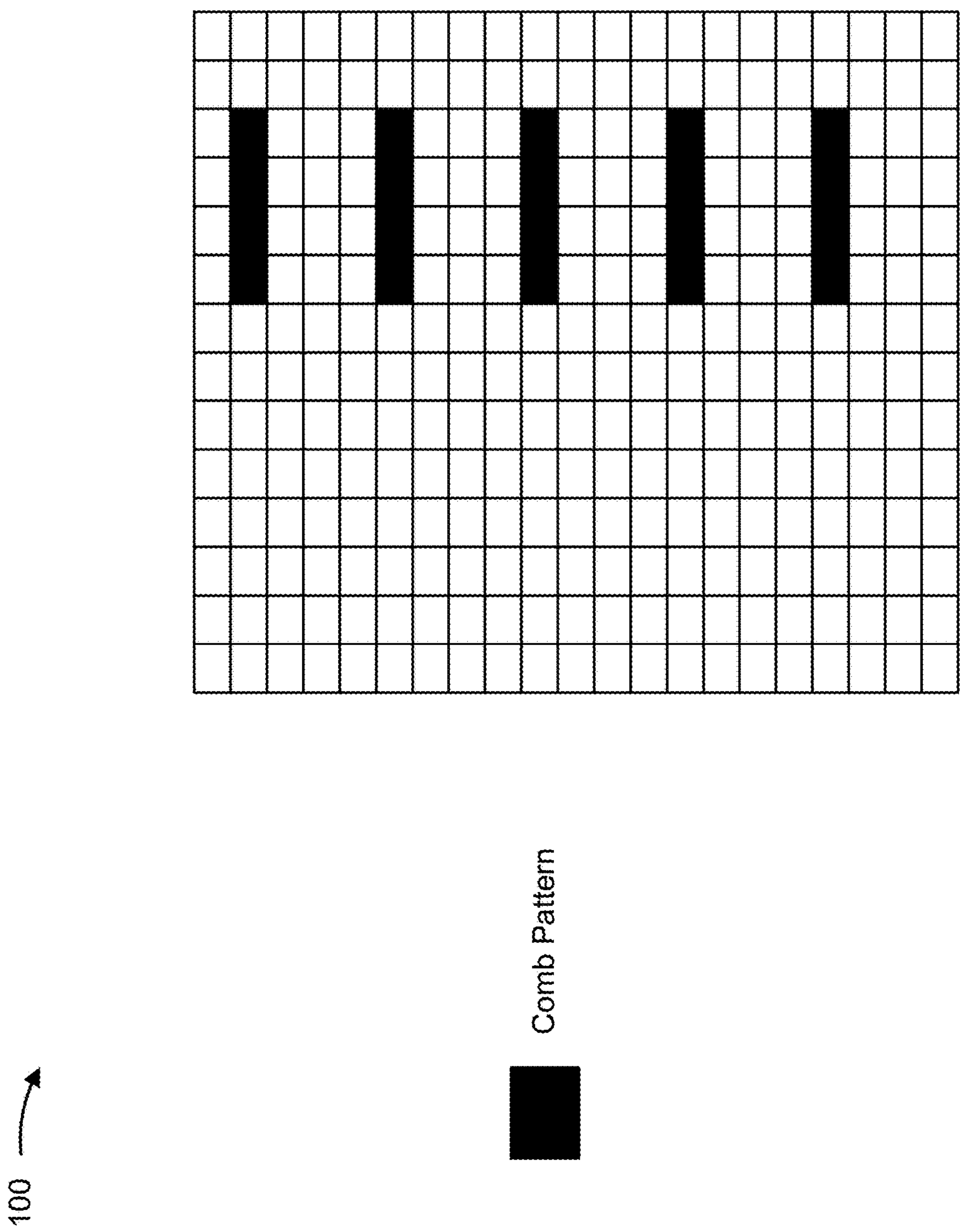

FIG. 11

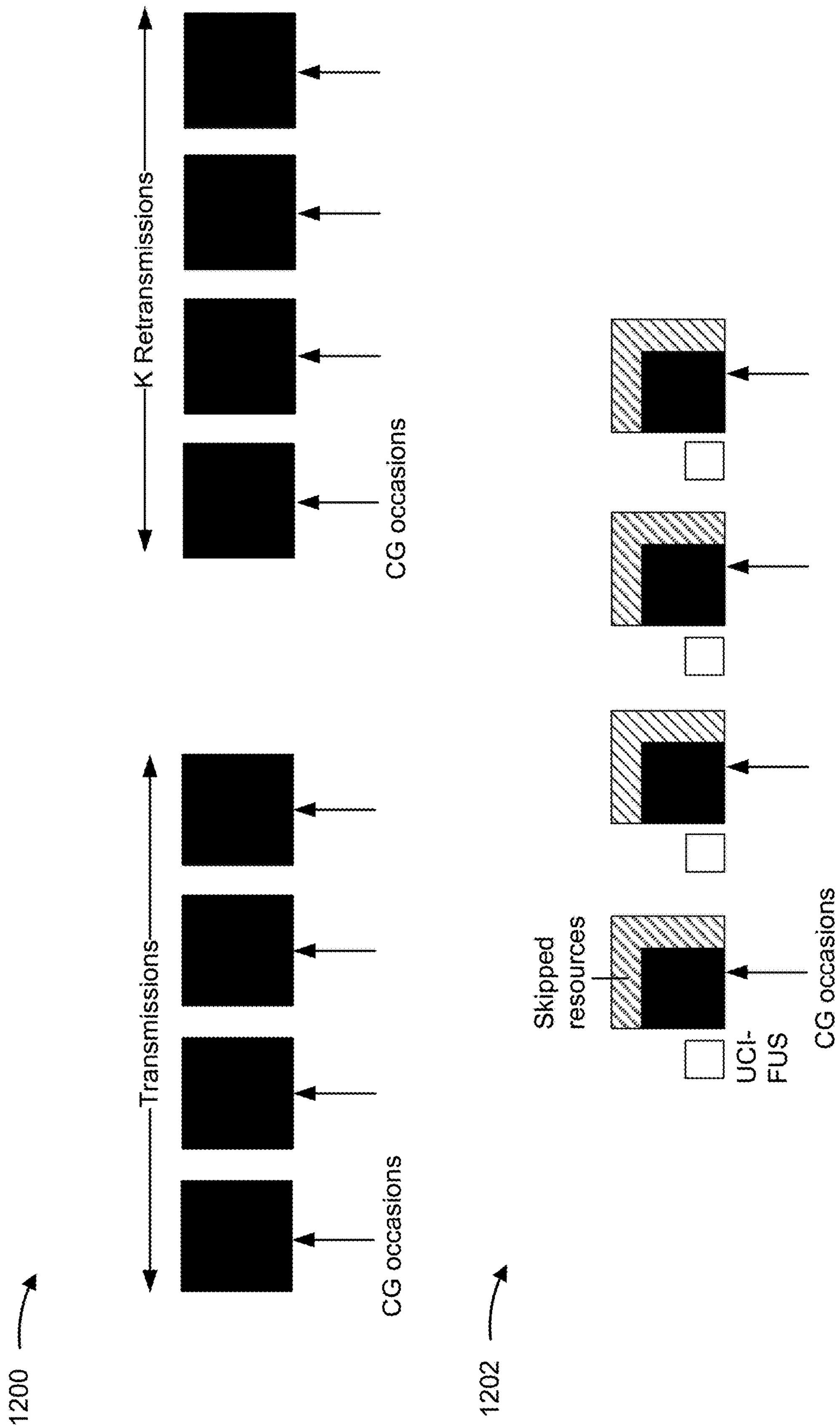
1200
Transmissions
CG occasions
K Retransmissions
CG occasions
1202
Skipped resources
UCI-FUS
CG occasions

FIG. 12

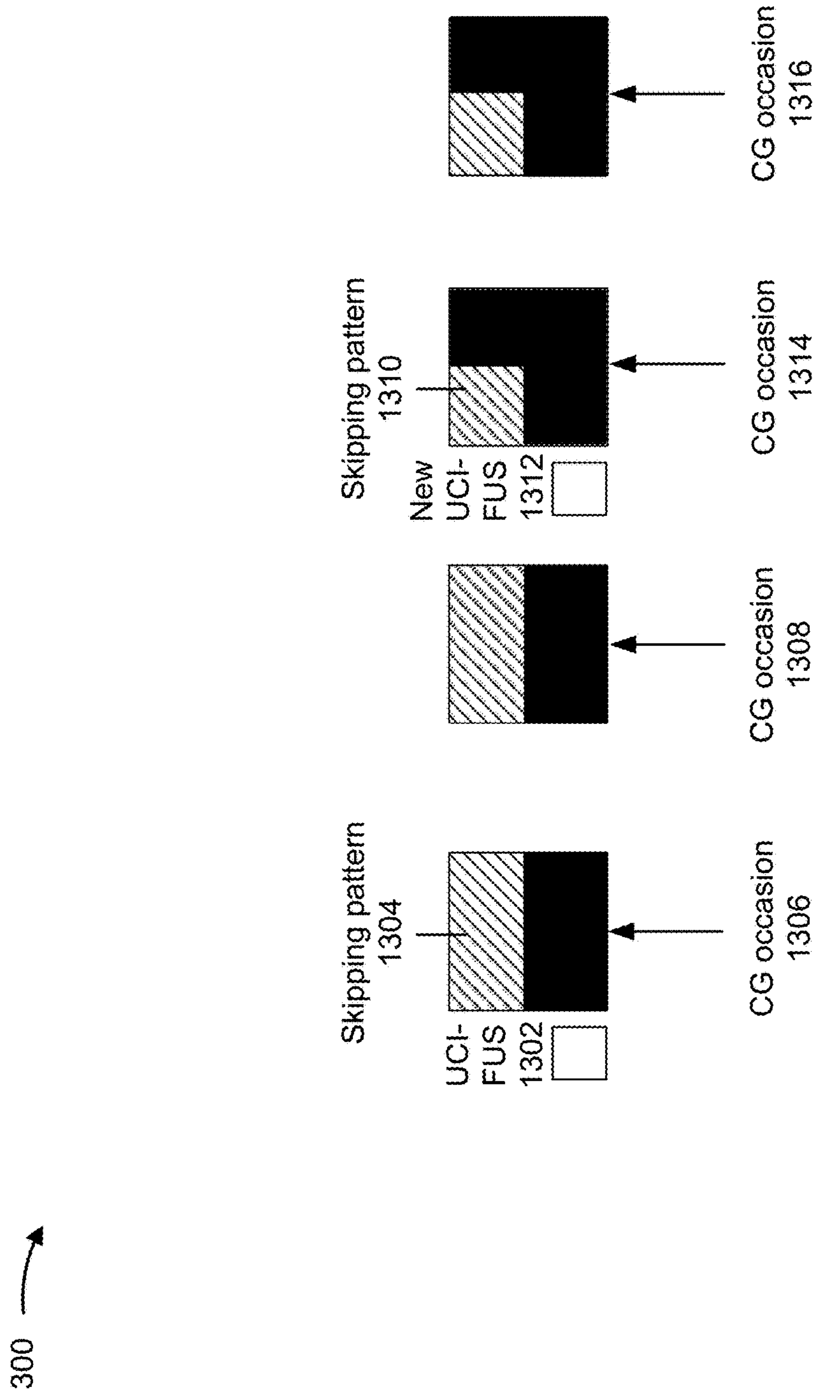
1300
UCI-FUS 1302
Skipping pattern 1304
CG occasion 1306
CG occasion 1308
New UCI-FUS 1312
Skipping pattern 1310
CG occasion 1314
CG occasion 1316

FIG. 13

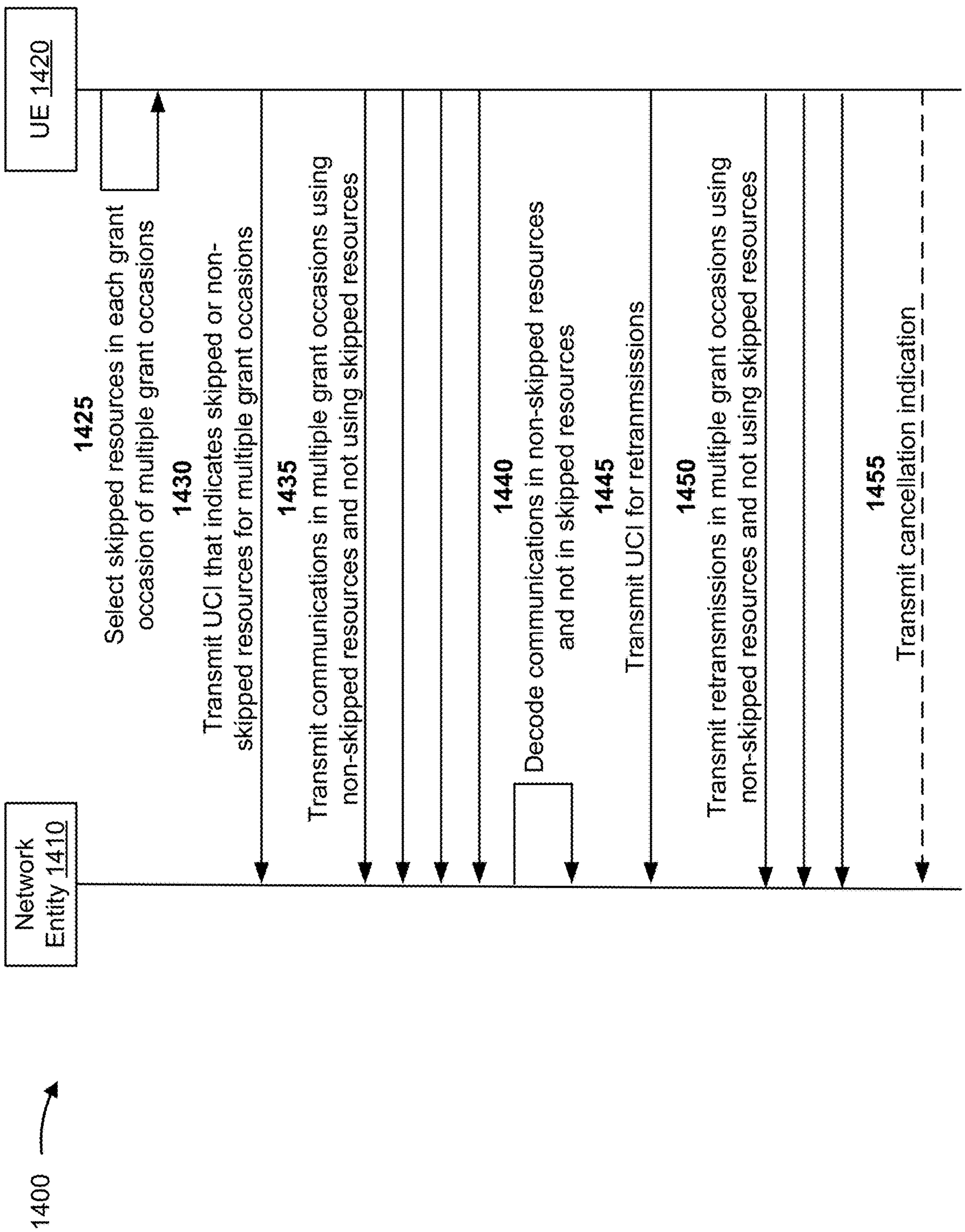
1400
UE 1420
Network Entity 1410
1425
Select skipped resources in each grant occasion of multiple grant occasions
1430
Transmit UCI that indicates skipped or non-skipped resources for multiple grant occasions
1435
Transmit communications in multiple grant occasions using non-skipped resources and not using skipped resources
1440
Decode communications in non-skipped resources and not in skipped resources
1445
Transmit UCI for retranmsissions
1450
Transmit retransmissions in multiple grant occasions using non-skipped resources and not using skipped resources
1455
Transmit cancellation indication

FIG. 14

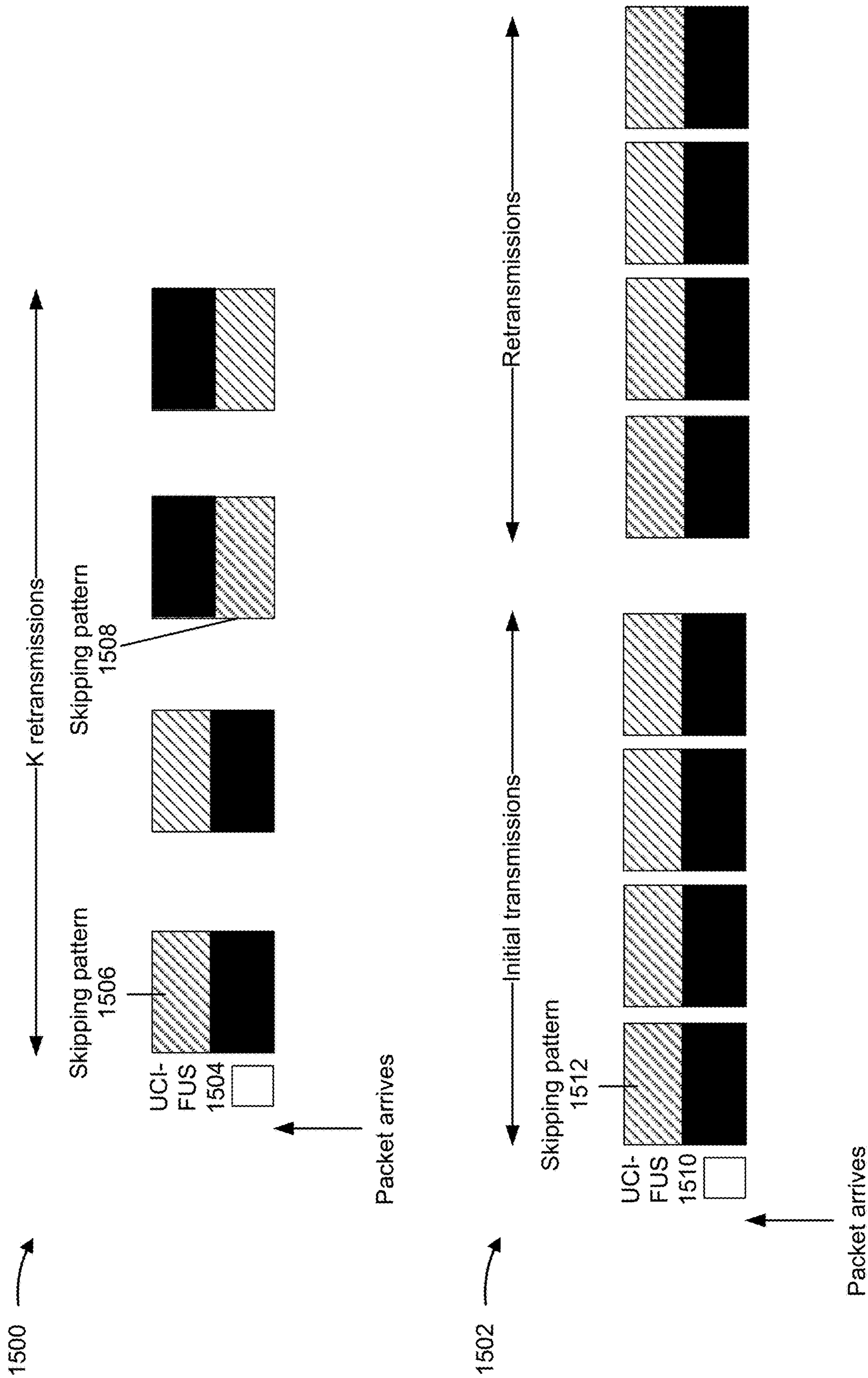
1500
Packet arrives
UCI-FUS 1504
Skipping pattern 1506
K retransmissions
Skipping pattern 1508
1502
Packet arrives
UCI-FUS 1510
Skipping pattern 1512
Initial transmissions
Retransmissions

FIG. 15

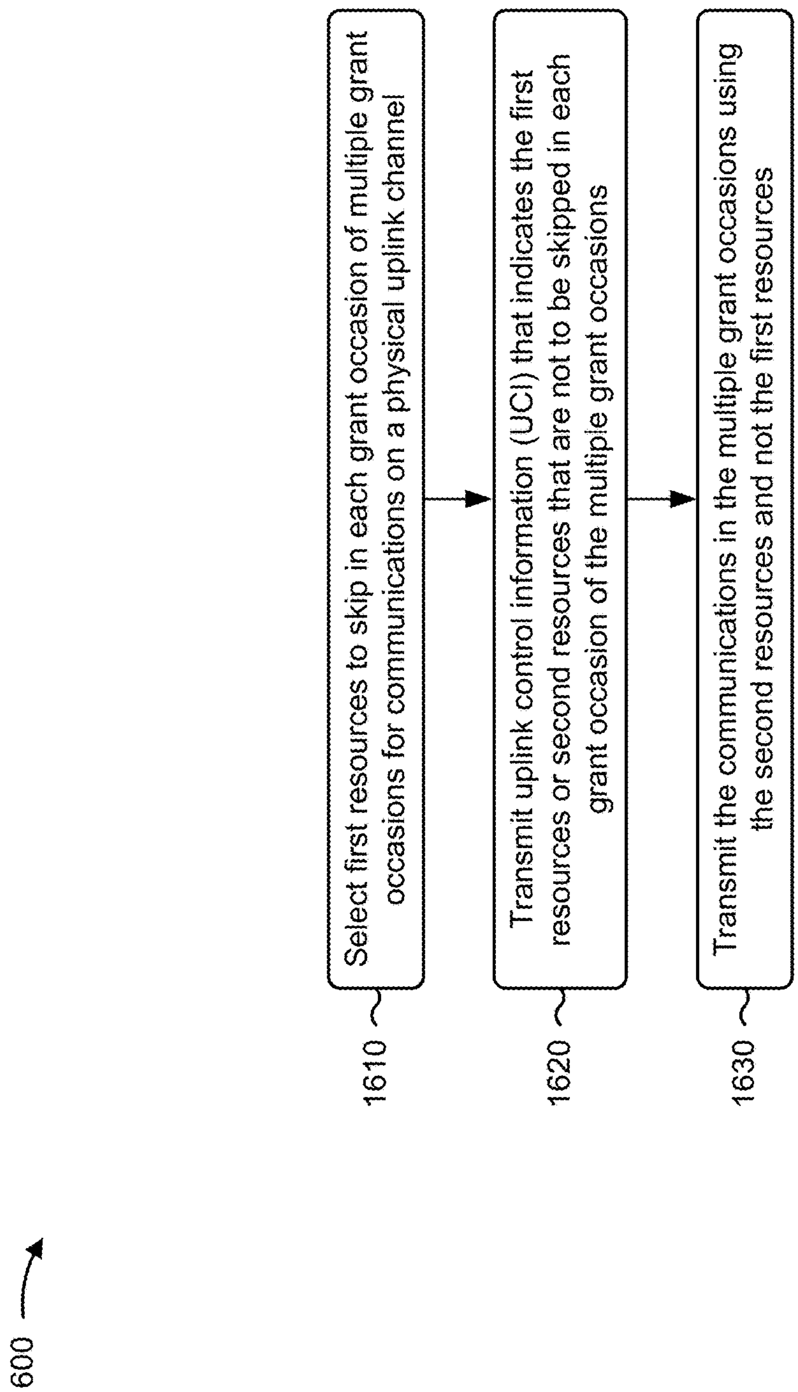
1600
1610
Select first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel
1620
Transmit uplink control information (UCI) that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions
1630
Transmit the communications in the multiple grant occasions using the second resources and not the first resources

FIG. 16

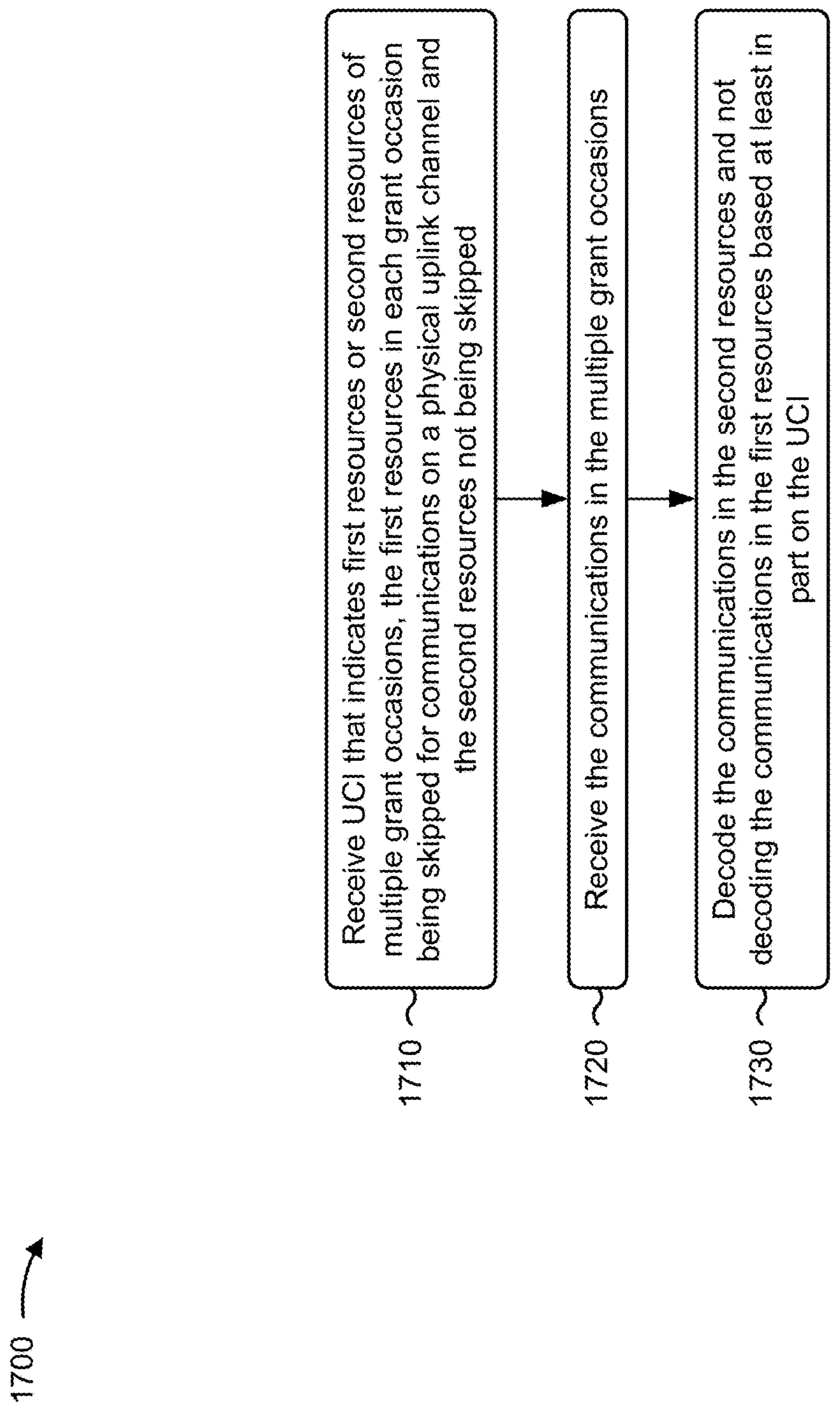
1700
1710
Receive UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being skipped for communications on a physical uplink channel and the second resources not being skipped
1720
Receive the communications in the multiple grant occasions
1730
Decode the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI

FIG. 17

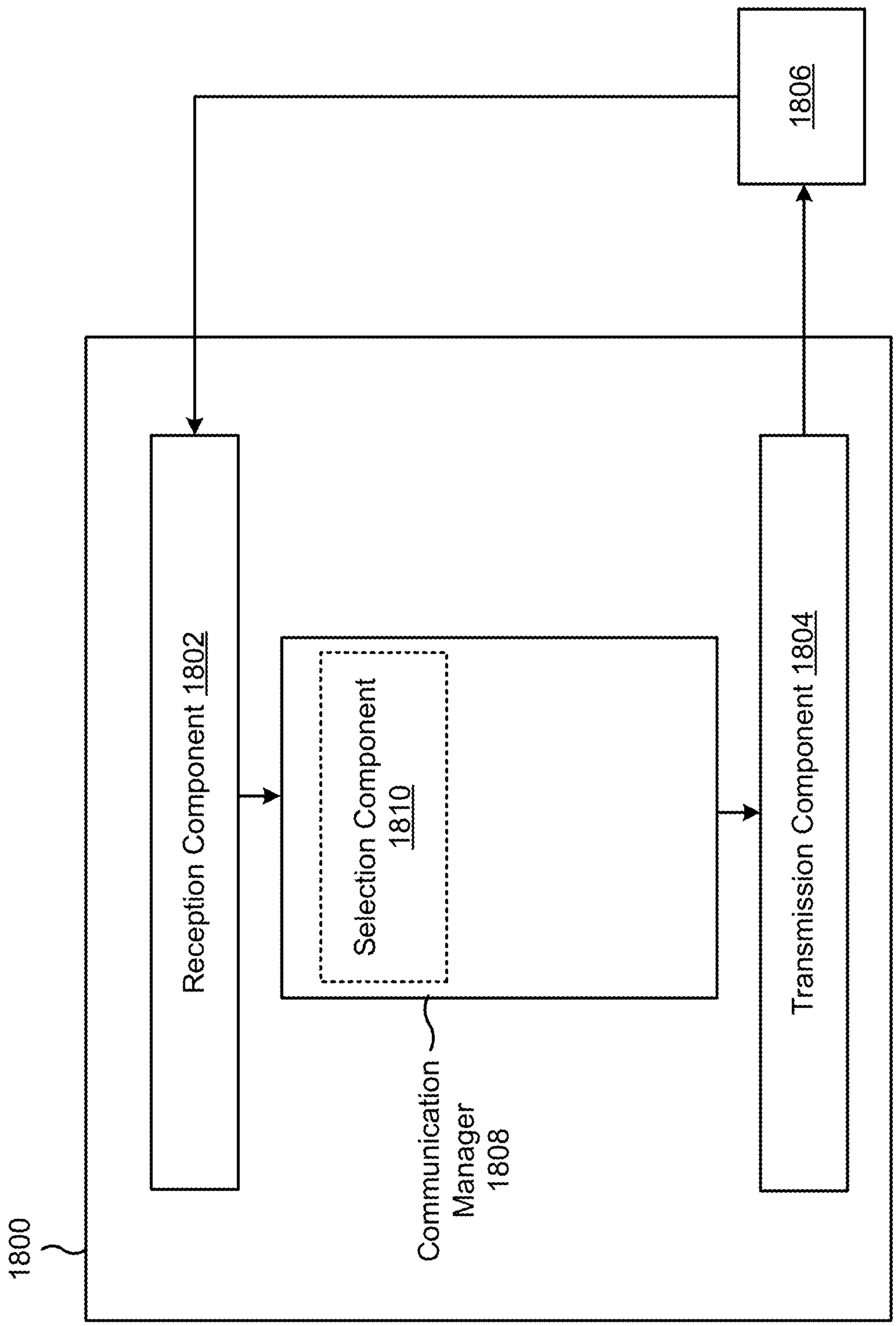
1806
Reception Component 1802
Selection Component 1810
Transmission Component 1804
Communication Manager 1808
1800

FIG. 18

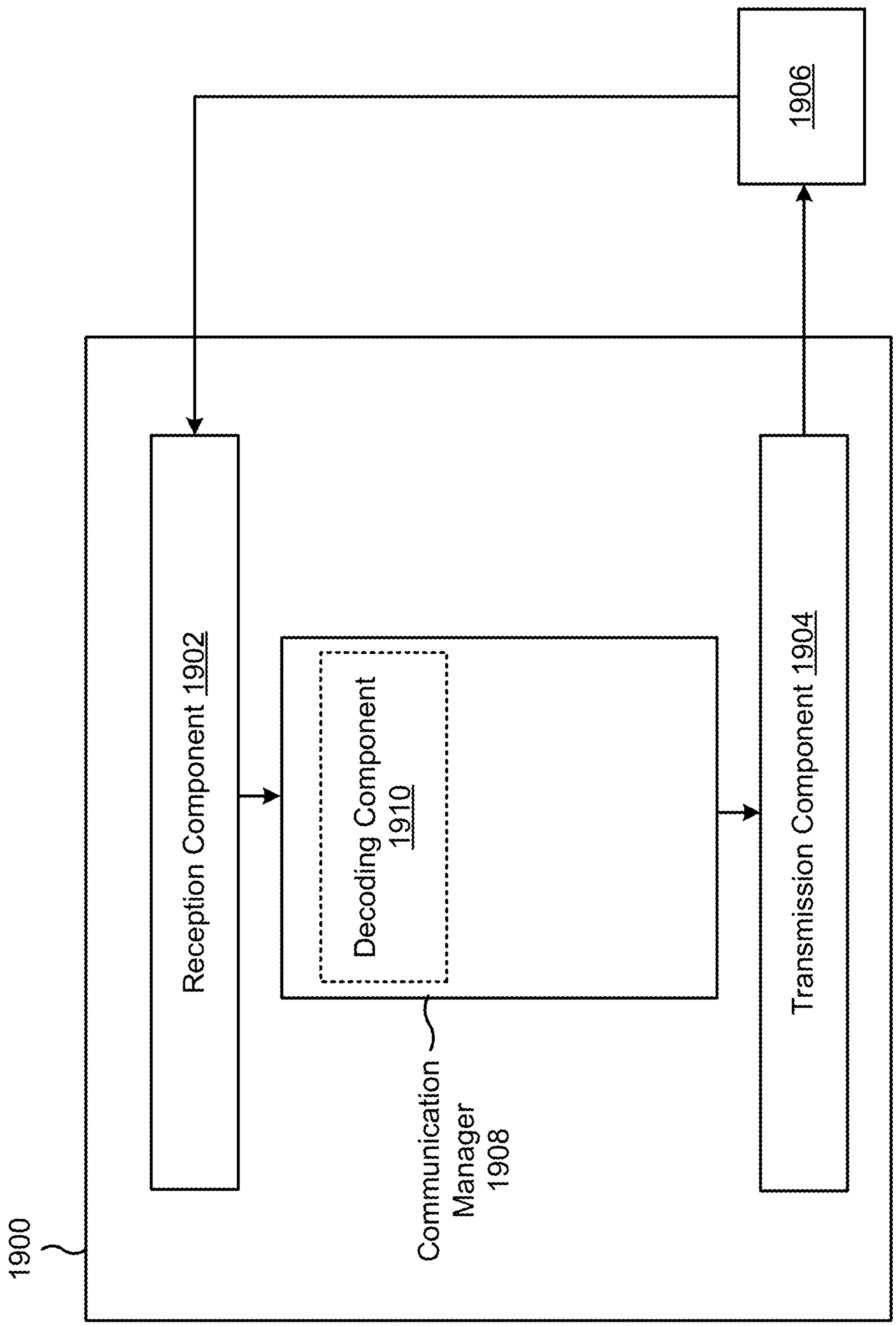
1906
1900
Reception Component 1902
Decoding Component 1910
Communication Manager 1908
Transmission Component 1904

FIG. 19

RESOURCE SKIPPING FOR MULTIPLE GRANTS

FIELD OF THE DISCLOSURE

Aspects of the present disclosure generally relate to wireless communication and to techniques and apparatuses for skipping resources for multiple grants.

BACKGROUND

Wireless communication systems are widely deployed to provide various telecommunication services such as telephony, video, data, messaging, and broadcasts. Typical wireless communication systems may employ multiple-access technologies capable of supporting communication with multiple users by sharing available system resources (e.g., bandwidth, transmit power, or the like). Examples of such multiple-access technologies include code division multiple access (CDMA) systems, time division multiple access (TDMA) systems, frequency division multiple access (FDMA) systems, orthogonal frequency division multiple access (OFDMA) systems, single-carrier frequency division multiple access (SC-FDMA) systems, time division synchronous code division multiple access (TD-SCDMA) systems, and Long Term Evolution (LTE). LTE/LTE-Advanced is a set of enhancements to the Universal Mobile Telecommunications System (UMTS) mobile standard promulgated by the Third Generation Partnership Project (3GPP).

A wireless network may include one or more base stations that support communication for a user equipment (UE) or multiple UEs. A UE may communicate with a base station via downlink communications and uplink communications. "Downlink" (or "DL") refers to a communication link from the base station to the UE, and "uplink" (or "UL") refers to a communication link from the UE to the base station.

The above multiple access technologies have been adopted in various telecommunication standards to provide a common protocol that enables different UEs to communicate on a municipal, national, regional, and/or global level. New Radio (NR), which may be referred to as 5G, is a set of enhancements to the LTE mobile standard promulgated by the 3GPP. NR is designed to better support mobile broadband internet access by improving spectral efficiency, lowering costs, improving services, making use of new spectrum, and better integrating with other open standards using orthogonal frequency division multiplexing (OFDM) with a cyclic prefix (CP) (CP-OFDM) on the downlink, using CP-OFDM and/or single-carrier frequency division multiplexing (SC-FDM) (also known as discrete Fourier transform spread OFDM (DFT-s-OFDM)) on the uplink, as well as supporting beamforming, multiple-input multiple-output (MIMO) antenna technology, and carrier aggregation. As the demand for mobile broadband access continues to increase, further improvements in LTE, NR, and other radio access technologies remain useful.

SUMMARY

Some aspects described herein relate to a method of wireless communication performed by a user equipment (UE). The method may include selecting first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel. The method may include transmitting uplink control information (UCI) that indicates the first resources or second resources that are not skipped in each grant occasion of the multiple grant occasions. The method may include transmitting the communications in the multiple grant occasions using the second resources and not the first resources.

Some aspects described herein relate to a method of wireless communication performed by a network entity. The method may include receiving UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being first for communications on a physical uplink channel and the second resources not being skipped. The method may include receiving the communications in the multiple grant occasions. The method may include decoding the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI.

Some aspects described herein relate to a UE for wireless communication. The UE may include a memory and one or more processors coupled to the memory. The one or more processors may be configured to select first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel. The one or more processors may be configured to transmit UCI that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions. The one or more processors may be configured to transmit the communications in the multiple grant occasions using the second resources and not the first resources.

Some aspects described herein relate to a network entity for wireless communication. The network entity may include a memory and one or more processors coupled to the memory. The one or more processors may be configured to receive UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being first for communications on a physical uplink channel and the second resources not being skipped. The one or more processors may be configured to receive the communications in the multiple grant occasions. The one or more processors may be configured to decode the communications in the second resources and not decode the communications in the first resources based at least in part on the UCI.

Some aspects described herein relate to a non-transitory computer-readable medium that stores a set of instructions for wireless communication by a UE. The set of instructions, when executed by one or more processors of the UE, may cause the UE to select first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel. The set of instructions, when executed by one or more processors of the UE, may cause the UE to transmit UCI that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions. The set of instructions, when executed by one or more processors of the UE, may cause the UE to transmit the communications in the multiple grant occasions using the second resources and not the first resources.

Some aspects described herein relate to a non-transitory computer-readable medium that stores a set of instructions for wireless communication by a network entity. The set of instructions, when executed by one or more processors of the network entity, may cause the network entity to receive UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being skipped for communications on a physical uplink channel and the second resources not being skipped. The set of instructions, when executed by one or more processors of the network entity, may cause the network entity to receive the communications in the multiple grant occasions. The set of instructions, when executed by one or more processors of the network entity, may cause the network entity to decode the communications in the second resources and not decode the communications in the first resources based at least in part on the UCI.

Some aspects described herein relate to an apparatus for wireless communication. The apparatus may include means for selecting first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel. The apparatus may include means for transmitting UCI that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions. The apparatus may include means for transmitting the communications in the multiple grant occasions using the second resources and not the first resources.

Some aspects described herein relate to an apparatus for wireless communication. The apparatus may include means for receiving UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being first for communications on a physical uplink channel and the second resources not being skipped. The apparatus may include means for receiving the communications in the multiple grant occasions. The apparatus may include means for decoding the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI.

Aspects generally include a method, apparatus, system, computer program product, non-transitory computer-readable medium, user equipment, base station, network entity, wireless communication device, and/or processing system as substantially described herein with reference to and as illustrated by the drawings and specification.

The foregoing has outlined rather broadly the features and technical advantages of examples according to the disclosure in order that the detailed description that follows may be better understood. Additional features and advantages will be described hereinafter. The conception and specific examples disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present disclosure. Such equivalent constructions do not depart from the scope of the appended claims. Characteristics of the concepts disclosed herein, both their organization and method of operation, together with associated advantages, will be better understood from the following description when considered in connection with the accompanying figures. Each of the figures is provided for the purposes of illustration and description, and not as a definition of the limits of the claims.

While aspects are described in the present disclosure by illustration to some examples, those skilled in the art will understand that such aspects may be implemented in many different arrangements and scenarios. Techniques described herein may be implemented using different platform types, devices, systems, shapes, sizes, and/or packaging arrangements. For example, some aspects may be implemented via integrated chip embodiments or other non-module-component based devices (e.g., end-user devices, vehicles, communication devices, computing devices, industrial equipment, retail/purchasing devices, medical devices, and/or artificial intelligence devices). Aspects may be implemented in chip-level components, modular components, non-modular components, non-chip-level components, device-level components, and/or system-level components. Devices incorporating described aspects and features may include additional components and features for implementation and practice of claimed and described aspects. For example, transmission and reception of wireless signals may include one or more components for analog and digital purposes (e.g., hardware components including antennas, radio frequency (RF) chains, power amplifiers, modulators, buffers, processors, interleavers, adders, and/or summers). It is intended that aspects described herein may be practiced in a wide variety of devices, components, systems, distributed arrangements, and/or end-user devices of varying size, shape, and constitution.

BRIEF DESCRIPTION OF THE DRAWINGS

So that the above-recited features of the present disclosure can be understood in detail, a more particular description, briefly summarized above, may be had by reference to aspects, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only certain typical aspects of this disclosure and are therefore not to be considered limiting of its scope, for the description may admit to other equally effective aspects. The same reference numbers in different drawings may identify the same or similar elements.

FIG. **1** is a diagram illustrating an example of a wireless network, in accordance with the present disclosure.

FIG. **2** is a diagram illustrating an example of a network entity (e.g., base station) in communication with a user equipment (UE) in a wireless network, in accordance with the present disclosure.

FIG. **3** is a diagram illustrating an example of a disaggregated base station, in accordance with the present disclosure.

FIG. **4** is a diagram illustrating an example of a slot format, in accordance with the present disclosure.

FIG. **5** is a diagram illustrating an example of uplink configured grant communication, in accordance with the present disclosure.

FIG. **6** is a diagram illustrating an example of skipping a communication associated with a grant, in accordance with the present disclosure.

FIG. **7** is a diagram illustrating an example of skipping resources of a grant, in accordance with the present disclosure.

FIG. **8** is a diagram illustrating an example of a skipping indication, in accordance with the present disclosure.

FIG. **9** is a diagram illustrating an example of skipping indications, in accordance with the present disclosure.

FIG. **10** is a diagram illustrating an example of skipping indications, in accordance with the present disclosure.

FIG. **11** is a diagram illustrating an example of skipping indications, in accordance with the present disclosure.

FIG. **12** is a diagram illustrating examples of configured grant occasions, in accordance with the present disclosure.

FIG. **13** is a diagram illustrating an example of a skipping indication for multiple grant occasions, in accordance with the present disclosure.

FIG. **14** is a diagram illustrating an example of skipping resources of a grant, in accordance with the present disclosure.

FIG. **15** is a diagram illustrating examples of using uplink control information to indicate skipped resources or non-skipped resources for retransmissions, in accordance with the present disclosure.

FIG. **16** is a diagram illustrating an example process performed, for example, by a UE, in accordance with the present disclosure.

FIG. **17** is a diagram illustrating an example process performed, for example, by a network entity, in accordance with the present disclosure.

FIGS. **18-19** are diagrams of example apparatuses for wireless communication, in accordance with the present disclosure.

DETAILED DESCRIPTION

Various aspects of the disclosure are described more fully hereinafter with reference to the accompanying drawings. This disclosure may, however, be embodied in many different forms and should not be construed as limited to any specific structure or function presented throughout this disclosure. Rather, these aspects are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the disclosure to those skilled in the art. One skilled in the art should appreciate that the scope of the disclosure is intended to cover any aspect of the disclosure disclosed herein, whether implemented independently of or combined with any other aspect of the disclosure. For example, an apparatus may be implemented or a method may be practiced using any number of the aspects set forth herein. In addition, the scope of the disclosure is intended to cover such an apparatus or method which is practiced using other structure, functionality, or structure and functionality in addition to or other than the various aspects of the disclosure set forth herein. It should be understood that any aspect of the disclosure disclosed herein may be embodied by one or more elements of a claim.

Several aspects of telecommunication systems will now be presented with reference to various apparatuses and techniques. These apparatuses and techniques will be described in the following detailed description and illustrated in the accompanying drawings by various blocks, modules, components, circuits, steps, processes, algorithms, or the like (collectively referred to as "elements"). These elements may be implemented using hardware, software, or combinations thereof. Whether such elements are implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system.

While aspects may be described herein using terminology commonly associated with a 5G or New Radio (NR) radio access technology (RAT), aspects of the present disclosure can be applied to other RATs, such as a 3G RAT, a 4G RAT, and/or a RAT subsequent to 5G (e.g., 6G).

FIG. **1** is a diagram illustrating an example of a wireless network **100**, in accordance with the present disclosure. The wireless network **100** may be or may include elements of a 5G (e.g., NR) network and/or a 4G (e.g., Long Term Evolution (LTE)) network, among other examples. The wireless network **100** may include a user equipment (UE) **120** or multiple UEs **120** (shown as a UE **120***a*, a UE **120***b*, a UE **120***c*, a UE **120***d*, and a UE **120***e*). The wireless network **100** may also include one or more network entities, such as base stations **110** (shown as a BS **110***a*, a BS **110***b*, a BS **110***c*, and a BS **110***d*), and/or other network entities. A base station **110** is a network entity that communicates with UEs **120**. A base station **110** (sometimes referred to as a BS) may include, for example, an NR base station, an LTE base station, a Node B, an eNB (e.g., in 4G), a gNB (e.g., in 5G), an access point, and/or a transmission reception point (TRP). Each base station **110** may provide communication coverage for a particular geographic area. In the Third Generation Partnership Project (3GPP), the term "cell" can refer to a coverage area of a base station **110** and/or a base station subsystem serving this coverage area, depending on the context in which the term is used.

A base station **110** may provide communication coverage for a macro cell, a pico cell, a femto cell, and/or another type of cell. A macro cell may cover a relatively large geographic area (e.g., several kilometers in radius) and may allow unrestricted access by UEs **120** with service subscriptions. A pico cell may cover a relatively small geographic area and may allow unrestricted access by UEs **120** with service subscription. A femto cell may cover a relatively small geographic area (e.g., a home) and may allow restricted access by UEs **120** having association with the femto cell (e.g., UEs **120** in a closed subscriber group (CSG)). A base station **110** for a macro cell may be referred to as a macro base station. A base station **110** for a pico cell may be referred to as a pico base station. A base station **110** for a femto cell may be referred to as a femto base station or an in-home base station. In the example shown in FIG. **1**, the BS **110***a* may be a macro base station for a macro cell **102***a*, the BS **110***b* may be a pico base station for a pico cell **102***b*, and the BS **110***c* may be a femto base station for a femto cell **102***c*. A base station may support one or multiple (e.g., three) cells.

In some examples, a cell may not necessarily be stationary, and the geographic area of the cell may move according to the location of a base station **110** that is mobile (e.g., a mobile base station). In some examples, the base stations **110** may be interconnected to one another and/or to one or more other base stations **110** or network entities in the wireless network **100** through various types of backhaul interfaces, such as a direct physical connection or a virtual network, using any suitable transport network.

In some aspects, the term "base station" (e.g., the base station **110**) or "network entity" may refer to an aggregated base station, a disaggregated base station, an integrated access and backhaul (IAB) node, a relay node, and/or one or more components thereof. For example, in some aspects, "base station" or "network entity" may refer to a central unit (CU), a distributed unit (DU), a radio unit (RU), a Near-Real Time (Near-RT) RAN Intelligent Controller (RIC), or a Non-Real Time (Non-RT) MC, or a combination thereof. In some aspects, the term "base station" or "network entity" may refer to one device configured to perform one or more functions, such as those described herein in connection with the base station **110**. In some aspects, the term "base station" or "network entity" may refer to a plurality of devices configured to perform the one or more functions. For example, in some distributed systems, each of a number of different devices (which may be located in the same geographic location or in different geographic locations) may be configured to perform at least a portion of a function, or to duplicate performance of at least a portion of the function, and the term "base station" or "network entity" may refer to any one or more of those different devices. In some aspects, the term "base station" or "network entity" may refer to one or more virtual base stations and/or one or more virtual base station functions. For example, in some aspects, two or more base station functions may be instantiated on a single device. In some aspects, the term "base station" or "network entity" may refer to one of the base station functions and not another. In this way, a single device may include more than one base station.

The wireless network **100** may include one or more relay stations. A relay station is a network entity that can receive a transmission of data from an upstream station (e.g., a network entity or a UE **120**) and send a transmission of the data to a downstream station (e.g., UE **120** or a network entity). A relay station may be a UE **120** that can relay transmissions for other UEs **120**. In the example shown in FIG. **1**, the BS **110***d* (e.g., a relay base station) may communicate with the BS **110***a* (e.g., a macro base station) and the UE **120***d* in order to facilitate communication between the BS **110***a* and the UE **120***d*. A base station **110** that relays communications may be referred to as a relay station, a relay base station, a relay, or the like.

The wireless network **100** may be a heterogeneous network with network entities that include different types of BSs, such as macro base stations, pico base stations, femto base stations, relay base stations, or the like. These different types of base stations **110** may have different transmit power levels, different coverage areas, and/or different impacts on interference in the wireless network **100**. For example, macro base stations may have a high transmit power level (e.g., 5 to 40 watts) whereas pico base stations, femto base stations, and relay base stations may have lower transmit power levels (e.g., 0.1 to 2 watts).

A network controller **130** may couple to or communicate with a set of network entities and may provide coordination and control for these network entities. The network controller **130** may communicate with the base stations **110** via a backhaul communication link. The network entities may communicate with one another directly or indirectly via a wireless or wireline backhaul communication link.

The UEs **120** may be dispersed throughout the wireless network **100**, and each UE **120** may be stationary or mobile. A UE **120** may include, for example, an access terminal, a terminal, a mobile station, and/or a subscriber unit. A UE **120** may be a cellular phone (e.g., a smart phone), a personal digital assistant (PDA), a wireless modem, a wireless communication device, a handheld device, a laptop computer, a cordless phone, a wireless local loop (WLL) station, a tablet, a camera, a gaming device, a netbook, a smartbook, an ultrabook, a medical device, a biometric device, a wearable device (e.g., a smart watch, smart clothing, smart glasses, a smart wristband, smart jewelry (e.g., a smart ring or a smart bracelet)), an entertainment device (e.g., a music device, a video device, and/or a satellite radio), a vehicular component or sensor, a smart meter/sensor, industrial manufacturing equipment, a global positioning system device, and/or any other suitable device that is configured to communicate via a wireless medium.

Some UEs **120** may be considered machine-type communication (MTC) or evolved or enhanced machine-type communication (eMTC) UEs. An MTC UE and/or an eMTC UE may include, for example, a robot, a drone, a remote device, a sensor, a meter, a monitor, and/or a location tag, that may communicate with a network entity, another device (e.g., a remote device), or some other entity. Some UEs **120** may be considered Internet-of-Things (IoT) devices, and/or may be implemented as NB-IoT (narrowband IoT) devices. Some UEs **120** may be considered a Customer Premises Equipment. A UE **120** may be included inside a housing that houses components of the UE **120**, such as processor components and/or memory components. In some examples, the processor components and the memory components may be coupled together. For example, the processor components (e.g., one or more processors) and the memory components (e.g., a memory) may be operatively coupled, communicatively coupled, electronically coupled, and/or electrically coupled.

In general, any number of wireless networks **100** may be deployed in a given geographic area. Each wireless network **100** may support a particular RAT and may operate on one or more frequencies. A RAT may be referred to as a radio technology, an air interface, or the like. A frequency may be referred to as a carrier, a frequency channel, or the like. Each frequency may support a single RAT in a given geographic area in order to avoid interference between wireless networks of different RATs. In some cases, NR or 5G RAT networks may be deployed.

In some examples, two or more UEs **120** (e.g., shown as UE **120***a* and UE **120***e*) may communicate directly using one or more sidelink channels (e.g., without using a network entity as an intermediary to communicate with one another). For example, the UEs **120** may communicate using peer-to-peer (P2P) communications, device-to-device (D2D) communications, a vehicle-to-everything (V2X) protocol (e.g., which may include a vehicle-to-vehicle (V2V) protocol, a vehicle-to-infrastructure (V2I) protocol, or a vehicle-to-pedestrian (V2P) protocol), and/or a mesh network. In such examples, a UE **120** may perform scheduling operations, resource selection operations, and/or other operations described elsewhere herein as being performed by the base station **110**.

Devices of the wireless network **100** may communicate using the electromagnetic spectrum, which may be subdivided by frequency or wavelength into various classes, bands, channels, or the like. For example, devices of the wireless network **100** may communicate using one or more operating bands. In 5G NR, two initial operating bands have been identified as frequency range designations FR1 (410 MHz-7.125 GHz) and FR2 (24.25 GHz-52.6 GHz). It should be understood that although a portion of FR1 is greater than 6 GHz, FR1 is often referred to (interchangeably) as a "Sub-6 GHz" band in various documents and articles. A similar nomenclature issue sometimes occurs with regard to FR2, which is often referred to (interchangeably) as a "millimeter wave" band in documents and articles, despite being different from the extremely high frequency (EHF) band (30 GHz-300 GHz) which is identified by the International Telecommunications Union (ITU) as a "millimeter wave" band.

The frequencies between FR1 and FR2 are often referred to as mid-band frequencies. Recent 5G NR studies have identified an operating band for these mid-band frequencies as frequency range designation FR3 (7.125 GHz-24.25 GHz). Frequency bands falling within FR3 may inherit FR1 characteristics and/or FR2 characteristics, and thus may effectively extend features of FR1 and/or FR2 into mid-band frequencies. In addition, higher frequency bands are currently being explored to extend 5G NR operation beyond 52.6 GHz. For example, three higher operating bands have been identified as frequency range designations FR4a or FR4-1 (52.6 GHz-71 GHz), FR4 (52.6 GHz-114.25 GHz), and FR5 (114.25 GHz-300 GHz). Each of these higher frequency bands falls within the EHF band.

With the above examples in mind, unless specifically stated otherwise, it should be understood that the term "sub-6 GHz" or the like, if used herein, may broadly represent frequencies that may be less than 6 GHz, may be within FR1, or may include mid-band frequencies. Further, unless specifically stated otherwise, it should be understood that the term "millimeter wave" or the like, if used herein, may broadly represent frequencies that may include mid-band frequencies, may be within FR2, FR4, FR4-a or FR4-1, and/or FR5, or may be within the EHF band. It is contemplated that the frequencies included in these operating bands (e.g., FR1, FR2, FR3, FR4, FR4-a, FR4-1, and/or FR5) may be modified, and techniques described herein are applicable to those modified frequency ranges.

In some aspects, the UE **120** may include a communication manager **140**. As described in more detail elsewhere herein, the communication manager **140** may select first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel. The communication manager **140** may transmit uplink control information (UCI) that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions. The communication manager **140** may transmit the communications in the multiple grant occasions using the second resources and not the first resources. Additionally, or alternatively, the communication manager **140** may perform one or more other operations described herein.

In some aspects, a network entity (e.g., base station **110**) may include a communication manager **150**. As described in more detail elsewhere herein, the communication manager **150** may receive UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being first for communications on a physical uplink channel and the second resources not being skipped. The communication manager **150** may receive the communications in the multiple grant occasions and decode the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI. Additionally, or alternatively, the communication manager **150** may perform one or more other operations described herein.

As indicated above, FIG. **1** is provided as an example. Other examples may differ from what is described with regard to FIG. **1**.

FIG. **2** is a diagram illustrating an example **200** of a network entity (e.g., base station **110**) in communication with a UE **120** in a wireless network **100**, in accordance with the present disclosure. The base station **110** may be equipped with a set of antennas **234***a* through **234***t*, such as T antennas (T≥1). The UE **120** may be equipped with a set of antennas **252***a* through **252***r*, such as R antennas (R≥1).

At the base station **110**, a transmit processor **220** may receive data, from a data source **212**, intended for the UE **120** (or a set of UEs **120**). The transmit processor **220** may select one or more modulation and coding schemes (MCSs) for the UE **120** based at least in part on one or more channel quality indicators (CQIs) received from that UE **120**. The base station **110** may process (e.g., encode and modulate) the data for the UE **120** based at least in part on the MCS(s) selected for the UE **120** and may provide data symbols for the UE **120**. The transmit processor **220** may process system information (e.g., for semi-static resource partitioning information (SRPI)) and control information (e.g., CQI requests, grants, and/or upper layer signaling) and provide overhead symbols and control symbols. The transmit processor **220** may generate reference symbols for reference signals (e.g., a cell-specific reference signal (CRS) or a demodulation reference signal (DMRS)) and synchronization signals (e.g., a primary synchronization signal (PSS) or a secondary synchronization signal (SSS)). A transmit (TX) multiple-input multiple-output (MIMO) processor **230** may perform spatial processing (e.g., precoding) on the data symbols, the control symbols, the overhead symbols, and/or the reference symbols, if applicable, and may provide a set of output symbol streams (e.g., T output symbol streams) to a corresponding set of modems **232** (e.g., T modems), shown as modems **232***a* through **232***t*. For example, each output symbol stream may be provided to a modulator component (shown as MOD) of a modem **232**. Each modem **232** may use a respective modulator component to process a respective output symbol stream (e.g., for OFDM) to obtain an output sample stream. Each modem **232** may further use a respective modulator component to process (e.g., convert to analog, amplify, filter, and/or upconvert) the output sample stream to obtain a downlink signal. The modems **232***a* through **232***t* may transmit a set of downlink signals (e.g., T downlink signals) via a corresponding set of antennas **234** (e.g., T antennas), shown as antennas **234***a* through **234***t*.

At the UE **120**, a set of antennas **252** (shown as antennas **252***a* through **252***r*) may receive the downlink signals from the base station **110** and/or other base stations **110** and may provide a set of received signals (e.g., R received signals) to a set of modems **254** (e.g., R modems), shown as modems **254***a* through **254***r*. For example, each received signal may be provided to a demodulator component (shown as DEMOD) of a modem **254**. Each modem **254** may use a respective demodulator component to condition (e.g., filter, amplify, downconvert, and/or digitize) a received signal to obtain input samples. Each modem **254** may use a demodulator component to further process the input samples (e.g., for OFDM) to obtain received symbols. A MIMO detector **256** may obtain received symbols from the modems **254**, may perform MIMO detection on the received symbols if applicable, and may provide detected symbols. A receive processor **258** may process (e.g., demodulate and decode) the detected symbols, may provide decoded data for the UE **120** to a data sink **260**, and may provide decoded control information and system information to a controller/processor **280**. The term "controller/processor" may refer to one or more controllers, one or more processors, or a combination thereof. A channel processor may determine a reference signal received power (RSRP) parameter, a received signal strength indicator (RSSI) parameter, a reference signal received quality (RSRQ) parameter, and/or a CQI parameter, among other examples. In some examples, one or more components of the UE **120** may be included in a housing **284**.

The network controller **130** may include a communication unit **294**, a controller/processor **290**, and a memory **292**. The network controller **130** may include, for example, one or more devices in a core network. The network controller **130** may communicate with the network entity via the communication unit **294**.

One or more antennas (e.g., antennas **234***a* through **234***t* and/or antennas **252***a* through **252***r*) may include, or may be included within, one or more antenna panels, one or more antenna groups, one or more sets of antenna elements, and/or one or more antenna arrays, among other examples. An antenna panel, an antenna group, a set of antenna elements, and/or an antenna array may include one or more antenna elements (within a single housing or multiple housings), a set of coplanar antenna elements, a set of non-coplanar antenna elements, and/or one or more antenna elements coupled to one or more transmission and/or reception components, such as one or more components of FIG. **2**.

On the uplink, at the UE **120**, a transmit processor **264** may receive and process data from a data source **262** and control information (e.g., for reports that include RSRP, RSSI, RSRQ, and/or CQI) from the controller/processor **280**. The transmit processor **264** may generate reference symbols for one or more reference signals. The symbols from the transmit processor **264** may be precoded by a TX MIMO processor **266** if applicable, further processed by the modems **254** (e.g., for DFT-s-OFDM or CP-OFDM), and transmitted to the network entity. In some examples, the modem **254** of the UE **120** may include a modulator and a demodulator. In some examples, the UE **120** includes a transceiver. The transceiver may include any combination of the antenna(s) **252**, the modem(s) **254**, the MIMO detector **256**, the receive processor **258**, the transmit processor **264**, and/or the TX MIMO processor **266**. The transceiver may be used by a processor (e.g., the controller/processor **280**) and the memory **282** to perform aspects of any of the methods described herein (e.g., with reference to FIGS. **4-19**).

At the network entity (e.g., base station **110**), the uplink signals from UE **120** and/or other UEs may be received by the antennas **234**, processed by the modem **232** (e.g., a demodulator component, shown as DEMOD, of the modem **232**), detected by a MIMO detector **236** if applicable, and further processed by a receive processor **238** to obtain decoded data and control information sent by the UE **120**. The receive processor **238** may provide the decoded data to a data sink **239** and provide the decoded control information to the controller/processor **240**. The network entity may include a communication unit **244** and may communicate with the network controller **130** via the communication unit **244**. The network entity may include a scheduler **246** to schedule one or more UEs **120** for downlink and/or uplink communications. In some examples, the modem **232** of the network entity may include a modulator and a demodulator. In some examples, the network entity includes a transceiver. The transceiver may include any combination of the antenna (s) **234**, the modem(s) **232**, the MIMO detector **236**, the receive processor **238**, the transmit processor **220**, and/or the TX MIMO processor **230**. The transceiver may be used by a processor (e.g., the controller/processor **240**) and the memory **242** to perform aspects of any of the methods described herein (e.g., with reference to FIGS. **4-19**).

A controller/processor of a network entity, (e.g., the controller/processor **240** of the base station **110**), the controller/processor **280** of the UE **120**, and/or any other component(s) of FIG. **2** may perform one or more techniques associated with indicating, with a single UCI, resources to skip for multiple grant occasions, as described in more detail elsewhere herein. For example, the controller/processor **240** of the base station **110**, the controller/processor **280** of the UE **120**, and/or any other component(s) of FIG. **2** may perform or direct operations of, for example, process **1600** of FIG. **16**, process **1700** of FIG. **17**, and/or other processes as described herein. The memory **242** and the memory **282** may store data and program codes for the network entity and the UE **120**, respectively. In some examples, the memory **242** and/or the memory **282** may include a non-transitory computer-readable medium storing one or more instructions (e.g., code and/or program code) for wireless communication. For example, the one or more instructions, when executed (e.g., directly, or after compiling, converting, and/or interpreting) by one or more processors of the network entity and/or the UE **120**, may cause the one or more processors, the UE **120**, and/or the network entity to perform or direct operations of, for example, process **1600** of FIG. **16**, process **1700** of FIG. **17**, and/or other processes as described herein. In some examples, executing instructions may include running the instructions, converting the instructions, compiling the instructions, and/or interpreting the instructions, among other examples.

In some aspects, the UE **120** includes means for selecting first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel; means for transmitting UCI that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions; and/or means for transmitting the communications in the multiple grant occasions using the second resources and not the first resources. The means for the UE **120** to perform operations described herein may include, for example, one or more of communication manager **140**, antenna **252**, modem **254**, MIMO detector **256**, receive processor **258**, transmit processor **264**, TX MIMO processor **266**, controller/processor **280**, or memory **282**.

In some aspects, a network entity (e.g., base station **110**) includes means for receiving UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being first for communications on a physical uplink channel and the second resources not being skipped; means for receiving the communications in the multiple grant occasions; and/or means for decoding the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI. In some aspects, the means for the network entity to perform operations described herein may include, for example, one or more of communication manager **150**, transmit processor **220**, TX MIMO processor **230**, modem **232**, antenna **234**, MIMO detector **236**, receive processor **238**, controller/processor **240**, memory **242**, or scheduler **246**.

While blocks in FIG. **2** are illustrated as distinct components, the functions described above with respect to the blocks may be implemented in a single hardware, software, or combination component or in various combinations of components. For example, the functions described with respect to the transmit processor **264**, the receive processor **258**, and/or the TX MIMO processor **266** may be performed by or under the control of the controller/processor **280**.

As indicated above, FIG. **2** is provided as an example. Other examples may differ from what is described with regard to FIG. **2**.

FIG. **3** is a diagram illustrating an example of a disaggregated base station **300**, in accordance with the present disclosure.

Deployment of communication systems, such as 5G NR systems, may be arranged in multiple manners with various components or constituent parts. In a 5G NR system, or network, a network node, a network entity, a mobility element of a network, a radio access network (RAN) node, a core network node, a network element, or a network equipment, such as a base station, or one or more units (or one or more components) performing base station functionality, may be implemented in an aggregated or disaggregated architecture. For example, a BS (such as a Node B, evolved NB (eNB), NR BS, 5G NB, access point (AP), a TRP, or a cell, etc.) may be implemented as an aggregated base station (also known as a standalone BS or a monolithic BS) or a disaggregated base station.

An aggregated base station may be configured to utilize a radio protocol stack that is physically or logically integrated within a single RAN node. A disaggregated base station may be configured to utilize a protocol stack that is physically or logically distributed among two or more units (such as one or more CUs, one or more DUs, or one or more RUs). In some aspects, a CU may be implemented within a RAN node, and one or more DUs may be co-located with the CU, or alternatively, may be geographically or virtually distributed throughout one or multiple other RAN nodes. The DUs may be implemented to communicate with one or more RUs. Each of the CU, DU and RU also can be implemented as virtual units (e.g., a virtual central unit (VCU), a virtual distributed unit (VDU), or a virtual radio unit (VRU)).

Base station-type operation or network design may consider aggregation characteristics of base station functionality. For example, disaggregated base stations may be utilized in an IAB network, an open radio access network (O-RAN (such as the network configuration sponsored by the O-RAN Alliance)), or a virtualized radio access network (vRAN, also known as a cloud radio access network (C-RAN)).

Disaggregation may include distributing functionality across two or more units at various physical locations, as well as distributing functionality for at least one unit virtually, which can enable flexibility in network design. The various units of the disaggregated base station, or disaggregated RAN architecture, can be configured for wired or wireless communication with at least one other unit.

The disaggregated base station **300** architecture may include one or more CUs **310** that can communicate directly with a core network **320** via a backhaul link, or indirectly with the core network **320** through one or more disaggregated base station units (such as a Near-RT RIC **325** via an E2 link, or a Non-RT RIC **315** associated with a Service Management and Orchestration (SMO) Framework **305**, or both). A CU **310** may communicate with one or more DUs **330** via respective midhaul links, such as an F1 interface. The DUs **330** may communicate with one or more RUs **340** via respective fronthaul links. The fronthaul link, the midhaul link, and the backhaul link may be generally referred to as "communication links." The RUs **340** may communicate with respective UEs **120** via one or more RF access links. In some aspects, the UE **120** may be simultaneously served by multiple RUs **340**. The DUs **330** and the RUs **340** may also be referred to as "O-RAN DUs (O-DUs") and "O-RAN RUs (O-RUs)", respectively. A network entity may include a CU, a DU, an RU, or any combination of CUs, DUs, and RUs. A network entity may include a disaggregated base station or one or more components of the disaggregated base station, such as a CU, a DU, an RU, or any combination of CUs, DUs, and RUs. A network entity may also include one or more of a TRP, a relay station, a passive device, an intelligent reflective surface (IRS), or other components that may provide a network interface for or serve a UE, mobile station, sensor/actuator, or other wireless device.

Each of the units (e.g., the CUs **310**, the DUs **330**, the RUs **340**, as well as the Near-RT RICs **325**, the Non-RT RICs **315** and the SMO Framework **305**) may include one or more interfaces or be coupled to one or more interfaces configured to receive or transmit signals, data, or information (collectively, signals) via a wired or wireless transmission medium. Each of the units, or an associated processor or controller providing instructions to the communication interfaces of the units, can be configured to communicate with one or more of the other units via the transmission medium. For example, the units can include a wired interface configured to receive or transmit signals over a wired transmission medium to one or more of the other units. Additionally, the units can include a wireless interface, which may include a receiver, a transmitter or transceiver (such as an RF transceiver), configured to receive or transmit signals, or both, over a wireless transmission medium to one or more of the other units.

In some aspects, the CU **310** may host one or more higher layer control functions. Such control functions can include radio resource control (RRC), packet data convergence protocol (PDCP), service data adaptation protocol (SDAP), or the like. Each control function can be implemented with an interface configured to communicate signals with other control functions hosted by the CU **310**. The CU **310** may be configured to handle user plane functionality (i.e., Central Unit—User Plane (CU-UP)), control plane functionality (i.e., Central Unit—Control Plane (CU-CP)), or a combination thereof. In some implementations, the CU **310** can be logically split into one or more CU-UP units and one or more CU-CP units. The CU-UP unit can communicate bidirectionally with the CU-CP unit via an interface, such as the E1 interface when implemented in an O-RAN configuration. The CU **310** can be implemented to communicate with the DU **330**, as necessary, for network control and signaling.

The DU **330** may correspond to a logical unit that includes one or more base station functions to control the operation of one or more RUs **340**. In some aspects, the DU **330** may host one or more of a radio link control (RLC) layer, a medium access control (MAC) layer, and one or more high physical (PHY) layers (such as modules for forward error correction (FEC) encoding and decoding, scrambling, modulation and demodulation, or the like) depending, at least in part, on a functional split, such as those defined by the 3GPP. In some aspects, the DU **330** may further host one or more low PHY layers. Each layer (or module) can be implemented with an interface configured to communicate signals with other layers (and modules) hosted by the DU **330**, or with the control functions hosted by the CU **310**.

Lower-layer functionality can be implemented by one or more RUs **340**. In some deployments, an RU **340**, controlled by a DU **330**, may correspond to a logical node that hosts RF processing functions, or low-PHY layer functions (such as performing fast Fourier transform (FFT), inverse FFT (iFFT), digital beamforming, physical random access channel (PRACH) extraction and filtering, or the like), or both, based at least in part on the functional split, such as a lower layer functional split. In such an architecture, the RU(s) **340** can be implemented to handle over the air (OTA) communication with one or more UEs **120**. In some implementations, real-time and non-real-time aspects of control and user plane communication with the RU(s) **340** can be controlled by the corresponding DU **330**. In some scenarios, this configuration can enable the DU(s) **330** and the CU **310** to be implemented in a cloud-based RAN architecture, such as a vRAN architecture.

The SMO Framework **305** may be configured to support RAN deployment and provisioning of non-virtualized and virtualized network elements. For non-virtualized network elements, the SMO Framework **305** may be configured to support the deployment of dedicated physical resources for RAN coverage requirements which may be managed via an operations and maintenance interface (such as an O1 interface). For virtualized network elements, the SMO Framework **305** may be configured to interact with a cloud computing platform (such as an open cloud (O-Cloud) **390**) to perform network element life cycle management (such as to instantiate virtualized network elements) via a cloud computing platform interface (such as an O2 interface). Such virtualized network elements can include, but are not limited to, CUs **310**, DUs **330**, RUs **340** and Near-RT RICs **325**. In some implementations, the SMO Framework **305** can communicate with a hardware aspect of a 4G RAN, such as an open eNB (O-eNB) **311**, via an O1 interface. Additionally, in some implementations, the SMO Framework **305** can communicate directly with one or more RUs **340** via an O1 interface. The SMO Framework **305** also may include a Non-RT RIC **315** configured to support functionality of the SMO Framework **305**.

The Non-RT RIC **315** may be configured to include a logical function that enables non-real-time control and optimization of RAN elements and resources, Artificial Intelligence/Machine Learning (AI/ML) workflows including model training and updates, or policy-based guidance of applications/features in the Near-RT RIC **325**. The Non-RT

RIC **315** may be coupled to or communicate with (such as via an A1 interface) the Near-RT RIC **325**. The Near-RT RIC **325** may be configured to include a logical function that enables near-real-time control and optimization of RAN elements and resources via data collection and actions over an interface (such as via an E2 interface) connecting one or more CUs **310**, one or more DUs **330**, or both, as well as an with the Near-RT RIC **325**.

In some implementations, to generate AI/ML models to be deployed in the Near-RT RIC **325**, the Non-RT MC **315** may receive parameters or external enrichment information from external servers. Such information may be utilized by the Near-RT MC **325** and may be received at the SMO Framework **305** or the Non-RT MC **315** from non-network data sources or from network functions. In some examples, the Non-RT RIC **315** or the Near-RT RIC **325** may be configured to tune RAN behavior or performance. For example, the Non-RT RIC **315** may monitor long-term trends and patterns for performance and employ AI/ML models to perform corrective actions through the SMO Framework **305** (such as reconfiguration via O1) or via creation of RAN management policies (such as A1 policies).

As indicated above, FIG. **3** is provided as an example. Other examples may differ from what is described with regard to FIG. **3**.

FIG. **4** is a diagram illustrating an example **400** of a slot format, in accordance with the present disclosure. As shown in FIG. **4**, time-frequency resources in a radio access network may be partitioned into resource blocks, shown by a single resource block (RB) **405**. An RB **405** is sometimes referred to as a physical resource block (PRB). An RB **405** includes a set of subcarriers (e.g., 12 subcarriers) and a set of symbols (e.g., 14 symbols) that are schedulable by a network entity (e.g., base station **110**) as a unit. In some aspects, an RB **405** may include a set of subcarriers in a single slot. As shown, a single time-frequency resource included in an RB **405** may be referred to as a resource element (RE) **410**. An RE **410** may include a single subcarrier (e.g., in frequency) and a single symbol (e.g., in time). A symbol may be referred to as an orthogonal frequency division multiplexing (OFDM) symbol. An RE **410** may be used to transmit one modulated symbol, which may be a real value or a complex value.

In some telecommunication systems (e.g., NR), RBs **405** may span 12 subcarriers with a subcarrier spacing of, for example, 15 kilohertz (kHz), 30 kHz, 60 kHz, or 120 kHz, among other examples, over a 0.1 millisecond (ms) duration. A radio frame may include 40 slots and may have a length of 10 ms. Consequently, each slot may have a length of 0.25 ms. However, a slot length may vary depending on a numerology used to communicate (e.g., a subcarrier spacing and/or a cyclic prefix format). A slot may be configured with a link direction (e.g., downlink or uplink) for transmission. In some aspects, the link direction for a slot may be dynamically configured.

As indicated above, FIG. **4** is provided as an example. Other examples may differ from what is described with respect to FIG. **4**.

FIG. **5** is a diagram illustrating an example **500** of uplink configured grant (CG) communication, in accordance with the present disclosure.

In some aspects, PRBs for uplink communications may be granted dynamically, such as with a scheduling request (SR) or a buffer status report (BSR). A UE may first transmit an SR on a physical uplink control channel (PUCCH), requesting radio resources in the uplink when the UE has pending data in its buffer. With periodic BSR reporting, the network entity knows the available buffer at the UE. The network entity then transmits an uplink grant downlink control information (DCI). The allocated resources are specified in the DCI for the UE to transmit a communication on the physical uplink shared channel (PUSCH).

Alternatively, PRBs for uplink communications may be granted according to a configuration. For example, CG communications may include periodic uplink communications that are configured for a UE, such that the network entity does not need to send separate DCI to schedule each uplink communication, thereby conserving signaling overhead.

As shown in example **500**, a UE (e.g., UE **120**) may be configured with a CG configuration for CG communications. For example, the UE may receive the CG configuration via an RRC message transmitted by a network entity (e.g., a base station **110**). The CG configuration may indicate a resource allocation associated with CG uplink communications (e.g., in a time domain, frequency domain, spatial domain, and/or code domain) and a periodicity at which the resource allocation is repeated, resulting in periodically reoccurring scheduled CG occasions **505** for the UE. In some examples, the CG configuration may identify a resource pool or multiple resource pools that are available to the UE for an uplink transmission. The CG configuration may configure contention-free CG communications (e.g., where resources are dedicated for the UE to transmit uplink communications) or contention-based CG communications (e.g., where the UE contends for access to a channel in the configured resource allocation, such as by using a channel access procedure or a channel sensing procedure).

The network entity may transmit CG activation DCI to the UE to activate the CG configuration for the UE. The network entity may indicate, in the CG activation DCI, communication parameters, such as an MCS, an RB allocation, and/or antenna ports, for the CG PUSCH communications to be transmitted in the scheduled CG occasions **505**. The UE may begin transmitting in the CG occasions **505** based at least in part on receiving the CG activation DCI. For example, beginning with a next scheduled CG occasion **505** subsequent to receiving the CG activation DCI, the UE may transmit a PUSCH communication in the scheduled CG occasions **505** using the communication parameters indicated in the CG activation DCI. The UE may refrain from transmitting in configured CG occasions **505** prior to receiving the CG activation DCI.

The network entity may transmit CG reactivation DCI to the UE to change the communication parameters for the CG PUSCH communications. Based at least in part on receiving the CG reactivation DCI, and the UE may begin transmitting in the scheduled CG occasions **505** using the communication parameters indicated in the CG reactivation DCI. For example, beginning with a next scheduled CG occasion **505** subsequent to receiving the CG reactivation DCI, the UE may transmit PUSCH communications in the scheduled CG occasions **505** based at least in part on the communication parameters indicated in the CG reactivation DCI.

In some cases, such as when the network entity needs to override a scheduled CG communication for a higher priority communication, the network entity may transmit CG cancellation DCI to the UE to temporarily cancel or deactivate one or more subsequent CG occasions **505** for the UE. The CG cancellation DCI may deactivate only a subsequent one CG occasion **505** or a subsequent N CG occasions **505** (where N is an integer). CG occasions **505** after the one or more (e.g., N) CG occasions **505** subsequent to the CG cancellation DCI may remain activated. Based at least in part on receiving the CG cancellation DCI, the UE may refrain from transmitting in the one or more (e.g., N) CG occasions **505** subsequent to receiving the CG cancellation DCI. As shown in example **500**, the CG cancellation DCI cancels one subsequent CG occasion **505** for the UE. After the CG occasion **505** (or N CG occasions) subsequent to receiving the CG cancellation DCI, the UE may automatically resume transmission in the scheduled CG occasions **505**.

The network entity may transmit CG release DCI to the UE to deactivate the CG configuration for the UE. The UE may stop transmitting in the scheduled CG occasions **505** based at least in part on receiving the CG release DCI. For example, the UE may refrain from transmitting in any scheduled CG occasions **505** until another CG activation DCI is received from the base station. Whereas the CG cancellation DCI may deactivate only a subsequent one CG occasion **505** or a subsequent N CG occasions **505**, the CG release DCI deactivates all subsequent CG occasions **505** for a given CG configuration for the UE until the given CG configuration is activated again by a new CG activation DCI.

With dynamic grants, RB allocation in the uplink may match the information bits of a communication and thus use less power. However, transmitting an SR and waiting for an uplink grant increases latency. With CG, RB allocation might be more than what is needed for the UE information bits, and more power may be consumed than necessary. The UE will have to pad the information bits such that all the allocated resources to the UE are used. If the UE has no information bits, (no packet convergence data protocol PDCP packets pending) or fewer information bits, the UE may still be required to transmit over the allocation resources.

As indicated above, FIG. **5** is provided as an example. Other examples may differ from what is described with respect to FIG. **5**.

FIG. **6** is a diagram illustrating an example **600** of skipping a communication associated with a grant, in accordance with the present disclosure.

With CG scheduling, resource allocation may be large, resource utilization may be high, interference in the uplink may increase, and power consumption may be higher. The higher power consumption may increase the thermal properties of the UE, which may be an important issue for extended reality (XR) devices or augmented reality (AR) devices.

In some aspects, a UE may skip or ignore a communication associated with a grant, whether a dynamic grant or a CG. Otherwise, the UE transmits padded bits over the allocated resources (e.g., RBs), even though the information bits may not require the allocated number of RBs for transmission. The allocated number of RBs may be an overallocation.

Example **600** shows that a UE may skip a communication associated with a grant. As shown by reference number **605**, the UE may receive a configuration (e.g., via RRC) that configures the UE to be able to skip a communication associated with a grant. As shown by reference number **610**, the UE may receive the grant for an uplink communication. As shown by reference number **615**, the UE may transmit the uplink communication (e.g., MAC protocol data unit (PDU)) if data is available. Power consumption may increase if the grant is larger. If no data is available, the UE may not transmit the uplink communication. However, latency may increase if there are a few bits that need to be transmitted, because the bits may be transmitted in a later MAC PDU.

As indicated above, FIG. **6** is provided as an example. Other examples may differ from what is described with respect to FIG. **6**.

FIG. **7** is a diagram illustrating an example **700** of skipping resources of a grant, in accordance with the present disclosure.

In some aspects, a UE may skip resources of a grant rather than skipping the grant altogether. Example **700** shows resources of a grant for a MAC PDU that include skipped resources **702** (resources that will be skipped) and non-skipped resources **704** (resources that will not be skipped). This flexible uplink skipping may enable the UE to select a subset of resources of the grant (and in effect select a subset of the resources of the grant to skip) based at least in part on a size of the payload. As a result, the UE conserves power by not transmitting over all of the resources of the grant. In some aspects, the UE may provide a skipping indication that indicates that the UE is skipping resources of the grant and/or using only a subset (e.g., a non-zero proper subset) of resources of the grant. The skipping indication may indicate the skipped resources and/or the non-skipped resources.

Example **700** shows a UE that may transmit over a subset of granted resources. As shown by reference number **705**, the UE may receive a configuration for flexible uplink skipping (e.g., via RRC signaling). As shown by reference number **710**, the UE may receive an uplink grant for a communication (e.g., new uplink transmission). The grant may include a number of allocated RBs (total amount of RBs). As shown by reference number **715**, if data is available, the UE may determine if an amount of data in the buffer satisfies a data threshold. For example, as shown by reference number **720**, if a number of bits in the buffer requires less than the total amount of RBs, the UE may transmit over a subset of the total quantity of RBs. If the amount of data to be transmitted does not requires less than the total quantity of RBs, the UE may transmit the data over the total quantity of RBs (using all of the RBs). By using a subset of the total quantity of RBs rather than no RBs or all of the RBs, the UE may reduce power consumption, conserve signaling resources, and reduce delay.

In some aspects, the UE may transmit UCI **722** that includes a skipping indication that informs the network entity of the skipped resources **702** and that the network entity may decode only the non-skipped resources **704** for an uplink MAC PDU. The UCI may a flexible uplink skipping (FUS) UCI, or a UCI-FUS. The UCI-FUS may indicate which resources have been skipped, such as a quantity of RBs that are skipped or an indication of time and frequency resources that are skipped (e.g., slot numbers, symbol numbers, RB numbers, and/or RB group numbers). The UCI-FUS may alternatively indicate which resources have not been skipped, and the network entity may determine the skipped resources **702** from the indication of the non-skipped resources **704**. The UCI-FUS may be transmitted on the PUCCH, which may be on the same slot as a PUSCH communication or on different slots. That is, the UCI-FUS may be used to adapt the transport block (TB) size.

As indicated above, FIG. **7** is provided as an example. Other examples may differ from what is described with respect to FIG. **7**.

FIG. **8** is a diagram illustrating an example **800** of a skipping indication, in accordance with the present disclosure.

Example **800** shows a skipping indication in UCI that indicates resources that are skipped as part of uplink flexible skipping, or a UCI-FUS. The skipped resources may be in the frequency domain and/or the time domain. The skipping indication may indicate, for example, for slot 0, symbols 10-13 are skipped, and PRBs greater than a specified PRB number are skipped. The skipping indication may specify one or more time-frequency sets of resources from among multiple time-frequency sets of resources (e.g., sets of PRBs, sets of symbols). The multiple time-frequency sets may be specified via RRC signaling.

In an example, if there are 14 bits available for the UCI, Set 0 may have 14 most significant bits (MSBs) that indicate a skipping indication across 14 symbols. A bit with a value of 1 may indicate that a symbol is skipped. A bit with a value of 0 may indicate that a symbol is not skipped (all RBs are used). Set 1 may have 14 MSBs that indicate whether the group of RBs in a bandwidth part (BWP) are skipped. The BWP may be divided into 14 RB groups (RBGs), and the 14 MSBs may indicate resources that are skipped over the RBGs. Set 2 may have a finer granularity for time and frequency (and require more bits). Other set definitions that may be used include a set having a pair of bits that indicate both time and frequency skipping. In some aspects, the skipping indication may indicate a TB size for the uplink to help quantify the amount of resources that are needed.

As indicated above, FIG. **8** is provided as an example. Other examples may differ from what is described with regard to FIG. **8**.

FIG. **9** is a diagram illustrating an example **900** of skipping indications, in accordance with the present disclosure. Example **900** shows REs that are used for PUSCH communications, a DMRS, or a phase tracking reference signal (PTRS).

Example **900** shows an example of skipping RBs of a grant but using all symbols of the grant. Example **900** shows that the network entity may reserve some PUSCH REs as a skipping indication in an RB. The skipping indication in the REs may include a type of modulation (e.g., MCS), a zero power, or a specified reference signal. A set of REs may be reserved for the skipping indication. The REs may be configurable via RRC signaling. The skipping indication may include a resource identifier (ID), and a skipping pattern that indicates skipped or used RBs (subcarrier locations) and/or symbols (symbol locations). An RRC configuration may include a pattern type or a location of an RE. Some REs may be unused.

As indicated above, FIG. **9** is provided as an example. Other examples may differ from what is described with regard to FIG. **9**.

FIG. **10** is a diagram illustrating an example **1000** of skipping indications, in accordance with the present disclosure.

Example **1000** shows an example of skipping RBs of a grant but using all symbols of the grant. Example **1000** shows that the network entity may reserve some PUSCH REs as a skipping indication in an RB. The REs may be front-loaded to reduce latency. The components of a PUSCH communication may be based on the quantity of symbols that are used. The skipping indication may indicate RBs (negative skipping) and/or symbols (positive skipping) in each RB.

If an RB is not skipped, the network entity continues to check for reserved REs for a skipping indication in the time domain. If an RB is skipped, the network entity may not continue to check REs for a skipping indication in the time domain. The network entity may determine that symbols past the skipping indication are not used or used, depending on the information in the REs.

As indicated above, FIG. **10** is provided as an example. Other examples may differ from what is described with regard to FIG. **10**.

FIG. **11** is a diagram illustrating an example **1100** of skipping indications, in accordance with the present disclosure.

In some aspects, to ease blind detection at the network entity, the network entity may limit the UE's freedom in selecting resources to skip. While the network entity may allow the UE to skip some resources in the uplink, the network entity may guide the UE skipping mechanism. The network entity may configure, via RRC signaling, a starting PRB where the UE is to transmit when implementing flexible uplink skipping. The network entity may also RRC configure the flexible uplink skipping with an RB comb pattern. Example **1100** shows an example of a comb pattern. The comb pattern may have an RB comb offset. Example **1100** shows an RB comb offset of 4 in example **1100** (there are 3 skipped RBs before transmission at a 4^{th} RB offset). The comb pattern may also have an RE comb offset, which indicates where the skipped RB starts. The comb pattern may limit the quantity of symbols that are skipped.

In some aspects, when the UE transmits over a subset of RBs, the DMRS may be present in the allocated RBs. The UE may first perform coherent energy detection on the DMRS positions. According to the information of the time-frequency location where the DMRS is detected, any strong signal detected by the network entity on the DMRS configured resources is considered to be a valid DMRS in a used RB. An energy detection threshold may be maintained by the network entity, and a separate energy detection threshold can be defined for single user MIMO (SU-MIMO) or multi-user MIMO

In some aspects, a power level of the subset of resources may be higher than a power level of another set of resources. RBs that contain uplink communications may be at power levels higher than unused RBs. The network entity may maintain a power level threshold to determine the power level of the unused subset of resources is higher than a power level of a used subset of resources.

As indicated above, FIG. **11** is provided as an example. Other examples may differ from what is described with regard to FIG. **11**.

FIG. **12** is a diagram illustrating examples **1200** and **1202** of configured grant occasions, in accordance with the present disclosure.

One or more grant configurations may be activated, and each grant configuration may specify multiple grant occasions, such as multiple CG occasions for CG. Alternatively, CG occasions may belong to the same legacy semi-static configuration. In addition to CG transmissions for a TB, K retransmissions may be configured for the TB (via RRC signaling) to improve transmission reliability. Example **1200** shows multiple CG occasions for transmissions and for retransmissions, which may be configured with a periodicity and an offset.

Example **1202** shows there may be flexible uplink skipping for multiple grant occasions, whether for CG, PUSCH grants, or dynamic grants. The UE may transmit a UCI-FUS before each CG occasion that has skipped resources. However, there may be multiple UCI-FUSs that consume signaling overhead.

As indicated above, FIG. **12** provides some examples. Other examples may differ from what is described with regard to FIG. **12**.

FIG. **13** is a diagram illustrating an example **1300** of a skipping indication for multiple grant occasions, in accordance with the present disclosure.

According to various aspects described herein, a UE may select skipped resources (first resources to be skipped) in each grant occasion of multiple grant occasions to skip for communications on a physical uplink channel and transmit a single UCI (e.g., UCI-FUS) that indicates the skipped resources of the multiple grant occasions. The single UCI may also indicate non-skipped resources (second resources that are not to be skipped) such that the network entity derives the skipped resources from the non-skipped resources. That is, the single UCI may effectively indicate the skipped resources when indicating the non-skipped resources. The multiple grant occasions may belong to a single grant configuration (e.g., semi-static CG activated by DCI, grant for PUSCH transmissions) or to multiple grant configurations.

Example **1300** shows a single UCI-FUS **1302** that indicates a skipping pattern **1304** that applies to multiple grant occasions, such as CG occasion **1306** and CG occasion **1308**. The UCI-FUS **1302** may be transmitted over PUCCH resources that are configured by a network entity. This may enable the network entity to control how often the UCI-FUS is transmitted. If additional data arrives and the skipping indication is no longer valid, the UE may transmit a new UCI-FUS to reconfigure the skipping over the remaining CG occasions. For example, the UE may select a different skipping pattern **1310** that is indicated with a single UCI-FUS **1312** that applies to CG occasion **1314** and CG occasion **1316**.

In some aspects, the UE may indicate a skipping pattern (e.g., pattern over symbols and RBs) using a bitmap (e.g., bits indicating time and/or frequency resources). The UE may also receive an RRC configuration of the skipping pattern and indicate an index corresponding to the skipping pattern, instead of a bitmap, to reduce overhead. That is, the UCI-FUS may carry just an index that corresponds to a skipping pattern in a grant occasion for which the actual skipping configuration is RRC configured.

As indicated above, FIG. **13** is provided as an example. Other examples may differ from what is described with regard to FIG. **13**.

FIG. **14** is a diagram illustrating an example **1400** of skipping resources of a grant, in accordance with the present disclosure. As shown in FIG. **14**, a network entity **1410** (e.g., base station **110**) and a UE **1420** (e.g., UE **120**) may communicate with one another via a wireless network (e.g., wireless network **100**).

As shown by reference number **1425**, the UE **1420** may select skipped resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel (e.g., PUCCH, PUSCH). As shown by reference number **1430**, the UE **1420** may transmit an indication (e.g., UCI-FUS) that indicates the skipped resources of the multiple grant occasions. The UE **1420** may alternatively indicate non-skipped resources such that the skipped resources can be derived. As shown by reference number **1435**, the UE **1420** may transmit the communications in the multiple grant occasions using the non-skipped resources and not the skipped resources.

As shown by reference number **1440**, the network entity **1410** decode the communications in the non-skipped resources and not in the skipped resources. As a result, the network entity **1410** and the UE **1420** conserve processing resources, signaling resources, and power. By using a single UCI for multiple grant occasions rather than UCI for each grant occasion, the network entity **1410** and the UE **1420** conserve additional processing resources and signaling resources.

In some aspects, the UE **1420** may indicate a skipping pattern for retransmission, such as for K retransmissions. As shown by reference number **1445**, the UE **1420** may transmit UCI that indicates skipped resources or non-skipped resources for K retransmissions in multiple grant occasions. The UCI may be a UCI-FUS that indicates a skipping pattern. As shown by reference number **1450**, the UE **1420** may transmit the retransmissions in the multiple grant occasions using the non-skipped resources and not using the skipped resources. The skipping pattern may explicitly indicate the skipped resources and/or the non-skipped resources.

In some aspects, the UE **1420** may transmit a cancellation indication, as shown by reference number **1455**, which may be included in UCI. The UE **1420** may not transmit a new UCI-FUS after the cancellation indication, and the UE **1420** may continue to use all resources in the grant occasions without skipping resources.

As indicated above, FIG. **14** is provided as an example. Other examples may differ from what is described with regard to FIG. **14**.

FIG. **15** is a diagram illustrating examples **1500** and **1502** of using UCI to indicate skipped resources or non-skipped resources for retransmissions, in accordance with the present disclosure.

The skipping pattern used for retransmissions may be indicated by a time and frequency bitmap in the UCI-FUS. This allows for maximum flexibility and allows the UE **1420** to transmit over different sets of resources. For example, a bitmap in the UCI-FUS for each CG occasion of the retransmissions may include or be indicated by 14 MSBs that indicate a skipping pattern over 14 symbols. In another example, the MSBs may indicate whether RBs or a RBGs in a BWP are skipped. More bits may be used to indicate a bitmap with finer time and frequency granularity. In some aspects, the network entity **1410** may use RRC signaling to configure skipping patterns, and the network entity **1410** may use an index for a skipping pattern, instead of a bitmap, to reduce overhead of the UCI-FUS. In this way, the UCI-FUS may include an index for a skipping pattern rather than using more information to detail the skipping pattern.

Different skipping patterns may be indicated by a single UCI-FUS to conserve signaling resources while improving time and frequency diversity gains. Example **1500** shows a UCI-FUS **1504** that indicates a first skipping pattern **1506** for the first two retransmissions and a second skipping pattern **1508** for the last two retransmissions. The first skipping pattern **1506** and the second skipping pattern **1508** in example **1500** use half the resources (e.g., RBs) of a CG occasion for the MAC PDU but hop frequencies or RBs over the total quantity of retransmissions. This improves frequency diversity and improves reliability while conserving signaling resources. The network entity **1410** may enable and/or control the frequency hopping schemes. Time diversity may also be applied.

Example **1502** shows that a single UCI-FUS **1510** may indicate the same skipping pattern **1512** for not only initial transmissions but for any retransmissions. The UE **1420** may transmit the UCI-FUS **1510** before the first initial transmission. In some aspects, the UCI-FUS **1510** may include an additional bit that indicates that the retransmissions are to skip the resources of the same skipping pattern **1512**. For example, if the bit is set to “1”, all of the multiple CG occasions (belonging to K retransmissions) may have time and frequency resources that are skipped similarly. If the bit is set to "0", the network entity **1410** may expect the UCI-FUS **1510** to either include a skipping pattern (e.g., bitmap) for the multiple CG occasions or expect that a UCI-FUS is to be transmitted before every CG occasion. Bitmaps may explicitly indicate skipped resources. Bitmaps may also indicate non-skipped resources such that the skipped resources can be derived from resources of a grant occasion (a sum of the skipped resources and non-skipped resources equal a total of the resources of a grant occasion). That is, whether the bitmap explicitly indicates skipped resources or non-skipped resources, the bitmap effectively indicates skipped resources. This also applies to skipping patterns that are indicated.

Note that while CG occasions are used as examples of the multiple grant occasions, the multiple grant occasions may include grants for multiple PUSCH communications, which may be overallocated in anticipation of incoming packets. The UCI-FUS may also be used for a dynamic grant of multiple grant occasions.

As indicated above, FIG. **15** provides some examples. Other examples may differ from what is described with regard to FIG. **15**.

FIG. **16** is a diagram illustrating an example process **1600** performed, for example, by a UE, in accordance with the present disclosure. Example process **1600** is an example where the UE (e.g., UE **120**, UE **1420**) performs operations associated with skipped resources for multiple grants.

As shown in FIG. **16**, in some aspects, process **1600** may include selecting first resources to skip (skipped resources) in each grant occasion of multiple grant occasions for communications on a physical uplink channel (block **1610**). For example, the UE (e.g., using communication manager **1808** and/or selection component **1810** depicted in FIG. **18**) may select first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel, as described above.

As further shown in FIG. **16**, in some aspects, process **1600** may include transmitting UCI that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions (block **1620**). For example, the UE (e.g., using communication manager **1808** and/or transmission component **1804** depicted in FIG. **18**) may transmit UCI that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions, as described above.

As further shown in FIG. **16**, in some aspects, process **1600** may include transmitting the communications in the multiple grant occasions using the second resources and not the first resources (block **1630**). For example, the UE (e.g., using communication manager **1808** and/or transmission component **1804** depicted in FIG. **18**) may transmit the communications in the multiple grant occasions using the second resources and not the first resources, as described above.

Process **1600** may include additional aspects, such as any single aspect or any combination of aspects described below and/or in connection with one or more other processes described elsewhere herein.

In a first aspect, the UCI indicates a quantity of the multiple grant occasions with the first resources.

In a second aspect, alone or in combination with the first aspect, process **1600** includes transmitting a cancellation indication that indicates that resources are no longer skipped in grant occasions, and transmitting additional communications without skipping resources.

In a third aspect, alone or in combination with one or more of the first and second aspects, the first resources include one or more of time resources or frequency resources.

In a fourth aspect, alone or in combination with one or more of the first through third aspects, selecting the first resources in each grant occasion includes receiving an indication of a skipping pattern or a bitmap of the first resources in each grant occasion.

In a fifth aspect, alone or in combination with one or more of the first through fourth aspects, the UCI includes a bitmap that indicates the first resources in each grant occasion of the multiple grant occasions.

In a sixth aspect, alone or in combination with one or more of the first through fifth aspects, the UCI includes an index that corresponds to a skipping pattern of the first resources in each grant occasion.

In a seventh aspect, alone or in combination with one or more of the first through sixth aspects, the UCI indicates one or more time and frequency bitmaps for the first resources in a specified quantity of retransmissions.

In an eighth aspect, alone or in combination with one or more of the first through seventh aspects, a quantity of most significant bits in the UCI indicate the one or more time and frequency bitmaps.

In a ninth aspect, alone or in combination with one or more of the first through eighth aspects, the UCI includes an index that corresponds to the one or more time and frequency bitmaps.

In a tenth aspect, alone or in combination with one or more of the first through ninth aspects, the one or more time and frequency bitmaps are associated with a frequency hopping scheme.

In an eleventh aspect, alone or in combination with one or more of the first through tenth aspects, transmitting the UCI includes transmitting the UCI before an initial transmission in the multiple grant occasions, and the first resources apply to retransmissions in the multiple grant occasions.

In a twelfth aspect, alone or in combination with one or more of the first through eleventh aspects, the UCI includes a bit that indicates whether the first resources apply to each of the multiple grant occasions.

In a thirteenth aspect, alone or in combination with one or more of the first through twelfth aspects, the multiple grant occasions include configured grant occasions.

In a fourteenth aspect, alone or in combination with one or more of the first through thirteenth aspects, the multiple grant occasions include grants for transmissions on a PUSCH.

Although FIG. **16** shows example blocks of process **1600**, in some aspects, process **1600** may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. **16**. Additionally, or alternatively, two or more of the blocks of process **1600** may be performed in parallel.

FIG. **17** is a diagram illustrating an example process **1700** performed, for example, by a network entity, in accordance with the present disclosure. Example process **1700** is an example where the network entity (e.g., base station **110**, network entity **1410**) performs operations associated with skipped resources for multiple grants.

As shown in FIG. **17**, in some aspects, process **1700** may include receiving UCI that indicates first resources (skipped resources) or second resources (non-skipped resources) of multiple grant occasions, the first resources in each grant occasion being skipped for communications on a physical uplink channel and the second resources not being skipped (block **1710**). For example, the network entity (e.g., using communication manager **1908** and/or reception component **1902** depicted in FIG. **19**) may receive UCI that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being skipped for communications on a physical uplink channel and the second resources not being skipped, as described above.

As further shown in FIG. **17**, in some aspects, process **1700** may include receiving the communications in the multiple grant occasions (block **1720**). For example, the network entity (e.g., using communication manager **1908** and/or reception component **1902** depicted in FIG. **19**) may receive the communications in the multiple grant occasions, as described above.

As further shown in FIG. **17**, in some aspects, process **1700** may include decoding the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI (block **1730**). For example, the network entity (e.g., using communication manager **1908** and/or decoding component **1910** depicted in FIG. **19**) may decode the communications in the second resources and not decode the communications in the first resources based at least in part on the UCI, as described above.

Process **1700** may include additional aspects, such as any single aspect or any combination of aspects described below and/or in connection with one or more other processes described elsewhere herein.

In a first aspect, the UCI indicates a quantity of the multiple grant occasions with the first resources.

In a second aspect, alone or in combination with the first aspect, process **1700** includes receiving a cancellation indication that indicates that resources are no longer skipped in grant occasions, and decoding additional communications without skipping resources.

In a third aspect, alone or in combination with one or more of the first and second aspects, process **1700** includes transmitting an indication of a skipping pattern or bitmap of the first resources in each grant occasion.

In a fourth aspect, alone or in combination with one or more of the first through third aspects, the UCI includes a bitmap that indicates the first resources in each grant occasion for the multiple grant occasions, and decoding the communications includes skipping decoding in the first resources.

In a fifth aspect, alone or in combination with one or more of the first through fourth aspects, the UCI includes an index that corresponds to a skipping pattern of the first resources in each grant occasion, and decoding the communications includes skipping decoding in the skipping pattern that corresponds to the index.

In a sixth aspect, alone or in combination with one or more of the first through fifth aspects, the UCI indicates one or more time and frequency bitmaps for the first resources in a specified quantity of retransmissions, and decoding the communications includes skipping decoding in the first resources for the specified quantity of retransmissions.

In a seventh aspect, alone or in combination with one or more of the first through sixth aspects, the UCI includes an index that corresponds to the one or more time and frequency bitmaps.

In an eighth aspect, alone or in combination with one or more of the first through seventh aspects, the one or more time and frequency bitmaps are associated with a frequency hopping scheme.

In a ninth aspect, alone or in combination with one or more of the first through eighth aspects, receiving the UCI includes receiving the UCI before an initial transmission in the multiple grant occasions, and decoding the communications includes skipping decoding in the first resources for retransmissions in the multiple grant occasions.

In a tenth aspect, alone or in combination with one or more of the first through ninth aspects, the UCI includes a bit that indicates whether the first resources apply to each of the multiple grant occasions.

In an eleventh aspect, alone or in combination with one or more of the first through tenth aspects, the multiple grant occasions include configured grant occasions.

In a twelfth aspect, alone or in combination with one or more of the first through eleventh aspects, the multiple grant occasions include grants for transmissions on a PUSCH.

Although FIG. **17** shows example blocks of process **1700**, in some aspects, process **1700** may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. **17**. Additionally, or alternatively, two or more of the blocks of process **1700** may be performed in parallel.

FIG. **18** is a diagram of an example apparatus **1800** for wireless communication, in accordance with the present disclosure. The apparatus **1800** may be a UE (e.g., UE **120**, UE **1420**), or a UE may include the apparatus **1800**. In some aspects, the apparatus **1800** includes a reception component **1802** and a transmission component **1804**, which may be in communication with one another (for example, via one or more buses and/or one or more other components). As shown, the apparatus **1800** may communicate with another apparatus **1806** (such as a UE, a base station, or another wireless communication device) using the reception component **1802** and the transmission component **1804**. As further shown, the apparatus **1800** may include the communication manager **1808**. The communication manager **1808** may control and/or otherwise manage one or more operations of the reception component **1802** and/or the transmission component **1804**. In some aspects, the communication manager **1808** may include one or more antennas, a modem, a controller/processor, a memory, or a combination thereof, of the UE described in connection with FIG. **2**. The communication manager **1808** may be, or be similar to, the communication manager **140** depicted in FIGS. **1** and **2**. For example, in some aspects, the communication manager **1808** may be configured to perform one or more of the functions described as being performed by the communication manager **140**. In some aspects, the communication manager **1808** may include the reception component **1802** and/or the transmission component **1804**. The communication manager **1808** may include a selection component **1810**, among other examples.

In some aspects, the apparatus **1800** may be configured to perform one or more operations described herein in connection with FIGS. **1-15**. Additionally, or alternatively, the apparatus **1800** may be configured to perform one or more processes described herein, such as process **1600** of FIG. **16**. In some aspects, the apparatus **1800** and/or one or more components shown in FIG. **18** may include one or more components of the UE described in connection with FIG. **2**. Additionally, or alternatively, one or more components shown in FIG. **18** may be implemented within one or more components described in connection with FIG. **2**. Additionally, or alternatively, one or more components of the set of components may be implemented at least in part as software stored in a memory. For example, a component (or a portion of a component) may be implemented as instructions or code stored in a non-transitory computer-readable medium and executable by a controller or a processor to perform the functions or operations of the component.

The reception component **1802** may receive communications, such as reference signals, control information, data communications, or a combination thereof, from the apparatus **1806**. The reception component **1802** may provide received communications to one or more other components of the apparatus **1800**. In some aspects, the reception component **1802** may perform signal processing on the received communications (such as filtering, amplification, demodulation, analog-to-digital conversion, demultiplexing, deinterleaving, de-mapping, equalization, interference cancellation, or decoding, among other examples), and may provide the processed signals to the one or more other components of the apparatus **1800**. In some aspects, the reception component **1802** may include one or more antennas, a modem, a demodulator, a MIMO detector, a receive processor, a controller/processor, a memory, or a combination thereof, of the UE described in connection with FIG. **2**.

The transmission component **1804** may transmit communications, such as reference signals, control information, data communications, or a combination thereof, to the apparatus **1806**. In some aspects, one or more other components of the apparatus **1800** may generate communications and may provide the generated communications to the transmission component **1804** for transmission to the apparatus **1806**. In some aspects, the transmission component **1804** may perform signal processing on the generated communications (such as filtering, amplification, modulation, digital-to-analog conversion, multiplexing, interleaving, mapping, or encoding, among other examples), and may transmit the processed signals to the apparatus **1806**. In some aspects, the transmission component **1804** may include one or more antennas, a modem, a modulator, a transmit MIMO processor, a transmit processor, a controller/processor, a memory, or a combination thereof, of the UE described in connection with FIG. **2**. In some aspects, the transmission component **1804** may be co-located with the reception component **1802** in a transceiver.

The selection component **1810** may select first resources (skipped resources) in each grant occasion to skip of multiple grant occasions for communications on a physical uplink channel. The transmission component **1804** may transmit UCI that indicates the first resources or second resources (non-skipped resources) that are not to be skipped in each grant occasion of the multiple grant occasions. The transmission component **1804** may transmit the communications in the multiple grant occasions using the second resources and not using the first resources.

The transmission component **1804** may transmit a cancellation indication that indicates that the first resources are no longer skipped in grant occasions. The transmission component **1804** may transmit additional communications without skipping resources.

The number and arrangement of components shown in FIG. **18** are provided as an example. In practice, there may be additional components, fewer components, different components, or differently arranged components than those shown in FIG. **18**. Furthermore, two or more components shown in FIG. **18** may be implemented within a single component, or a single component shown in FIG. **18** may be implemented as multiple, distributed components. Additionally, or alternatively, a set of (one or more) components shown in FIG. **18** may perform one or more functions described as being performed by another set of components shown in FIG. **18**.

FIG. **19** is a diagram of an example apparatus **1900** for wireless communication, in accordance with the present disclosure. The apparatus **1900** may be a network entity (e.g., a base station **110**, network entity **1410**), or a network entity may include the apparatus **1900**. In some aspects, the apparatus **1900** includes a reception component **1902** and a transmission component **1904**, which may be in communication with one another (for example, via one or more buses and/or one or more other components). As shown, the apparatus **1900** may communicate with another apparatus **1906** (such as a UE, a base station, or another wireless communication device) using the reception component **1902** and the transmission component **1904**. As further shown, the apparatus **1900** may include the communication manager **1908**. The communication manager **1908** may control and/or otherwise manage one or more operations of the reception component **1902** and/or the transmission component **1904**. In some aspects, the communication manager **1908** may include one or more antennas, a modem, a controller/processor, a memory, or a combination thereof, of the network entity described in connection with FIG. **2**. The communication manager **1908** may be, or be similar to, the communication manager **150** depicted in FIGS. **1** and **2**. For example, in some aspects, the communication manager **1908** may be configured to perform one or more of the functions described as being performed by the communication manager **150**. In some aspects, the communication manager **1908** may include the reception component **1902** and/or the transmission component **1904**. The communication manager **1908** may include a decoding component **1910**, among other examples.

In some aspects, the apparatus **1900** may be configured to perform one or more operations described herein in connection with FIGS. **1-15**. Additionally, or alternatively, the apparatus **1900** may be configured to perform one or more processes described herein, such as process **1700** of FIG. **17**. In some aspects, the apparatus **1900** and/or one or more components shown in FIG. **19** may include one or more components of the network entity described in connection with FIG. **2**. Additionally, or alternatively, one or more components shown in FIG. **19** may be implemented within one or more components described in connection with FIG. **2**. Additionally, or alternatively, one or more components of the set of components may be implemented at least in part as software stored in a memory. For example, a component (or a portion of a component) may be implemented as instructions or code stored in a non-transitory computer-readable medium and executable by a controller or a processor to perform the functions or operations of the component.

The reception component **1902** may receive communications, such as reference signals, control information, data communications, or a combination thereof, from the apparatus **1906**. The reception component **1902** may provide received communications to one or more other components of the apparatus **1900**. In some aspects, the reception component **1902** may perform signal processing on the received communications (such as filtering, amplification, demodulation, analog-to-digital conversion, demultiplexing, deinterleaving, de-mapping, equalization, interference cancellation, or decoding, among other examples), and may provide the processed signals to the one or more other components of the apparatus **1900**. In some aspects, the reception component **1902** may include one or more antennas, a modem, a demodulator, a MIMO detector, a receive processor, a controller/processor, a memory, or a combination thereof, of the network entity described in connection with FIG. 2.

The transmission component 1904 may transmit communications, such as reference signals, control information, data communications, or a combination thereof, to the apparatus 1906. In some aspects, one or more other components of the apparatus 1900 may generate communications and may provide the generated communications to the transmission component 1904 for transmission to the apparatus 1906. In some aspects, the transmission component 1904 may perform signal processing on the generated communications (such as filtering, amplification, modulation, digital-to-analog conversion, multiplexing, interleaving, mapping, or encoding, among other examples), and may transmit the processed signals to the apparatus 1906. In some aspects, the transmission component 1904 may include one or more antennas, a modem, a modulator, a transmit MIMO processor, a transmit processor, a controller/processor, a memory, or a combination thereof, of the network entity described in connection with FIG. 2. In some aspects, the transmission component 1904 may be co-located with the reception component 1902 in a transceiver.

The reception component 1902 may receive UCI that indicates first resources (skipped resources) or second resources (non-skipped resources) in each grant occasion of multiple grant occasions, the first resources in each grant occasion being skipped for communications on a physical uplink channel and the second resources not being skipped. The reception component 1902 may receive the communications in the multiple grant occasions. The decoding component 1910 may decode the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI.

The reception component 1902 may receive a cancellation indication that indicates that resources are no longer skipped in grant occasions. The decoding component 1910 may decode additional communications without skipping resources.

The transmission component 1904 may transmit an indication of a skipping pattern or bitmap of the first resources in each grant occasion.

The number and arrangement of components shown in FIG. 19 are provided as an example. In practice, there may be additional components, fewer components, different components, or differently arranged components than those shown in FIG. 19. Furthermore, two or more components shown in FIG. 19 may be implemented within a single component, or a single component shown in FIG. 19 may be implemented as multiple, distributed components. Additionally, or alternatively, a set of (one or more) components shown in FIG. 19 may perform one or more functions described as being performed by another set of components shown in FIG. 19.

The following provides an overview of some Aspects of the present disclosure:

Aspect 1: A method of wireless communication performed by a user equipment (UE), comprising: selecting first resources to skip in each grant occasion of multiple grant occasions for communications on a physical uplink channel; transmitting uplink control information (UCI) that indicates the first resources or second resources that are not to be skipped in each grant occasion of the multiple grant occasions; and transmitting the communications in the multiple grant occasions using the second resources and not the first resources.

Aspect 2: The method of Aspect 1, wherein the UCI indicates a quantity of the multiple grant occasions.

Aspect 3: The method of Aspect 1 or 2, further comprising: transmitting a cancellation indication that indicates that the first resources are no longer skipped in grant occasions; and transmitting additional communications without skipping resources.

Aspect 4: The method of any of Aspects 1-3, wherein the first resources include one or more of time resources or frequency resources.

Aspect 5: The method of any of Aspects 1-4, wherein selecting the first resources in each grant occasion includes receiving an indication of a skipping pattern or a bitmap of the first resources in each grant occasion.

Aspect 6: The method of any of Aspects 1-5, wherein the UCI includes a bitmap that indicates the first resources in each grant occasion of the multiple grant occasions.

Aspect 7: The method of any of Aspects 1-5, wherein the UCI includes an index that corresponds to a skipping pattern of the first resources in each grant occasion.

Aspect 8: The method of any of Aspects 1-7, wherein the UCI indicates one or more time and frequency bitmaps for the first resources in a specified quantity of retransmissions.

Aspect 9: The method of Aspect 8, wherein a quantity of most significant bits in the UCI indicate the one or more time and frequency bitmaps.

Aspect 10: The method of Aspect 8, wherein the UCI includes an index that corresponds to the one or more time and frequency bitmaps.

Aspect 11: The method of any of Aspects 8-10, wherein the one or more time and frequency bitmaps are associated with a frequency hopping scheme.

Aspect 12: The method of any of Aspects 1-11, wherein transmitting the UCI includes transmitting the UCI before an initial transmission in the multiple grant occasions, and wherein the first resources apply to retransmissions in the multiple grant occasions.

Aspect 13: The method of Aspect 12, wherein the UCI includes a bit that indicates whether the first resources apply to each of the multiple grant occasions.

Aspect 14: The method of any of Aspects 1-13, wherein the multiple grant occasions include configured grant occasions.

Aspect 15: The method of any of Aspects 1-14, wherein the multiple grant occasions include grants for transmissions on a physical uplink shared channel.

Aspect 16: A method of wireless communication performed by a network entity, comprising: receiving uplink control information (UCI) that indicates first resources or second resources of multiple grant occasions, the first resources in each grant occasion being skipped for communications on a physical uplink channel and the second resources not being skipped; receiving the communications in the multiple grant occasions; and decoding the communications in the second resources and not decoding the communications in the first resources based at least in part on the UCI.

Aspect 17: The method of Aspect 16, wherein the UCI indicates a quantity of the multiple grant occasions.

Aspect 18: The method of Aspect 16 or 17, further comprising: receiving a cancellation indication that indicates that the first resources are no longer skipped in grant occasions; and decoding additional communications without skipping resources.

Aspect 19: The method of any of Aspects 16-18, further comprising transmitting an indication of a skipping pattern or bitmap of the first resources in each grant occasion.

Aspect 20: The method of any of Aspects 16-19, wherein the UCI includes a bitmap that indicates the first resources in each grant occasion for the multiple grant occasions, and wherein decoding the communications includes skipping decoding in the first resources.

Aspect 21: The method of any of Aspects 16-20, wherein the UCI includes an index that corresponds to a skipping pattern of the first resources in each grant occasion, and wherein decoding the communications includes skipping decoding in the skipping pattern that corresponds to the index.

Aspect 22: The method of any of Aspects 16-21, wherein the UCI indicates one or more time and frequency bitmaps for the first resources in a specified quantity of retransmissions, and wherein decoding the communications includes skipping decoding in the first resources for the specified quantity of retransmissions.

Aspect 23: The method of Aspect 22, wherein the UCI includes an index that corresponds to the one or more time and frequency bitmaps.

Aspect 24: The method of Aspect 22 or 23, wherein the one or more time and frequency bitmaps are associated with a frequency hopping scheme.

Aspect 25: The method of any of Aspects 16-24, wherein receiving the UCI includes receiving the UCI before an initial transmission in the multiple grant occasions, and wherein decoding the communications includes skipping decoding in the first resources for retransmissions in the multiple grant occasions.

Aspect 26: The method of Aspect 25, wherein the UCI includes a bit that indicates whether the first resources apply to each of the multiple grant occasions.

Aspect 27: The method of any of Aspects 16-26, wherein the multiple grant occasions include configured grant occasions.

Aspect 28: The method of any of Aspects 16-27, wherein the multiple grant occasions include grants for transmissions on a physical uplink shared channel.

Aspect 29: An apparatus for wireless communication at a device, comprising a processor; memory coupled with the processor; and instructions stored in the memory and executable by the processor to cause the apparatus to perform the method of one or more of Aspects 1-28.

Aspect 30: A device for wireless communication, comprising a memory and one or more processors coupled to the memory, the one or more processors configured to perform the method of one or more of Aspects 1-28.

Aspect 31: An apparatus for wireless communication, comprising at least one means for performing the method of one or more of Aspects 1-28.

Aspect 32: A non-transitory computer-readable medium storing code for wireless communication, the code comprising instructions executable by a processor to perform the method of one or more of Aspects 1-28.

Aspect 33: A non-transitory computer-readable medium storing a set of instructions for wireless communication, the set of instructions comprising one or more instructions that, when executed by one or more processors of a device, cause the device to perform the method of one or more of Aspects 1-28.

The foregoing disclosure provides illustration and description but is not intended to be exhaustive or to limit the aspects to the precise forms disclosed. Modifications and variations may be made in light of the above disclosure or may be acquired from practice of the aspects.

As used herein, the term "component" is intended to be broadly construed as hardware and/or a combination of hardware and software. "Software" shall be construed broadly to mean instructions, instruction sets, code, code segments, program code, programs, subprograms, software modules, applications, software applications, software packages, routines, subroutines, objects, executables, threads of execution, procedures, and/or functions, among other examples, whether referred to as software, firmware, middleware, microcode, hardware description language, or otherwise. As used herein, a "processor" is implemented in hardware and/or a combination of hardware and software. It will be apparent that systems and/or methods described herein may be implemented in different forms of hardware and/or a combination of hardware and software. The actual specialized control hardware or software code used to implement these systems and/or methods is not limiting of the aspects. Thus, the operation and behavior of the systems and/or methods are described herein without reference to specific software code, since those skilled in the art will understand that software and hardware can be designed to implement the systems and/or methods based, at least in part, on the description herein.

As used herein, "satisfying a threshold" may, depending on the context, refer to a value being greater than the threshold, greater than or equal to the threshold, less than the threshold, less than or equal to the threshold, equal to the threshold, not equal to the threshold, or the like.

Even though particular combinations of features are recited in the claims and/or disclosed in the specification, these combinations are not intended to limit the disclosure of various aspects. Many of these features may be combined in ways not specifically recited in the claims and/or disclosed in the specification. The disclosure of various aspects includes each dependent claim in combination with every other claim in the claim set. As used herein, a phrase referring to "at least one of" a list of items refers to any combination of those items, including single members. As an example, "at least one of: a, b, or c" is intended to cover a, b, c, a+b, a+c, b+c, and a+b+c, as well as any combination with multiples of the same element (e.g., a+a, a+a+a, a+a+b, a+a+c, a+b+b, a+c+c, b+b, b+b+b, b+b+c, c+c, and c+c+c, or any other ordering of a, b, and c).

No element, act, or instruction used herein should be construed as critical or essential unless explicitly described as such. Also, as used herein, the articles "a" and "an" are intended to include one or more items and may be used interchangeably with "one or more." Further, as used herein, the article "the" is intended to include one or more items referenced in connection with the article "the" and may be used interchangeably with "the one or more." Furthermore, as used herein, the terms "set" and "group" are intended to include one or more items and may be used interchangeably with "one or more." Where only one item is intended, the phrase "only one" or similar language is used. Also, as used herein, the terms "has," "have," "having," or the like are intended to be open-ended terms that do not limit an element that they modify (e.g., an element "having" A may also have B). Further, the phrase "based on" is intended to mean "based, at least in part, on" unless explicitly stated otherwise. Also, as used herein, the term "or" is intended to be inclusive when used in a series and may be used interchangeably with "and/or," unless explicitly stated otherwise (e.g., if used in combination with "either" or "only one of").

What is claimed is:

1. A user equipment (UE) for wireless communication, comprising:

one or more memories; and

one or more processors, coupled to the one or more memories, configured to:

select first resources to skip within each configured grant (CG) occasion of multiple CG occasions for communications on a physical uplink channel;

transmit a single flexible uplink skipping (FUS) uplink control information (UCI) (UCI-FUS) that indicates the first resources or second resources that are not to be skipped within each CG occasion of the multiple CG occasions; and

transmit the communications in the multiple CG occasions using resources other than the first resources.

2. The UE of claim **1**, wherein the single UCI-FUS indicates a quantity of the multiple CG occasions.

3. The UE of claim **1**, wherein the one or more processors are configured to:

transmit a cancellation indication that indicates that the first resources are no longer skipped in CG occasions; and

transmit additional communications without skipping resources.

4. The UE of claim **1**, wherein the first resources include one or more of time resources or frequency resources.

5. The UE of claim **1**, wherein the one or more processors, to select the first resources, are configured to receive an indication of a skipping pattern of the first resources or a bitmap of the first resources in each CG occasion.

6. The UE of claim **1**, wherein the single UCI-FUS includes a bitmap that indicates the first resources within each CG occasion of the multiple CG occasions.

7. The UE of claim **1**, wherein the single UCI-FUS includes an index that corresponds to a skipping pattern of the first resources.

8. The UE of claim **1**, wherein the single UCI-FUS indicates one or more time and frequency bitmaps for the first resources in a specified quantity of retransmissions.

9. The UE of claim **8**, wherein a quantity of most significant bits in the single UCI-FUS indicate the one or more time and frequency bitmaps.

10. The UE of claim **8**, wherein the single UCI-FUS includes an index that corresponds to the one or more time and frequency bitmaps.

11. The UE of claim **8**, wherein the one or more time and frequency bitmaps are associated with a frequency hopping scheme.

12. The UE of claim **1**, wherein the one or more processors, to transmit the single UCI-FUS, are configured to transmit the single UCI-FUS before an initial transmission in the multiple CG occasions, and wherein the first resources apply to retransmissions in the multiple CG occasions.

13. The UE of claim **12**, wherein the single UCI-FUS includes a bit that indicates whether the first resources apply to each of the multiple CG occasions.

14. The UE of claim **1**, wherein the multiple CG occasions include CGs for transmissions on a physical uplink shared channel.

15. A network entity for wireless communication, comprising:

one or more memories; and

one or more processors, coupled to the one or more memories, configured to:

receive a single flexible uplink skipping (FUS) uplink control information (UCI) (UCI-FUS) that indicates first resources or second resources of multiple configured grant (CG) occasions, the first resources within each CG occasion being skipped for communications on a physical uplink channel and the second resources not being skipped;

receive the communications in the multiple CG occasions; and

decode the communications in resources other than the first resources based at least in part on the single UCI-FUS.

16. The network entity of claim **15**, wherein the single UCI-FUS indicates a quantity of the multiple CG occasions.

17. The network entity of claim **15**, wherein the one or more processors are configured to:

receive a cancellation indication that indicates that the first resources are no longer skipped in CG occasions; and

decode additional communications without skipping resources.

18. The network entity of claim **15**, wherein the one or more processors are configured to transmit an indication of a skipping pattern of the first resources or bitmap of the first resources in each grant occasion.

19. The network entity of claim **15**, wherein the single UCI-FUS includes a bitmap that indicates the first resources in each CG occasion for the multiple CG occasions, and wherein the one or more processors, to decode the communications, are configured to skip decoding in the first resources.

20. The network entity of claim **15**, wherein the single UCI-FUS includes an index that corresponds to a skipping pattern of the first resources, and

wherein the one or more processors, to decode the communications, are configured to skip decoding in the skipping pattern that corresponds to the index.

21. The network entity of claim **15**, wherein the single UCI-FUS indicates one or more time and frequency bitmaps for the first resources in a specified quantity of retransmissions, and

wherein the one or more processors, to decode the communications, are configured to skip decoding in the first resources for the specified quantity of retransmissions.

22. The network entity of claim **21**, wherein the single UCI-FUS includes an index that corresponds to the one or more time and frequency bitmaps.

23. The network entity of claim **21**, wherein the one or more time and frequency bitmaps are associated with a frequency hopping scheme.

24. The network entity of claim **15**, wherein the one or more processors, to receive the single UCI-FUS, are configured to receive the single UCI-FUS before an initial transmission in the multiple CG occasions, and wherein the one or more processors, to decode the communications, are configured to skip decoding in the first resources for retransmissions in the multiple CG occasions.

25. The network entity of claim **24**, wherein the single UCI-FUS includes a bit that indicates whether the first resources apply to each of the multiple CG occasions.

26. The network entity of claim **15**, wherein the multiple CG occasions include CGs for transmissions on a physical uplink shared channel.

27. A method of wireless communication performed by a user equipment (UE), comprising:

selecting first resources to skip within each configured grant (CG) occasion of multiple CG occasions for communications on a physical uplink channel;

transmitting a single flexible uplink skipping (FUS) uplink control information (UCI) (UCI-FUS) that indicates the first resources or second resources that are not to be skipped within each grant-CG occasion of the multiple grant-CG occasions; and

transmitting the communications in the multiple CG occasions using resources other than the first resources.

28. The method of claim **27**, wherein the single UCI-FUS indicates a quantity of the multiple CG occasions.

29. The method of claim **27**, further comprising:

transmitting a cancellation indication that indicates that the first resources are no longer skipped in CG occasions; and

transmitting additional communications without skipping resources.

30. A method of wireless communication performed by a network entity, comprising:

receiving a single flexible uplink skipping (FUS) uplink control information (UCI) (UCI-FUS) that indicates first resources or second resources of multiple configured grant (CG) occasions, the first resources within each CG occasion being skipped for communications on a physical uplink channel and the second resources not being skipped;

receiving the communications in the multiple CG occasions; and

decoding the communications in resources other than the first resources based at least in part on the single UCI-FUS.

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