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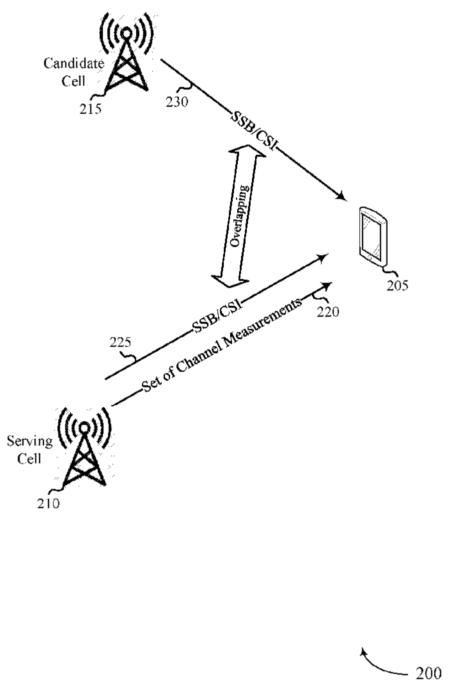

FIG. 2

(57) Abstract: Methods, systems, and devices for wireless communication are described. A user equipment (UE) may receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one (L1) measurement and a second measurement gap associated with one or more of: a second L1 measurement or a layer three measurement of the set of channel measurements. The UE may select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The UE may perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap.

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OVERLAPPING MEASUREMENT GAPS IN LAYER ONE AND LAYER THREE MEASUREMENTS

TECHNICAL FIELD

[0001] The following relates to wireless communication, including overlapping measurement gaps in layer one (L1) and layer three (L3) measurements.

BACKGROUND

[0002] Wireless communications systems are widely deployed to provide various types of communication content such as voice, video, packet data, messaging, broadcast, and so on. These systems may be capable of supporting communication with multiple users by sharing the available system resources (e.g., time, frequency, and power). Examples of such multiple-access systems include fourth generation (4G) systems such as Long Term Evolution (LTE) systems, LTE-Advanced (LTE-A) systems, or LTE-A Pro systems, and fifth generation (5G) systems which may be referred to as New Radio (NR) systems. These systems may employ technologies such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal FDMA (OFDMA), or discrete Fourier transform spread orthogonal frequency division multiplexing (DFT-S-OFDM). A wireless multiple-access communications system may include one or more base stations, each supporting wireless communication for communication devices, which may be known as user equipment (UE).

[0003] In some wireless communications systems, a UE may perform mobility and handover procedures to switch between candidate serving cells. In some cases, however, techniques for performing channel measurements for the candidate serving cells may be improved.

SUMMARY

[0004] The described techniques relate to improved methods, systems, devices, and apparatuses that support overlapping measurement gaps in layer one (L1) and layer three (L3) measurements. For example, the described techniques provide for configuring a user equipment (UE) to perform a set of measurements. For example, one or more signals (e.g., radio resource control (RRC) signaling, or downlink control information (DCI) signaling) may be used to configure or otherwise identify a set of measurements for the UE to perform. The set of measurements may include at least one L1 measurement (e.g., a first L1 measurement) and either another L1 measurement (e.g., a second L1 measurement) or a L3 measurement. Each configured measurement may be associated with a measurement gap, which generally defines when and where (e.g., in the time domain and frequency domain) the UE will monitor for the signal(s) (e.g., such as synchronization signal block (SSB), channel state information-reference signal (CSI-RS), or other reference and/or synchronization signals) to be measured. In some examples, a first measurement gap associated with the first L1 measurement and a second measurement gap associated with the second L1 measurement or L3 measurement may at least partially overlap in the time domain. Accordingly, aspects of the techniques described herein provide for a prioritization between the overlapping measurement gaps when the set of measurements includes a first L1 measurement and a second L1 or an L3 measurement. Broadly, the prioritization may be based on the gap priority of each measurement gap, the periodicity of each measurement gap, a layer-based prioritization (e.g., L3>L1, or vice versa). Accordingly, the UE may perform at least a portion of the set of measurement based on the first measurement gap or the second measurement gap according to the selected measurement gap.

[0005] A method for wireless communications at a user equipment (UE) is described. The method may include receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements, selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap, and performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0006] An apparatus for wireless communications at a UE is described. The apparatus may include at least one processor, and memory coupled with the at least one processor, the memory storing instructions. The instructions may be executable by the at least one processor to cause the UE to receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements, select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap, and perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting.

[0007] Another apparatus for wireless communications at a UE is described. The apparatus may include means for receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements, means for selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap, and means for performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0008] A non-transitory computer-readable medium storing code for communications at a UE is described. The code comprising instructions executable by at least one processor cause the UE to: receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements, select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap, and perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting.

[0009] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, selecting the one of the first measurement gap or the second measurement gap may include operations, features, means, or instructions for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap.

[0010] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, selecting the one of the first measurement gap or the second measurement gap may include operations, features, means, or instructions for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap.

[0011] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, selecting the one of the first measurement gap or the second measurement gap may include operations, features, means, or instructions for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with L1 measurements and a second priority level associated with L3 measurements.

[0012] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the second priority level includes a higher priority level than the first priority level.

[0013] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, selecting the one of the first measurement gap or the second measurement gap may include operations, features, means, or instructions for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with traffic to be communicated based on a result of the first L1 measurement and a second priority level associated with traffic to be communicated based on a result of the one or more of the second L1 measurement or the L3 measurement.

[0014] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, selecting the one of the first measurement gap or the second measurement gap may include operations, features, means, or instructions for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with a first channel state information report to be communicated based on a result of the first L1 measurement and a second priority level associated with a second channel state information report to be communicated based on a result of one or more of the second L1 measurement or the L3 measurement.

[0015] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for determining a first identifier associated with the first channel state information report and a second identifier associated with the second channel state information report, where the first priority level may be based on the first identifier and the second priority level may be based on the second identifier.

[0016] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, selecting the one of the first measurement gap or the second measurement gap may include operations, features, means, or instructions for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity of a first channel state information report to be communicated based on a result of the first L1 measurement and a second periodicity of a second channel state information report to be communicated based on a result of one or more of the second L1 measurement or the L3 measurement.

[0017] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting a channel measurement report in accordance with performing at least the portion of the set of channel measurements using the first measurement gap or the second measurement gap.

[0018] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the first measurement gap and the second measurement gap include inter-frequency measurement gaps.

[0019] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the first measurement gap may be associated with a first channel state information report and the second measurement gap may be associated with a second channel state information report.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 illustrates an example of a wireless communications system that supports overlapping measurement gaps in layer one (L1) and layer three (L3 measurements in accordance with one or more aspects of the present disclosure.

[0021] FIG. 2 illustrates an example of a wireless communication system that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure.

[0022] FIG. 3 illustrates an example of a measurement configuration that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure.

[0023] FIGs. 4 and 5 illustrate block diagrams of devices that support overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure.

[0024] FIG. 6 illustrates a block diagram of a communications manager that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure.

[0025] FIG. 7 illustrates a diagram of a system including a device that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure.

[0026] FIGs. 8 through 10 illustrate flowcharts showing methods that support overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure.

DETAILED DESCRIPTION

[0027] A user equipment (UE) may be scheduled to perform channel measurements to monitor a channel used for wireless communications and to assess new channels that might be used for wireless communications. Such channel measurements may ensure uninterrupted communications for the UE as well as support UE mobility. Conventional measurements may include layer three (L3) measurements in which the UE performs L3 intra- or inter-frequency measurements of the serving and neighboring cell(s) synchronization signal block (SSB) transmissions to determine channel performance. Such measurements may also include layer one (L1) reference signal received power (RSRP) measurements in the active bandwidth part (BWP). In some examples, the UE is configured to perform a set of measurements such that measurement gaps associated with different measurements overlap in the time domain. However, such techniques do not provide for prioritization or handling of L1 measurements and L1 or L3 measurements when the measurement gaps overlap, at least to some degree, in the time domain.

[0028] The described techniques relate to improved methods, systems, devices, and apparatuses that support overlapping measurement gaps in L1 and L3 measurements. For example, the described techniques provide for a UE to be configured to perform a set of measurements. For example, one or more signals (e.g., radio resource control (RRC) signaling or downlink control information (DCI) signaling) may be used to signal or otherwise identify the set of measurements to be performed by the UE. The set of measurements may include at least one L1 measurement (e.g., a first L1 measurement) and either another L1 measurement (e.g., a second L1 measurement) or a L3 measurement. Each configured measurement may be associated with a respective measurement gap, which generally defines when and where (e.g., in the time domain and frequency domain) the UE will monitor for the signal(s) (e.g., such as SSB, channel state information-reference signal (CSI-RS), or other reference and/or synchronization signals) to be measured.

[0029] In some examples, a first measurement gap associated with the first L1 measurement and a second measurement gap associated with the second L1 measurement or L3 measurement may overlap in the time domain, at least to some degree. Accordingly, aspects of the techniques described herein provide for a prioritization between the overlapping measurement gaps when the set of measurement include a L1 measurement and L1 or L3 measurement. Broadly, the prioritization may be based on the gap priority of each measurement gap, the periodicity of each measurement gap or a layer-based prioritization (e.g., L3>L1, or vice versa). Accordingly, the UE may perform at least a portion of the set of measurement based on the first measurement gap or the second measurement gap according to the selected measurement gap.

[0030] Aspects of the disclosure are initially described in the context of wireless communications systems. Aspects of the disclosure are further illustrated by and described with reference to apparatus diagrams, system diagrams, and flowcharts that relate to overlapping measurement gaps in L1 and L3 measurements.

[0031] **FIG. 1** illustrates an example of a wireless communications system 100 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The wireless communications system 100 may include one or more network entities 105, one or more UEs 115, and a core network 130. In some examples, the wireless communications system 100 may be a Long Term Evolution (LTE) network, an LTE-Advanced (LTE-A) network, an LTE-A Pro network, a New Radio (NR) network, or a network operating in accordance with other systems and radio technologies, including future systems and radio technologies not explicitly mentioned herein.

[0032] The network entities 105 may be dispersed throughout a geographic area to form the wireless communications system 100 and may include devices in different forms or having different capabilities. In various examples, a network entity 105 may be referred to as a network element, a mobility element, a radio access network (RAN) node, or network equipment, among other nomenclature. In some examples, network entities 105 and UEs 115 may wirelessly communicate via one or more communication links 125 (e.g., a radio frequency (RF) access link). For example, a network entity 105 may support a coverage area 110 (e.g., a geographic coverage area) over which the UEs

115 and the network entity 105 may establish one or more communication links 125. The coverage area 110 may be an example of a geographic area over which a network entity 105 and a UE 115 may support the communication of signals according to one or more radio access technologies (RATs).

[0033] The UEs 115 may be dispersed throughout a coverage area 110 of the wireless communications system 100, and each UE 115 may be stationary, or mobile, or both at different times. The UEs 115 may be devices in different forms or having different capabilities. Some example UEs 115 are illustrated in FIG. 1. The UEs 115 described herein may be capable of supporting communications with various types of devices, such as other UEs 115 or network entities 105, as shown in FIG. 1.

[0034] As described herein, a node of the wireless communications system 100, which may be referred to as a network node, or a wireless node, may be a network entity 105 (e.g., any network entity described herein), a UE 115 (e.g., any UE described herein), a network controller, an apparatus, a device, a computing system, one or more components, or another suitable processing entity configured to perform any of the techniques described herein. For example, a node may be a UE 115. As another example, a node may be a network entity 105. As another example, a first node may be configured to communicate with a second node or a third node. In one aspect of this example, the first node may be a UE 115, the second node may be a network entity 105, and the third node may be a UE 115. In another aspect of this example, the first node may be a UE 115, the second node may be a network entity 105, and the third node may be a network entity 105. In yet other aspects of this example, the first, second, and third nodes may be different relative to these examples. Similarly, reference to a UE 115, network entity 105, apparatus, device, computing system, or the like may include disclosure of the UE 115, network entity 105, apparatus, device, computing system, or the like being a node. For example, disclosure that a UE 115 is configured to receive information from a network entity 105 also discloses that a first node is configured to receive information from a second node.

[0035] In some examples, network entities 105 may communicate with the core network 130, or with one another, or both. For example, network entities 105 may communicate with the core network 130 via one or more backhaul communication links 120 (e.g., in accordance with an S1, N2, N3, or other interface protocol). In some examples, network entities 105 may communicate with one another via a backhaul communication link 120 (e.g., in accordance with an X2, Xn, or other interface protocol) either directly (e.g., directly between network entities 105) or indirectly (e.g., via a core network 130). In some examples, network entities 105 may communicate with one another via a midhaul communication link 162 (e.g., in accordance with a midhaul interface protocol) or a fronthaul communication link 168 (e.g., in accordance with a fronthaul interface protocol), or any combination thereof. The backhaul communication links 120, midhaul communication links 162, or fronthaul communication links 168 may be or include one or more wired links (e.g., an electrical link, an optical fiber link), one or more wireless links (e.g., a radio link, a wireless optical link), among other examples or various combinations thereof. A UE 115 may communicate with the core network 130 via a communication link 155.

[0036] One or more of the network entities 105 described herein may include or may be referred to as a base station 140 (e.g., a base transceiver station, a radio base station, an NR base station, an access point, a radio transceiver, a NodeB, an eNodeB (eNB), a next-generation NodeB or a giga-NodeB (either of which may be referred to as a gNB), a 5G NB, a next-generation eNB (ng-eNB), a Home NodeB, a Home eNodeB, or other suitable terminology). In some examples, a network entity 105 (e.g., a base station 140) may be implemented in an aggregated (e.g., monolithic, standalone) base station architecture, which may be configured to utilize a protocol stack that is physically or logically integrated within a single network entity 105 (e.g., a single RAN node, such as a base station 140).

[0037] In some examples, a network entity 105 may be implemented in a disaggregated architecture (e.g., a disaggregated base station architecture, a disaggregated RAN architecture), which may be configured to utilize a protocol stack that is physically or logically distributed among two or more network entities 105, such as an integrated access backhaul (IAB) network, an open RAN (O-RAN) (e.g., a network configuration sponsored by the O-RAN Alliance), or a virtualized RAN (vRAN) (e.g., a cloud RAN (C-RAN)). For example, a network entity 105 may include one or more of a central unit (CU) 160, a distributed unit (DU) 165, a radio unit (RU) 170, a RAN Intelligent Controller (RIC) 175 (e.g., a Near-Real Time RIC (Near-RT RIC), a Non-Real Time RIC (Non-RT RIC)), a Service Management and Orchestration

(SMO) 180 system, or any combination thereof. An RU 170 may also be referred to as a radio head, a smart radio head, a remote radio head (RRH), a remote radio unit (RRU), or a transmission reception point (TRP). One or more components of the network entities 105 in a disaggregated RAN architecture may be co-located, or one or more components of the network entities 105 may be located in distributed locations (e.g., separate physical locations). In some examples, one or more network entities 105 of a disaggregated RAN architecture may be implemented as virtual units (e.g., a virtual CU (VCU), a virtual DU (VDU), a virtual RU (VRU)).

[0038] The split of functionality between a CU 160, a DU 165, and an RU 170 is flexible and may support different functionalities depending on which functions (e.g., network layer functions, protocol layer functions, baseband functions, RF functions, and any combinations thereof) are performed at a CU 160, a DU 165, or an RU 170. For example, a functional split of a protocol stack may be employed between a CU 160 and a DU 165 such that the CU 160 may support one or more layers of the protocol stack and the DU 165 may support one or more different layers of the protocol stack. In some examples, the CU 160 may host upper protocol layer (e.g., layer 3 (L3), layer 2 (L2)) functionality and signaling (e.g., Radio Resource Control (RRC), service data adaption protocol (SDAP), Packet Data Convergence Protocol (PDCP)). The CU 160 may be connected to one or more DUs 165 or RUs 170, and the one or more DUs 165 or RUs 170 may host lower protocol layers, such as layer 1 (L1) (e.g., physical (PHY) layer) or L2 (e.g., radio link control (RLC) layer, medium access control (MAC) layer) functionality and signaling, and may each be at least partially controlled by the CU 160. Additionally, or alternatively, a functional split of the protocol stack may be employed between a DU 165 and an RU 170 such that the DU 165 may support one or more layers of the protocol stack and the RU 170 may support one or more different layers of the protocol stack. The DU 165 may support one or multiple different cells (e.g., via one or more RUs 170). In some cases, a functional split between a CU 160 and a DU 165, or between a DU 165 and an RU 170 may be within a protocol layer (e.g., some functions for a protocol layer may be performed by one of a CU 160, a DU 165, or an RU 170, while other functions of the protocol layer are performed by a different one of the CU 160, the DU 165, or the RU 170). A CU 160 may be functionally split further into CU control plane (CU-CP) and CU user plane (CU-UP) functions. A CU 160 may be connected to one or more DUs 165 via a midhaul communication link 162 (e.g., F1, F1-c, F1-u), and a DU 165 may be connected to one or more RUs 170 via a fronthaul communication link 168 (e.g., open fronthaul (FH) interface). In some examples, a midhaul communication link 162 or a fronthaul communication link 168 may be implemented in accordance with an interface (e.g., a channel) between layers of a protocol stack supported by respective network entities 105 that are in communication via such communication links.

[0039] In wireless communications systems (e.g., wireless communications system 100), infrastructure and spectral resources for radio access may support wireless backhaul link capabilities to supplement wired backhaul connections, providing an IAB network architecture (e.g., to a core network 130). In some cases, in an IAB network, one or more network entities 105 (e.g., IAB nodes 104) may be partially controlled by each other. One or more IAB nodes 104 may be referred to as a donor entity or an IAB donor. One or more DUs 165 or one or more RUs 170 may be partially controlled by one or more CUs 160 associated with a donor network entity 105 (e.g., a donor base station 140). The one or more donor network entities 105 (e.g., IAB donors) may be in communication with one or more additional network entities 105 (e.g., IAB nodes 104) via supported access and backhaul links (e.g., backhaul communication links 120). IAB nodes 104 may include an IAB mobile termination (IAB-MT) controlled (e.g., scheduled) by DUs 165 of a coupled IAB donor. An IAB-MT may include an independent set of antennas for relay of communications with UEs 115, or may share the same antennas (e.g., of an RU 170) of an IAB node 104 used for access via the DU 165 of the IAB node 104 (e.g., referred to as virtual IAB-MT (vIAB-MT)). In some examples, the IAB nodes 104 may include DUs 165 that support communication links with additional entities (e.g., IAB nodes 104, UEs 115) within the relay chain or configuration of the access network (e.g., downstream). In such cases, one or more components of the disaggregated RAN architecture (e.g., one or more IAB nodes 104 or components of IAB nodes 104) may be configured to operate according to the techniques described herein.

[0040] For instance, an access network (AN) or RAN may include communications between access nodes (e.g., an IAB donor), IAB nodes 104, and one or more UEs 115. The IAB donor may facilitate connection between the core network 130 and the AN (e.g., via a wired or wireless connection to the core network 130). That is, an IAB donor may refer to a RAN node with a wired or wireless connection to core network 130. The IAB donor may include a CU 160 and at least one DU 165 (e.g., and RU 170), in which case the CU 160 may communicate with the core network 130 via an interface (e.g., a backhaul link). IAB donor and IAB nodes 104 may communicate via an F1 interface according to a protocol that defines signaling messages (e.g., an F1 AP protocol). Additionally, or alternatively, the CU 160 may communicate with the core network via an interface, which may be an example of a portion of backhaul link, and may communicate with other CUs 160 (e.g., a CU 160 associated with an alternative IAB donor) via an Xn-C interface, which may be an example of a portion of a backhaul link.

[0041] An IAB node 104 may refer to a RAN node that provides IAB functionality (e.g., access for UEs 115, wireless self-backhauling capabilities). A DU 165 may act as a distributed scheduling node towards child nodes associated with the IAB node 104, and the IAB-MT may act as a scheduled node towards parent nodes associated with the IAB node 104. That is, an IAB donor may be referred to as a parent node in communication with one or more child nodes (e.g., an IAB donor may relay transmissions for UEs through one or more other IAB nodes 104). Additionally, or alternatively, an IAB node 104 may also be referred to as a parent node or a child node to other IAB nodes 104, depending on the relay chain or configuration of the AN. Therefore, the IAB-MT entity of IAB nodes 104 may provide a Uu interface for a child IAB node 104 to receive signaling from a parent IAB node 104, and the DU interface (e.g., DUs 165) may provide a Uu interface for a parent IAB node 104 to signal to a child IAB node 104 or UE 115.

[0042] For example, IAB node 104 may be referred to as a parent node that supports communications for a child IAB node, or referred to as a child IAB node associated with an IAB donor, or both. The IAB donor may include a CU 160 with a wired or wireless connection (e.g., a backhaul communication link 120) to the core network 130 and may act as parent node to IAB nodes 104. For example, the DU 165 of IAB donor may relay transmissions to UEs 115 through IAB nodes 104, or may directly signal transmissions to a UE 115, or both. The CU 160 of IAB donor may signal communication link establishment via an F1 interface to IAB nodes 104, and the IAB nodes 104 may schedule transmissions (e.g., transmissions to the UEs 115 relayed from the IAB donor) through the DUs 165. That is, data may be relayed to and from IAB nodes 104 via signaling via an NR Uu interface to MT of the IAB node 104. Communications with IAB node 104 may be scheduled by a DU 165 of IAB donor and communications with IAB node 104 may be scheduled by DU 165 of IAB node 104.

[0043] In the case of the techniques described herein applied in the context of a disaggregated RAN architecture, one or more components of the disaggregated RAN architecture may be configured to support overlapping measurement gaps in L1 and L3 measurements as described herein. For example, some operations described as being performed by a UE 115 or a network entity 105 (e.g., a base station 140) may additionally, or alternatively, be performed by one or more components of the disaggregated RAN architecture (e.g., IAB nodes 104, DUs 165, CUs 160, RUs 170, RIC 175, SMO 180).

[0044] A UE 115 may include or may be referred to as a mobile device, a wireless device, a remote device, a handheld device, or a subscriber device, or some other suitable terminology, where the "device" may also be referred to as a unit, a station, a terminal, or a client, among other examples. A UE 115 may also include or may be referred to as a personal electronic device such as a cellular phone, a personal digital assistant (PDA), a multimedia/entertainment device (e.g., a radio, a MP3 player, or a video device), a camera, a gaming device, a navigation/positioning device (e.g., GNSS (global navigation satellite system) devices based on, for example, GPS (global positioning system), Beidou, GLONASS, or Galileo, or a terrestrial-based device), a tablet computer, a laptop computer, a netbook, a smartbook, a personal computer, a smart device, a wearable device (e.g., a smart watch, smart clothing, smart glasses, virtual reality goggles, a smart wristband, smart jewelry (e.g., a smart ring, a smart bracelet)), a drone, a robot/robotic device, a vehicle, a vehicular device, a meter (e.g., parking meter, electric meter, gas meter, water meter), a monitor, a gas pump, an appliance (e.g., kitchen appliance, washing machine, dryer), a location tag, a medical/healthcare device, an implant, a sensor/actuator, a display, or any other suitable device configured to communicate via a wireless or wired medium, or a personal computer. In some examples, a UE 115 may include or be referred to as a wireless local loop (WLL) station, an Internet of Things (IoT) device, an Internet of Everything (IoE) device, or a machine type communications (MTC) device, among other examples, which may be implemented in various objects such as appliances, or vehicles, meters, among other examples.

[0045] The UEs 115 described herein may be able to communicate with various types of devices, such as other UEs 115 that may sometimes act as relays as well as the network entities 105 and the network equipment including macro eNBs or gNBs, small cell eNBs or gNBs, or relay base stations, among other examples, as shown in FIG. 1.

[0046] The UEs 115 and the network entities 105 may wirelessly communicate with one another via one or more communication links 125 (e.g., an access link) using resources associated with one or more carriers. The term "carrier" may refer to a set of RF spectrum resources having a defined physical layer structure for supporting the communication links 125. For example, a carrier used for a communication link 125 may include a portion of a RF spectrum band (e.g., a bandwidth part (BWP)) that is operated according to one or more physical layer channels for a given radio access technology (e.g., LTE, LTE-A, LTE-A Pro, NR). Each physical layer channel may carry acquisition signaling (e.g., synchronization signals, system information), control signaling that coordinates operation for the carrier, user data, or other signaling. The wireless communications system 100 may support communication with a UE 115 using carrier aggregation or multi-carrier operation. A UE 115 may be configured with multiple downlink component carriers and one or more uplink component carriers according to a carrier aggregation configuration. Carrier aggregation may be used with both frequency division duplexing (FDD) and time division duplexing (TDD) component carriers. Communication between a network entity 105 and other devices may refer to communication between the devices and any portion (e.g., entity, sub-entity) of a network entity 105. For example, the terms "transmitting," "receiving," or "communicating," when referring to a network entity 105, may refer to any portion of a network entity 105 (e.g., a base station 140, a CU 160, a DU 165, a RU 170) of a RAN communicating with another device (e.g., directly or via one or more other network entities 105).

[0047] In some examples, such as in a carrier aggregation configuration, a carrier may also have acquisition signaling or control signaling that coordinates operations for other carriers. A carrier may be associated with a frequency channel (e.g., an evolved universal mobile telecommunication system terrestrial radio access (E-UTRA) absolute

RF channel number (EARFCN)) and may be identified according to a channel raster for discovery by the UEs 115. A carrier may be operated in a standalone mode, in which case initial acquisition and connection may be conducted by the UEs 115 via the carrier, or the carrier may be operated in a non-standalone mode, in which case a connection is anchored using a different carrier (e.g., of the same or a different radio access technology).

[0048] The communication links 125 shown in the wireless communications system 100 may include downlink transmissions (e.g., forward link transmissions) from a network entity 105 to a UE 115, uplink transmissions (e.g., return link transmissions) from a UE 115 to a network entity 105, or both, among other configurations of transmissions. Carriers may carry downlink or uplink communications (e.g., in an FDD mode) or may be configured to carry downlink and uplink communications (e.g., in a TDD mode).

[0049] A carrier may be associated with a particular bandwidth of the RF spectrum and, in some examples, the carrier bandwidth may be referred to as a "system bandwidth" of the carrier or the wireless communications system 100. For example, the carrier bandwidth may be one of a set of bandwidths for carriers of a particular radio access technology (e.g., 1.4, 3, 5, 10, 15, 20, 40, or 80 megahertz (MHz)). Devices of the wireless communications system 100 (e.g., the network entities 105, the UEs 115, or both) may have hardware configurations that support communications using a particular carrier bandwidth or may be configurable to support communications using one of a set of carrier bandwidths. In some examples, the wireless communications system 100 may include network entities 105 or UEs 115 that support concurrent communications using carriers associated with multiple carrier bandwidths. In some examples, each served UE 115 may be configured for operating using portions (e.g., a sub-band, a BWP) or all of a carrier bandwidth.

[0050] Signal waveforms transmitted via a carrier may be made up of multiple subcarriers (e.g., using multi-carrier modulation (MCM) techniques such as orthogonal frequency division multiplexing (OFDM) or discrete Fourier transform spread OFDM (DFT-S-OFDM)). In a system employing MCM techniques, a resource element may refer to resources of one symbol period (e.g., a duration of one modulation symbol) and one subcarrier, in which case the symbol period and subcarrier spacing may be inversely related. The quantity of bits carried by each resource element may depend on the modulation scheme (e.g., the order of the modulation scheme, the coding rate of the modulation scheme, or both), such that a relatively higher quantity of resource elements (e.g., in a transmission duration) and a relatively higher order of a modulation scheme may correspond to a relatively higher rate of communication. A wireless communications resource may refer to a combination of an RF spectrum resource, a time resource, and a spatial resource (e.g., a spatial layer, a beam), and the use of multiple spatial resources may increase the data rate or data integrity for communications with a UE 115.

[0051] One or more numerologies for a carrier may be supported, and a numerology may include a subcarrier spacing (Δf) and a cyclic prefix. A carrier may be divided into one or more BWPs having the same or different numerologies. In some examples, a UE 115 may be configured with multiple BWPs. In some examples, a single BWP for a carrier may be active at a given time and communications for the UE 115 may be restricted to one or more active BWPs.

[0052] The time intervals for the network entities 105 or the UEs 115 may be expressed in multiples of a basic time unit which may, for example, refer to a sampling period of $T_s = 1/(\Delta f_{max} \cdot N_f)$ seconds, for which Δf_{max} may represent a supported subcarrier spacing, and N_f may represent a supported discrete Fourier transform (DFT) size. Time intervals of a communications resource may be organized according to radio frames each having a specified duration (e.g., 10 milliseconds (ms)). Each radio frame may be identified by a system frame number (SFN) (e.g., ranging from 0 to 1023).

[0053] Each frame may include multiple consecutively-numbered subframes or slots, and each subframe or slot may have the same duration. In some examples, a frame may be divided (e.g., in the time domain) into subframes, and each subframe may be further divided into a quantity of slots. Alternatively, each frame may include a variable quantity of slots, and the quantity of slots may depend on subcarrier spacing. Each slot may include a quantity of symbol periods (e.g., depending on the length of the cyclic prefix prepended to each symbol period). In some wireless communications systems 100, a slot may further be divided into multiple mini-slots associated with one or more symbols. Excluding the cyclic prefix, each symbol period may be associated with one or more (e.g., N_f) sampling periods. The duration of a symbol period may depend on the subcarrier spacing or frequency band of operation.

[0054] A subframe, a slot, a mini-slot, or a symbol may be the smallest scheduling unit (e.g., in the time domain) of the wireless communications system 100 and may be referred to as a transmission time interval (TTI). In some examples, the TTI duration (e.g., a quantity of symbol periods in a TTI) may be variable. Additionally, or alternatively, the smallest scheduling unit of the wireless communications system 100 may be dynamically selected (e.g., in bursts of shortened TTIs (sTTIs)).

[0055] Physical channels may be multiplexed for communication using a carrier according to various techniques. A physical control channel and a physical data channel may be multiplexed for signaling via a downlink carrier, for example, using one or more of time division multiplexing (TDM) techniques, frequency division multiplexing (FDM) techniques, or hybrid TDM-FDM techniques. A control region (e.g., a control resource set (CORESET)) for a physical control channel may be defined by a set of symbol periods and may extend across the system bandwidth or a subset of the system bandwidth of the carrier. One or more control regions (e.g., CORESETs) may be configured for a set of the UEs 115. For example, one or more of the UEs 115 may monitor or search control regions for control information according to one or more search space sets, and each search space set may include one or multiple control channel candidates in one or more aggregation levels arranged in a cascaded manner. An aggregation level for a control channel candidate may refer to an amount of control channel resources (e.g., control channel elements (CCEs)) associated with encoded information for a control information format having a given payload size. Search space sets may include common search space sets configured for sending control information to multiple UEs 115 and UE-specific search space sets for sending control information to a specific UE 115.

[0056] A network entity 105 may provide communication coverage via one or more cells, for example a macro cell, a small cell, a hot spot, or other types of cells, or any combination thereof. The term "cell" may refer to a logical communication entity used for communication with a network entity 105 (e.g., using a carrier) and may be associated with an identifier for distinguishing neighboring cells (e.g., a physical cell identifier (PCID), a virtual cell identifier (VCID), or others). In some examples, a cell also may refer to a coverage area 110 or a portion of a coverage area 110 (e.g., a sector) over which the logical communication entity operates. Such cells may range from smaller areas (e.g., a structure, a subset of structure) to larger areas depending on various factors such as the capabilities of the network entity 105. For example, a cell may be or include a building, a subset of a building, or exterior spaces between or overlapping with coverage areas 110, among other examples.

[0057] A macro cell generally covers a relatively large geographic area (e.g., several kilometers in radius) and may allow unrestricted access by the UEs 115 with service subscriptions with the network provider supporting the macro cell. A small cell may be associated with a lower-powered network entity 105 (e.g., a lower-powered base station 140), as compared with a macro cell, and a small cell may operate using the same or different (e.g., licensed, unlicensed) frequency bands as macro cells. Small cells may provide unrestricted access to the UEs 115 with service subscriptions with the network provider or may provide restricted access to the UEs 115 having an association with the small cell (e.g., the UEs 115 in a closed subscriber group (CSG), the UEs 115 associated with users in a home or office). A network entity 105 may support one or multiple cells and may also support communications via the one or more cells using one or multiple component carriers.

[0058] In some examples, a carrier may support multiple cells, and different cells may be configured according to different protocol types (e.g., MTC, narrowband IoT (NB-IoT), enhanced mobile broadband (eMBB)) that may provide access for different types of devices.

[0059] In some examples, a network entity 105 (e.g., a base station 140, an RU 170) may be movable and therefore provide communication coverage for a moving coverage area 110. In some examples, different coverage areas 110 associated with different technologies may overlap, but the different coverage areas 110 may be supported by the same network entity 105. In some other examples, the overlapping coverage areas 110 associated with different technologies may be supported by different network entities 105. The wireless communications system 100 may include, for example, a heterogeneous network in which different types of the network entities 105 provide coverage for various coverage areas 110 using the same or different radio access technologies.

[0060] The wireless communications system 100 may support synchronous or asynchronous operation. For synchronous operation, network entities 105 (e.g., base stations 140) may have similar frame timings, and transmissions from different network entities 105 may be approximately aligned in time. For asynchronous operation, network entities 105 may have different frame timings, and transmissions from different network entities 105 may, in some examples, not be aligned in time. The techniques described herein may be used for either synchronous or asynchronous operations.

[0061] Some UEs 115, such as MTC or IoT devices, may be low cost or low complexity devices and may provide for automated communication between machines (e.g., via Machine-to-Machine (M2M) communication). M2M communication or MTC may refer to data communication technologies that allow devices to communicate with one another or a network entity 105 (e.g., a base station 140) without human intervention. In some examples, M2M communication or MTC may include communications from devices that integrate sensors or meters to measure or capture information and relay such information to a central server or application program that uses the information or presents the information to humans interacting with the application program. Some UEs 115 may be designed to collect information or enable automated behavior of machines or other devices. Examples of applications for MTC devices include smart metering, inventory monitoring, water level monitoring, equipment monitoring, healthcare monitoring, wildlife monitoring, weather and geological event monitoring, fleet management and tracking, remote security sensing, physical access control, and transaction-based business charging. In an aspect, techniques disclosed herein may be applicable to MTC or IoT UEs. MTC or IoT UEs may include MTC/enhanced MTC (eMTC, also referred to as CAT-M, Cat M1) UEs, NB-IoT (also referred to as CAT NB1) UEs, as well as other types of UEs. eMTC and NB-IoT may refer to future technologies that may evolve from or may be based on these technologies. For example, eMTC may include FeMTC (further eMTC), eFeMTC (enhanced further eMTC), and mMTC (massive MTC), and NB-IoT may include eNB-IoT (enhanced NB-IoT), and FeNB-IoT (further enhanced NB-IoT).

[0062] Some UEs 115 may be configured to employ operating modes that reduce power consumption, such as half-duplex communications (e.g., a mode that supports one-way communication via transmission or reception, but not transmission and reception concurrently). In some examples, half-duplex communications may be performed at a reduced peak rate. Other power conservation techniques for the UEs 115 include entering a power saving deep sleep mode when not engaging in active communications, operating using a limited bandwidth (e.g., according to narrowband communications), or a combination of these techniques. For example, some UEs 115 may be configured for operation using a narrowband protocol type that is associated with a defined portion or range (e.g., set of subcarriers or resource blocks (RBs)) within a carrier, within a guard-band of a carrier, or outside of a carrier.

[0063] The wireless communications system 100 may be configured to support ultra-reliable communications or low-latency communications, or various combinations thereof. For example, the wireless communications system 100 may be configured to support ultra-reliable low-latency communications (URLLC). The UEs 115 may be designed to support ultra-reliable, low-latency, or critical functions. Ultra-reliable communications may include private communication or group communication and may be supported by one or more services such as push-to-talk, video, or data. Support for ultra-reliable, low-latency functions may include prioritization of services, and such services may be used for public safety or general commercial applications. The terms ultra-reliable, low-latency, and ultra-reliable low-latency may be used interchangeably herein.

[0064] In some examples, a UE 115 may be configured to support communicating directly with other UEs 115 via a device-to-device (D2D) communication link 135 (e.g., in accordance with a peer-to-peer (P2P), D2D, or sidelink protocol). In some examples, one or more UEs 115 of a group that are performing D2D communications may be within the coverage area 110 of a network entity 105 (e.g., a base station 140, an RU 170), which may support aspects of such D2D communications being configured by (e.g., scheduled by) the network entity 105. In some examples, one or more UEs 115 of such a group may be outside the coverage area 110 of a network entity 105 or may be otherwise unable to or not configured to receive transmissions from a network entity 105. In some examples, groups of the UEs 115 communicating via D2D communications may support a one-to-many (1:M) system in which each UE 115 transmits to each of the other UEs 115 in the group. In some examples, a network entity 105 may facilitate the scheduling of resources for D2D communications. In some other examples, D2D communications may be carried out between the UEs 115 without an involvement of a network entity 105.

[0065] In some systems, a D2D communication link 135 may be an example of a communication channel, such as a sidelink communication channel, between vehicles (e.g., UEs 115). In some examples, vehicles may communicate using vehicle-to-everything (V2X) communications, vehicle-to-vehicle (V2V) communications, or some combination of these. A vehicle may signal information related to traffic conditions, signal scheduling, weather, safety, emergencies, or any other information relevant to a V2X system. In some examples, vehicles in a V2X system may communicate with roadside infrastructure, such as roadside units, or with the network via one or more network nodes (e.g., network entities 105, base stations 140, RUs 170) using vehicle-to-network (V2N) communications, or with both.

[0066] The core network 130 may provide user authentication, access authorization, tracking, Internet Protocol (IP) connectivity, and other access, routing, or mobility functions. The core network 130 may be an evolved packet core (EPC) or 5G core (5GC), which may include at least one control plane entity that manages access and mobility (e.g., a mobility management entity (MME), an access and mobility management function (AMF)) and at least one user plane entity that routes packets or interconnects to external networks (e.g., a serving gateway (S-GW), a Packet Data Network (PDN) gateway (P-GW), or a user plane function (UPF)). The control plane entity may manage non-access stratum (NAS) functions such as mobility, authentication, and bearer management for the UEs 115 served by the network entities 105 (e.g., base stations 140) associated with the core network 130. User IP packets may be transferred through the user plane entity, which may provide IP address allocation as well as other functions. The user plane entity may be connected to IP services 150 for one or more network operators. The IP services 150 may include access to the Internet, Intranet(s), an IP Multimedia Subsystem (IMS), or a Packet-Switched Streaming Service.

[0067] The wireless communications system 100 may operate using one or more frequency bands, which may be in the range of 300 megahertz (MHz) to 300 gigahertz (GHz). Generally, the region from 300 MHz to 3 GHz is known as the ultra-high frequency (UHF) region or decimeter band because the wavelengths range from approximately one decimeter to one meter in length. UHF waves may be blocked or redirected by buildings and environmental features, which may be referred to as clusters, but the waves may penetrate structures sufficiently for a macro cell to provide service to the UEs 115 located indoors. Communications using UHF waves may be associated with smaller antennas and shorter ranges (e.g., less than 100 kilometers) compared to communications using the smaller frequencies and longer waves of the high frequency (HF) or very high frequency (VHF) portion of the spectrum below 300 MHz.

[0068] The wireless communications system 100 may also operate using a super high frequency (SHF) region, which may be in the range of 3 GHz to 30 GHz, also known as the centimeter band, or using an extremely high frequency (EHF) region of the spectrum (e.g., from 30 GHz to 300 GHz), also known as the millimeter band. In some examples, the wireless communications system 100 may support millimeter wave (mmW) communications between the UEs 115 and the network entities 105 (e.g., base stations 140, RUs 170), and EHF antennas of the respective devices may be smaller and more closely spaced than UHF antennas. In some examples, such techniques may facilitate using antenna arrays within a device. The propagation of EHF transmissions, however, may be subject to even greater attenuation and shorter range than SHF or UHF transmissions. The techniques disclosed herein may be employed across transmissions that use one or more different frequency regions, and designated use of bands across these frequency regions may differ by country or regulating body.

[0069] The wireless communications system 100 may utilize both licensed and unlicensed RF spectrum bands. For example, the wireless communications system 100 may employ License Assisted Access (LAA), LTE-Unlicensed (LTE-U) radio access technology, or NR technology using an unlicensed band such as the 5 GHz industrial, scientific, and medical (ISM) band. While operating using unlicensed RF spectrum bands, devices such as the network entities 105 and the UEs 115 may employ carrier sensing for collision detection and avoidance. In some examples, operations using unlicensed bands may be based on a carrier aggregation configuration in conjunction with component carriers operating using a licensed band (e.g., LAA). Operations using unlicensed spectrum may include downlink transmissions, uplink transmissions, P2P transmissions, or D2D transmissions, among other examples.

[0070] A network entity 105 (e.g., a base station 140, an RU 170) or a UE 115 may be equipped with multiple antennas, which may be used to employ techniques such as transmit diversity, receive diversity, multiple-input multiple-output (MIMO) communications, or beamforming. The antennas of a network entity 105 or a UE 115 may be located within one or more antenna arrays or antenna panels, which may support MIMO operations or transmit or receive beamforming. For example, one or more base station antennas or antenna arrays may be co-located at an antenna assembly, such as an antenna tower. In some examples, antennas or antenna arrays associated with a network entity 105 may be located at diverse geographic locations. A network entity 105 may include an antenna array with a set of rows and columns of antenna ports that the network entity 105 may use to support beamforming of communications with a UE 115. Likewise, a UE 115 may include one or more antenna arrays that may support various MIMO or beamforming operations. Additionally, or alternatively, an antenna panel may support RF beamforming for a signal transmitted via an antenna port.

[0071] The network entities 105 or the UEs 115 may use MIMO communications to exploit multipath signal propagation and increase spectral efficiency by transmitting or receiving multiple signals via different spatial layers. Such techniques may be referred to as spatial multiplexing. The multiple signals may, for example, be transmitted by the transmitting device via different antennas or different combinations of antennas. Likewise, the multiple signals may be received by the receiving device via different antennas or different combinations of antennas. Each of the multiple signals may be referred to as a separate spatial stream and may carry information associated with the same data stream (e.g., the same codeword) or different data streams (e.g., different codewords). Different spatial layers may be associated with different antenna ports used for channel measurement and reporting. MIMO techniques include single-user MIMO (SU-MIMO), for which multiple spatial layers are transmitted to the same receiving device, and multiple-user MIMO (MU-MIMO), for which multiple spatial layers are transmitted to multiple devices.

[0072] Beamforming, which may also be referred to as spatial filtering, directional transmission, or directional reception, is a signal processing technique that may be used at a transmitting device or a receiving device (e.g., a network entity 105, a UE 115) to shape or steer an antenna beam (e.g., a transmit beam, a receive beam) along a spatial path between the transmitting device and the receiving device. Beamforming may be achieved by combining the signals communicated via antenna elements of an antenna array such that some signals propagating along particular orientations with respect to an antenna array experience constructive interference while others experience destructive interference. The adjustment of signals communicated via the antenna elements may include a transmitting device or a receiving device applying amplitude offsets, phase offsets, or both to signals carried via the antenna elements associated with the device. The adjustments associated with each of the antenna elements may be defined by a beamforming weight set associated with a particular orientation (e.g., with respect to the antenna array of the transmitting device or receiving device, or with respect to some other orientation).

[0073] A network entity 105 or a UE 115 may use beam sweeping techniques as part of beamforming operations. For example, a network entity 105 (e.g., a base station 140, an RU 170) may use multiple antennas or antenna arrays (e.g., antenna panels) to conduct beamforming operations for directional communications with a UE 115. Some signals (e.g., synchronization signals, reference signals, beam selection signals, or other control signals) may be transmitted by a network entity 105 multiple times along different directions. For example, the network entity 105 may transmit a signal according to different beamforming weight sets associated with different directions of transmission. Transmissions along different beam directions may be used to identify (e.g., by a transmitting device, such as a network entity 105, or by a receiving device, such as a UE 115) a beam direction for later transmission or reception by the network entity 105.

[0074] Some signals, such as data signals associated with a particular receiving device, may be transmitted by transmitting device (e.g., a transmitting network entity 105, a transmitting UE 115) along a single beam direction (e.g., a direction associated with the receiving device, such as a receiving network entity 105 or a receiving UE 115). In some examples, the beam direction associated with transmissions along a single beam direction may be determined based on a signal that was transmitted along one or more beam directions. For example, a UE 115 may receive one or more of the signals transmitted by the network entity 105 along different directions and may report to the network entity 105 an indication of the signal that the UE 115 received with a highest signal quality or an otherwise acceptable signal quality.

[0075] In some examples, transmissions by a device (e.g., by a network entity 105 or a UE 115) may be performed using multiple beam directions, and the device may use a combination of digital precoding or beamforming to generate a combined beam for transmission (e.g., from a network entity 105 to a UE 115). The UE 115 may report feedback that indicates precoding weights for one or more beam directions, and the feedback may correspond to a configured set of beams across a system bandwidth or one or more sub-bands. The network entity 105 may transmit a reference signal (e.g., a cell-specific reference signal (CRS), a channel state information reference signal (CSI-RS)), which may be precoded or unprecoded. The UE 115 may provide feedback for beam selection, which may be a precoding matrix indicator (PMI) or codebook-based feedback (e.g., a multi-panel type codebook, a linear combination type codebook, a port selection type codebook). Although these techniques are described with reference to signals transmitted along one or more directions by a network entity 105 (e.g., a base station 140, an RU 170), a UE 115 may employ similar techniques for transmitting signals multiple times along different directions (e.g., for identifying a beam direction for subsequent transmission or reception by the UE 115) or for transmitting a signal along a single direction (e.g., for transmitting data to a receiving device).

[0076] A receiving device (e.g., a UE 115) may perform reception operations in accordance with multiple receive configurations (e.g., directional listening) when receiving various signals from a receiving device (e.g., a network entity 105), such as synchronization signals, reference signals, beam selection signals, or other control signals. For example, a receiving device may perform reception in accordance with multiple receive directions by receiving via different antenna subarrays, by processing received signals according to different antenna subarrays, by receiving according to different receive beamforming weight sets (e.g., different directional listening weight sets) applied to signals received at multiple antenna elements of an antenna array, or by processing received signals according to different receive beamforming weight sets applied to signals received at multiple antenna elements of an antenna array, any of which may be referred to as “listening” according to different receive configurations or receive directions. In some examples, a receiving device may use a single receive configuration to receive along a single beam direction (e.g., when receiving a data signal). The single receive configuration may be aligned along a beam direction determined based on listening according to different receive configuration directions (e.g., a beam direction determined to have a highest signal strength, highest signal-to-noise ratio (SNR), or otherwise acceptable signal quality based on listening according to multiple beam directions).

[0077] The wireless communications system 100 may be a packet-based network that operates according to a layered protocol stack. In the user plane, communications at the bearer or PDCP layer may be IP-based. An RLC layer may perform packet segmentation and reassembly to communicate via logical channels. A MAC layer may perform priority handling and multiplexing of logical channels into transport channels. The MAC layer also may implement error detection techniques, error correction techniques, or both to support retransmissions to improve link efficiency. In the control plane, an RRC layer may provide establishment, configuration, and maintenance of an RRC connection between a UE 115 and a network entity 105 or a core network 130 supporting radio bearers for user plane data. A PHY layer may map transport channels to physical channels.

[0078] The UEs 115 and the network entities 105 may support retransmissions of data to increase the likelihood that data is received successfully. Hybrid automatic repeat request (HARQ) feedback is one technique for increasing the likelihood that data is received correctly via a communication link (e.g., a communication link 125, a D2D communication link 135). HARQ may include a combination of error detection (e.g., using a cyclic redundancy check (CRC)), forward error correction (FEC), and retransmission (e.g., automatic repeat request (ARQ)). HARQ may improve throughput at the MAC layer in poor radio conditions (e.g., low signal-to-noise conditions). In some examples, a device may support same-slot HARQ feedback, in which case the device may provide HARQ feedback in a specific slot for data received via a previous symbol in the slot. In some other examples, the device may provide HARQ feedback in a subsequent slot, or according to some other time interval.

[0079] A UE 115 may receive one or more signals identifying a set of channel measurements to be performed by the UE. The one or more signals may explicitly or implicitly indicate at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L2 measurement of the set of channel measurements. The UE 115 may select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The UE 115 may perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting.

[0080] **FIG. 2** illustrates an example of a wireless communications system 200 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. Wireless communications systems 200 may implement aspects of wireless communication system 100. Wireless communications system 200 may include a UE 205, a network entity 210, and a network entity 215. In some aspects, network entity 210 may be a serving cell of UE 205 while network entity 215 may be a candidate cell of UE 205.

[0081] A UE 205 may perform L1/L2 mobility procedures to handover from one serving cell to another in the wireless communications system 200. During such procedures, the UE 205 may monitor or measure a channel according to different layers of a protocol stack (e.g., L1, layer two (L2), L3) to determine which cell to handover to. For example, the UE 205 may perform a channel or signal quality measurement (e.g., transmit power or signal-to-noise ratio (SNR)) of a target serving cell (such as network entity 215) and report the measurement to its service call (e.g., such as network entity 210), such that the service cell may determine if the UE 205 is to handover to the target serving cell. The UE 205 may perform the channel measurements between a current serving cell and the target serving cell in a same frequency (e.g., intra-frequency measurements) or in different frequencies (e.g., inter-frequency measurements). To account for a difference in frequency between the current and target serving cells when performing inter-frequency measurements, the UE 205 may use a measurement gap.

During a measurement gap, the UE 205 and the cell(s) may refrain from transmitting or receiving signaling such that the UE 205 may switch to the target serving cell, perform channel measurements on that cell, and switch back to the current serving cell without dropping any transmissions.

[0082] In cases where a UE 205 may support active BWPs without SSBs, the UE 205 may perform L1 measurements outside of the active BWP (but within a configured bandwidth of a corresponding cell). For example, the UE 205 may support L1 SSB measurements outside of the active BWP with or without a measurement gap. In some examples of an L1/L2 mobility procedure, the UE 205 may be configured with a current, serving special cell (SpCell) and multiple candidate SpCells. During a handover procedure as the UE 205 moves throughout the wireless communications system 200, the UE 205 may switch from the current SpCell to one or the candidate SpCells (e.g., a new SpCell) based on higher layer signaling (e.g., L3 signaling). To decrease latency of this process, the UE 205 may switch between the SpCells based on lower layer signaling (e.g., L1/L2 signaling), which is associated with a lower latency. In some examples, the SpCells of the UE 205 may be intra- or inter-frequency cells. That is, L1/L2-based inter-cell mobility may be applicable to both intra-frequency and inter-frequency scenarios.

[0083] In some examples, the UE 205 may perform channel measurements associated with candidate serving cells to determine whether to handover between the cells. For example, the UE 205 may perform L3 intra- or inter-frequency measurements or L1 RSRP measurements. The UE 205 may use L3 intra- or inter-frequency measurements during an L3 handover procedure. For an L3 intra-frequency measurement, a measured SSB of a neighbor cell (e.g., a candidate serving cell, such as network entity 215) and a measured SSB of a current serving cell (e.g., such as network entity 210) may have a same center frequency and a same sub-carrier spacing. That is, an L3 intra-frequency measurement may be defined as an SSB-based intra-frequency measurement provided the center frequency and the subcarrier spacing of the SSB of the serving cell indicated for measurement (e.g., the current serving cell) and the SSB of the neighbor cell are the same. Alternatively, an L3 inter-frequency measurement may be defined as an SSB-based inter-frequency measurement provided the center frequency and the subcarrier spacing of the SSBs are different (e.g., failing to satisfy the conditions of the intra-frequency case).

[0084] The UE 205 may use L1 RSRP measurement during an L1 handover procedure. The UE 205 may use an L1-RSRP measurement for reference signals in an active BWP, which may not require a measurement gap. In some cases, a network entity (e.g., the service cell, such as network entity 210) may configure the UE 205 to perform L1-RSRP measurements of configured CSI-RS resources, SSB resources, or both for L1-RSRP. In addition, the UE 205 may perform the measurements for a serving cell, including a primary cell (Pcell), a primary-secondary cell (PSCell), or a secondary cell (SCell), on the resources configured for the L1-RSRP measurements within the active BWP. As described herein, an SpCell may be equivalent to a PCell or a PSCell.

[0085] In some cases, however, the UE 205 may fail to support some cases of L1 channel measurements. Moreover, it may be unspecified whether a given L1 channel measurement scenario uses measurement gaps, which the UE 205 may use for both intra-frequency and inter-frequency scenarios. For example, the UE 205 may fail to support L1 measurements for cases in which an SSB of a measured candidate cell is outside of an active BWP but within a configured bandwidth of an activated or current serving cell (e.g., Case 1). Additionally, or alternatively, the UE 205 may fail to support L1 measurements for cases in which the SSB of the measured candidate cell is outside of the configured bandwidth of the activated serving cell. In some examples, the UE 205 may fail to support L1 measurements for cases in which the SSB of the measured candidate cell is within the active bandwidth but with a different center frequency or SCS from a measured SSB of the activated serving cell. That is, the UE 205 and the network entity 210 may lack information about how the UE 115 may perform L1 channel measurements for L1 mobility procedures, and whether measurement gaps may be used for such channel measurements, which may increase latency and decrease handover efficiency.

[0086] Moreover, regarding L3 mobility procedures, L3 concurrent measurement gaps may experience collisions or scheduling overlaps, which may impact L3 intra- and inter-frequency measurements. In some cases, collisions between measurement gap occasions of two concurrent measurement gaps may occur if the two measurement gaps include two per-UE measurement gaps, two per-frequency measurement gaps in a same frequency or a same frequency range (e.g., intra-frequency measurement gaps), or one per-UE measurement gaps and one per-frequency measurement gap. When a network entity 210 configures the UE 205 with concurrent measurement gaps, two measurement gaps may be considered as colliding or overlapping, at least to some degree, if at least the two corresponding measurement gap occasions are fully or partially overlapping in a time domain or a distance between the two measurement gap occasions is, for example, equal to or smaller than 4 ms. In some examples, the distance may be a time difference between an ending point (e.g., an end) of a first measurement gap occasion and a starting point (e.g., a beginning) of a second measurement gap occasion, where the first measurement gap occasion occurs earlier in time than the second measurement gap occasion. In some cases, more than two measurement gap occasions may overlap sequentially.

[0087] In some examples, in the case of a collision between two measurement gap occasions in an L3 mobility procedure, the UE 205 may perform measurements in a measurement gap occasion associated with a measurement gap with a higher priority, and the UE 205 may drop the measurement gap occasion associated with a relatively lower priority. In this way, the UE 205 may transmit or receive reference signals in corresponding serving cells that are not interrupted. In some examples, the UE 205 may refrain from applying such a selection process when the network entity 210 configures a measurement gap without an assigned priority simultaneously with one or more measurement gaps that affect serving carrier in a same frequency range, and when the measurement gaps with and without assigned priorities are colliding with each other. That is, the UE 205 may use techniques other than a priority comparison to select measurement gaps if not all configured measurement gaps are assigned a priority. In some cases, the network entity 210 may configure a priority for a measurement gap via *gapPriority* in *GapConfig*. The requirements of the concurrent measurement gaps may apply provided that the network entity 210 configures the two measurement gaps colliding with each other with different priorities. While these selection criteria apply to L3 mobility procedures, the UE 205 may lack comparable criteria for L1 mobility procedures.

[0088] The wireless communications system 200 may support defining and reporting a capability of supporting concurrent measurement gaps for L1 channel measurements and L1/L3 measurements. In some examples, a UE 205 may transmit a capability message indicating its support of concurrent measurement gaps for L1 plus L1/L3 overlapping channel measurements. In some cases, the capability message may include one or more information elements indicating the support of such measurement gaps for L1 channel measurements, L3 channel measurements, or both. The UE 205 may receive signal(s) 220 indicating one or more measurement gaps associated with respective channel measurements (e.g., a first set of L1 channel measurements and a second set of L1 or L3 channel measurements). The UE 205 may select at least one or the measurement gaps to use for performing L1 or L3 channel measurements based on an overlap (e.g., scheduling collision) between the one or more signaled measurement gaps. That is, if two measurement gaps are at least partially overlapping in time, or if a distance between the two measurement gaps is smaller than a defined threshold (such as a standardized threshold known by the UE 205 or a threshold signaled to the UE 205 by the network entity 210), the concurrent measurement gaps may have a scheduling conflict that the UE 205 may consider when selecting one or more of the measurement gaps to use. The UE 205 may perform an L1 channel measurement, an L3 channel measurement, or both, using the selected measurement gaps, and transmit a channel measurement report to a network entity 210 in accordance with the measurement.

[0089] In some aspects, the wireless communications system 200 may support defining techniques for the UE 205 to select between overlapping measurement gaps for L1 and L1/L3 channel measurements. For example, network entity 210 may transmit or otherwise provide (and UE 205 may receive or otherwise obtain) signal(s) 220 that identify a set of channel measurements for the UE 205. For example, the signal(s) 220 may include separate or composite signaling identifying a first measurement gap and a second measurement gap. In some aspects, the first measurement gap and the second measurement gap collide (e.g., overlap, at least to some degree, in the time domain, which may include fewer than a 4ms separation between the ending of the first measurement gap and the beginning of the second measurement gap). The second measurement gap may be another L1 measurement gap (e.g., a second L1 measurement gap) or a L3 measurement gap.

[0090] In some aspects, the set of channel measurements may include measurement configurations for the serving cell of UE 205 (e.g., network entity 210) and/or for one or more candidate cell(s) for UE 205. The candidate cell(s) may include neighboring cells to be monitored for a potential handover procedure of the UE 205 from network entity 210 to network entity 215. In other examples, the candidate cell(s) may include neighboring cells that may be added for wireless communications with the UE 205, e.g., to be added as new SCell(s). The set of channel measurements may be separately signaled (more than one signals) for each the serving cell and candidate cell(s), e.g., in separate RRC signaling, DCI signaling, medium access control-control element (MAC-CE) signaling, or some combination of such signaling. The set of channel measurements may be signaled in one signal for each cell, in some examples. In some examples, the set of channel measurements may be signaled for multiple cells associated with the same network entity.

[0091] In some aspects, each measurement gap may correspond to the time and/or frequency resources allocated to each configured cell. That is, each set of measurements may identify or otherwise indicate which time resources, frequency resources, and/or spatial resources the associated cell will transmit one or more signals to be measured by the UE 205. The measurement gap, from the perspective of the UE 205 may indicate the time period during which the UE 205 tunes to the allocated resources and monitors for the signal to be measured. Upon measuring the signal from the cell, the UE 205 may determine the channel performance characteristics (e.g., CSI, interference level, load, throughput, or synchronization) to be reported in a measurement report transmitted to the serving cell (e.g., the network entity 210). For intra-frequency measurements between the cells, the UE 205 may not be required to perform retuning operations between measurements and, therefore, the duration of the measurement gap may be shortened. For inter-frequency measurements between the cells, the UE 205 may perform retuning operations between measurements and, therefore, the duration of the measurement gap may be longer relative to intra-frequency measurement gaps.

[0092] Accordingly, the set of channel measurements may include a first measurement gap associated with first channel measurements and a second measurement gap associated with second channel measurements. This is illustrated in FIG. 2 where at 225 the network entity 210 transmits or otherwise provides a SSB, CSI-RS, or some other reference, tracking, or synchronization signal and at 230 the network entity 215 transmits or otherwise provides a SSB, CSI-RS or some other reference, tracking or synchronization signal. The UE 205 may generally be configured to measure both signals provided by the network entity 210 and the network entity 215 and report the results of the channel measurements to the network entity 210 in a feedback message.

[0093] However, in some examples the first measurement gap and the second measurement gap may overlap, at least to some degree, in the time domain. That is, the time period during which the UE 205 is scheduled to monitor for the SSB/CSI-RS signaling from the network entity 210 at 225 overlaps with (or is not sufficiently separated from) the time period during which the UE 205 is scheduled to monitor for the SSB/CSI-RS signaling from the network entity 215 at 230. Again, the first measurement gap may be associated with a L1 measurement and the second measurement gap may be associated with another L1 measurement or an L3 measurement.

[0094] Accordingly, the UE 205 may generally select between the first measurement gap and the second measurement gap (e.g., the overlapping gaps) due to the overlap in the time domain. That is, in some examples the first measurement gap and the second measurement gap may be associated with inter-frequency measurements where the UE 205 would need to perform retuning operations between measurements. In other examples, the first measurement gap and the second measurement gap may be associated with intra-frequency measurements, but may overlap in the time domain a sufficient amount that the UE 205 is unable to monitor for both signals at the same time. Accordingly, the UE 205 may select between the measurement gaps that overlap in the time domain. The UE 205 may then perform at least a portion of the set of channel measurements based on the selecting. For example, the UE 205 may perform the first L1 channel measurements when the first measurement gap is selected or may perform the second L1 or L3 channel measurements when the second measurement gap is selected, or vice versa when the second measurement gap is selected.

[0095] In some aspects, when the UE 205 is configured with multiple measurement gaps for different L1 inter-frequency CSI reports and different L1 or L3 inter-frequency CSI reports and when any two of the multiple measurement gaps are overlapping or considered as concurrent measurement gaps, the UE 205 may perform channel measurements for measurement gaps based on the techniques described herein.

[0096] In some examples, the selecting may be based on a prioritization between the first and second measurement gaps. For example, the first measurement gap may be a measurement gap identified in a first channel measurement and the second measurement gap may be a measurement gap identified in a second channel measurement. The first measurement may carry or otherwise convey an indication of a first priority level associated with the first measurement gap. The second measurement may carry or otherwise convey an indication of a second priority level associated with the second measurement gap. The UE 205 may select the measurement gap associated with the highest priority between the first and second measurement gaps (e.g., based on the first priority level and second priority level). In some aspects, this may provide a unified prioritization rule for all types of L1 and L1 or L3 CSI measurements and reporting. One non-limiting example may include the unified prioritization rule being based on the order of *gapPriority* associated with the measurement gap configuration.

[0097] Additionally, or alternatively, the selecting may be based on a periodicity of the measurement gaps. For example, the UE 205 may select the first or second measurement gap based on a prioritization based on a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap. That is, the first measurement may include a first periodicity for the first measurement gap and the second measurement may include a second periodicity for the second measurement gap. The periodicity for a measurement gap may generally define how often the allocated resources are repeated for channel measurements. The periodicity may be periodic (e.g., regularly scheduled), semi-persistent (e.g., semi-periodic), or aperiodic (e.g., on-demand) in nature. In some examples, this may provide a fixed prioritization rule based on the periodicity of the measurement gaps. As one non-limiting example, such a fixed rule may include aperiodic measurement gaps being given a higher priority than semi-persistent measurement gaps and with semi-persistent measurement gaps being given a higher priority than periodic measurement gaps.

[0098] Additionally, or alternatively, the selecting may be based on the type associated with the measurement gaps. For example, the UE 205 may select the first or second measurement gap based on a prioritization based on a first priority level of the type in which the channel measurements occur. That is, the techniques provided herein provide for the set of channel measurements to include at least one L1 measurement and either another L1 measurement or an L3 measurement. The type of L1 measurement may be associated with a first priority level and the type of L3 measurement may be associated with a second priority level. The priority level of the type associated with the measurement gap may be used by the UE 205 to select the measurement gap between the first and second measurement gaps. In some examples, the first priority level of the L1 measurement may be given a higher priority level than the second priority level of the L3 measurement. In other examples, the first priority level of the L1 measurement may be given a lower priority level than the second priority level of the L3 measurement. Accordingly, this may provide a fixed rule to prioritize one type of CSI measurement and reporting over another type. As one non-limiting example, this may include L3 measurement being prioritized (e.g., associated with a higher priority level) over L1 measurements. That is, in this example the channel measurement associated with L3 measurements may be prioritized over the ones associated with L1 measurement.

[0099] In some examples, the UE 205 may be configured with multiple measurement gaps for L1 inter-frequency CSI reports of the same or different periodicities. When any two of the measurement gaps are overlapping or considered as concurrent measurement gaps, the UE 205 may be configured to apply a prioritization rule for the measurement gap according to the techniques described herein. Such techniques may provide a mechanism for the UE 205 to select between overlapping measurement gaps for L1 inter-frequency CSI measurement and reporting. In some examples, this may additionally, or alternatively, include the techniques for selecting between the first and second measurement gaps discussed above.

[0100] Additionally, or alternatively, the selecting may be based on the traffic being communicated on the channel being measured. For example, the UE 205 may select the first or second measurement gap based on a prioritization based on a first priority level associated with the traffic to be communicated based on the result of the first L1 measurement and a second priority level associated with the traffic to be communicated based on a result of the second L1 measurement or L3 measurement. This generally adopts a physical layer prioritization rule associated with the uplink transmission of CSI reports. As one non-limiting example, this may include a measurement gap associated with an uplink transmission (e.g., physical uplink shared channel (PUSCH) transmission) having a higher physical priority than the uplink transmission (e.g., PUSCH) having a lower physical priority.

[0101] Additionally, or alternatively, the selecting may be based on the transmission of the CSI reports. For example, the UE 205 may select the first or second measurement gap based on a prioritization based on a first priority level associated with a first CSI report to be communicated based on a result of the first L1 measurement and a second priority level associated with a second CSI report to be communicated based on a result of the second L1 measurement or the L3 measurement. That is, the first CSI report may be associated with the same or a different periodicity and/or physical layer priority than the second CSI report. Each CSI report may also be associated with unique CSI report identifiers (e.g., ID numbers). The priority level of the CSI reports may be based on the differences between the periodicities and/or the physical layer priority of each of the first and second CSI reports. When the periodicities and/or physical layer priority are the same, the identifiers of the CSI reports may be used to define the priority level (e.g., CSI report with lower identifier is given priority over CSI report with higher identifier). This may provide a prioritization rule used for the transmission of the CSI reports to be considered during measurement gap selection.

[0102] Additionally, or alternatively, the selecting may be based on the periodicity of the CSI reports. For example, the UE 205 may select the first or second measurement gap based on a prioritization based on a first priority level associated with a first periodicity for the first CSI report to be communicated based on a result of the first L1 measurement and a second priority level associated with a second periodicity for the second CSI report to be communicated based on a result of the second L1 measurement or the L3 measurement. This may provide a prioritization rule based on the corresponding periodicity of the CSI reports. For example, this may be applied when the CSI report have the same uplink physical layer priority. In this example, the measurement gap associated with an aperiodic CSI report may be given a higher priority level than a semi-persistent CSI report and the semi-persistent CSI report may be given a higher priority level than a periodic CSI report.

[0103] Aspects of the examples and techniques discussed above may be applied when the *gapPriority* is not configured or when the *gapPriority* is the same for the concurrent measurement gaps (e.g., for the first and second measurement gaps).

[0104] Accordingly, the UE 205 may perform at least a portion of the set of measurement according to the selecting. That is, the UE 205 may perform channel measurements using the first measurement gap or the second measurement gap, with the measurement gap being selected based on the techniques discussed herein. The UE 205 may transmit or otherwise provide (and the network entity 210 may receive or otherwise obtain) a channel measurement report according to the performing. For example, the channel measurement report may carry or otherwise indicate a result of the channel measurements performing during the selected first measurement gap or second measurement gap.

[0105] **FIG. 3** illustrates an example of a measurement gap configuration 300 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. Measurement gap configuration 300 may implement aspects of wireless communications systems 100 and/or 200. Aspects of measurement gap configuration 300 may be implemented at or implemented by an active cell 305, a candidate cell 310, and a candidate cell 315, which may be examples of the corresponding devices described herein. For example, the active cell 305, the candidate cell 310, and/or the candidate cell 315 may be examples of one or more network device(s).

[0106] As discussed above, aspects of the techniques described herein provide mechanisms for a UE to select between overlapping measurement gaps for L1 and another L1 or an L3 measurement. For example, the UE may receive signal(s) 320 identifying a set of channel measurements. The set of channel measurement may include a channel measurement (e.g., a configuration or set of parameters to be used to perform channel measurements) for a service cell (e.g., the active cell 305) and one or more candidate cells, with two candidate cells being shown in FIG. 3 by way of example only. In some aspects, the signal(s) 320 may include one signal identifying or otherwise indicating the set of channel measurements or separate signaling being used to identify or otherwise indicate separate channel measurements in the set of channel measurements. Each channel measurement in the set of channel measurements may identify the time resources, frequency resources, spatial resources, and/or code resources that the UE is to monitor to detect a signal (e.g., SSB/CSI) transmitted from the serving or candidate cell. The set of channel measurements may include at least one L1 measurement and either another L1 measurement or an L3 measurement.

[0107] In the non-limiting example illustrated in FIG. 3, the set of channel measurements may include a first measurement of signal 325 (e.g., SSB, CSI-RS, or another reference, tracking, or synchronization signal) associated with the active cell 305 during a first measurement gap. The first measurement may include a first CSI report identified by a first CSI report identifier. The first measurement may include a first CSI periodicity, a first CSI report priority level, and other information associated with the CSI measurement and reporting. Similarly, the set of channel measurements may include a second measurement of signal 330 associated with the candidate cell 310 during a second measurement gap. The second measurement may include a second CSI report identified by a second CSI report identifier. The second measurement may include a second CSI periodicity or a second CSI report priority level. Lastly, the set of channel measurements may include a third measurement of signal 335 associated with the candidate cell 315 during a third measurement gap. The third measurement may include a third CSI report identified by a third CSI report identifier. The third measurement may include a third CSI periodicity or a third CSI report priority level.

[0108] At least one channel measurement in the set of channel measurements may be an L1 measurement. At least one other channel measurement in the set of channel measurements may include another L1 measurement or an L3 measurement.

[0109] However, the second measurement gap and the third measurement gap may be overlapping measurement gaps (e.g., overlapping in the time domain or without a sufficient threshold separation time). Accordingly, the UE may select the second measurement gap (a first measurement gap in this context) or the third measurement gap (a second measurement gap in this context) according to a prioritization between the second and third measurement gaps. The UE may then perform at least a portion of the set of channel measurements according to the selecting (e.g., using the second or third measurement gap). For example, the prioritization may be based on the priority level of each measurement gap, the periodicity of each measurement gap, the physical layer (e.g., L3 or L1 measurements), or the traffic priority, for the channel associated with the channel measurements.

[0110] The UE may transmit or otherwise provide a channel measurement report 340 indicating a result of the channel measurements. The channel measurement report 340 may be transmitted to the active cell 305 of the UE.

[0111] **FIG. 4** illustrates a block diagram 400 of a device 405 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The device 405 may be an example of aspects of a UE 115 as described herein. The device 405 may include a receiver 410, a transmitter 415, and a communications manager 420. The device 405 may also include a processor. Each of these components may be in communication with one another (e.g., via one or more buses). Components within a wireless communication system may be coupled (for example, operatively, communicatively, functionally, electronically, and/or electrically) to each other.

[0112] The receiver 410 may provide a means for receiving information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to overlapping measurement gaps in L1 and L3 measurements). Information may be passed on to other components of the device 405. The receiver 410 may utilize a single antenna or a set of multiple antennas.

[0113] The transmitter 415 may provide a means for transmitting signals generated by other components of the device 405. For example, the transmitter 415 may transmit information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to overlapping measurement gaps in L1 and L3 measurements). In some examples, the transmitter 415 may be co-located with a receiver 410 in a transceiver module. The transmitter 415 may utilize a single antenna or a set of multiple antennas.

[0114] The communications manager 420, the receiver 410, the transmitter 415, or various combinations thereof or various components thereof may be examples of means for performing various aspects of overlapping measurement gaps in L1 and L3 measurements as described herein. For example, the communications manager 420, the receiver 410, the transmitter 415, or various combinations or components thereof may support a method for performing one or more of the functions described herein.

[0115] In some examples, the communications manager 420, the receiver 410, the transmitter 415, or various combinations or components thereof may be implemented in hardware (e.g., in communications management circuitry). The hardware may include a processor, a digital signal processor (DSP), a central processing unit (CPU), a graphics processing unit (GPU), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA) or other programmable logic device, a microcontroller, discrete gate or transistor logic, discrete hardware components, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure. In some examples, a processor and memory coupled with the processor may be configured to perform one or more of the functions described herein (e.g., by executing, by the processor, instructions stored in the memory).

[0116] Additionally, or alternatively, in some examples, the communications manager 420, the receiver 410, the transmitter 415, or various combinations or components thereof may be implemented in code (e.g., as communications management software) executed by a processor. If implemented in code executed by a processor, the functions of the communications manager 420, the receiver 410, the transmitter 415, or various combinations or components thereof may be performed by a general-purpose processor, a DSP, a CPU, a GPU, an ASIC, an FPGA, a microcontroller, or any combination of these or other programmable logic devices (e.g., configured as or otherwise supporting a means for performing the functions described in the present disclosure).

[0117] In some examples, the communications manager 420 may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver 410, the transmitter 415, or both. For example, the communications manager 420 may receive information from the receiver 410, send information to the transmitter 415, or be integrated in combination with the receiver 410, the transmitter 415, or both to obtain information, output information, or perform various other operations as described herein.

[0118] The communications manager 420 may support wireless communications at a UE in accordance with examples as disclosed herein. For example, the communications manager 420 may be configured as or otherwise support a means for receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The communications manager 420 may be configured as or otherwise support a means for selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The communications manager 420 may be configured as or otherwise support a means for performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0119] By including or configuring the communications manager 420 in accordance with examples as described herein, the device 405 (e.g., a processor controlling or otherwise coupled with the receiver 410, the transmitter 415, the communications manager 420, or a combination thereof) may support techniques for selecting between overlapping L1 and L1 or L3 channel measurements based on a prioritization rule associated with each measurement gap.

[0120] **FIG. 5** illustrates a block diagram 500 of a device 505 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The device 505 may be an example of aspects of a device 405 or a UE 115 as described herein. The device 505 may include a receiver 510, a transmitter 515, and a communications manager 520. The device 505 may also include a processor. Each of these components may be in communication with one another (e.g., via one or more buses).

[0121] The receiver 510 may provide a means for receiving information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to overlapping measurement gaps in L1 and L3 measurements). Information may be passed on to other components of the device 505. The receiver 510 may utilize a single antenna or a set of multiple antennas.

[0122] The transmitter 515 may provide a means for transmitting signals generated by other components of the device 505. For example, the transmitter 515 may transmit information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to overlapping measurement gaps in L1 and L3 measurements). In some examples, the transmitter 515 may be co-located with a receiver 510 in a transceiver module. The transmitter 515 may utilize a single antenna or a set of multiple antennas.

[0123] The device 505, or various components thereof, may be an example of means for performing various aspects of overlapping measurement gaps in L1 and L3 measurements as described herein. For example, the communications manager 520 may include a channel measurement configuration manager 525, a measurement gap manager 530, a channel measurement manager 535, or any combination thereof. The communications manager 520 may be an example of aspects of a communications manager 420 as described herein. In some examples, the communications manager 520, or various components thereof, may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver 510, the transmitter 515, or both. For example, the communications manager 520 may receive information from the receiver 510, send information to the transmitter 515, or be integrated in combination with the receiver 510, the transmitter 515, or both to obtain information, output information, or perform various other operations as described herein.

[0124] The communications manager 520 may support wireless communications at a UE in accordance with examples as disclosed herein. The channel measurement configuration manager 525 may be configured as or otherwise support a means for receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The measurement gap manager 530 may be configured as or otherwise support a means for selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The channel measurement manager 535 may be configured as or otherwise support a means for performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0125] **FIG. 6** illustrates a block diagram 600 of a communications manager 620 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The communications manager 620 may be an example of aspects of a communications manager 420, a communications manager 520, or both, as described herein. The communications manager 620, or various components thereof, may be an example of means for performing various aspects of overlapping measurement gaps in L1 and L3 measurements as described herein. For example, the communications manager 620 may include a channel measurement configuration manager 625, a measurement gap manager 630, a channel measurement manager 635, a prioritization manager 640, a periodicity manager 645, a channel measurement report manager 650, or any combination thereof. Each of these components may communicate, directly or indirectly, with one another (e.g., via one or more buses).

[0126] The communications manager 620 may support wireless communications at a UE in accordance with examples as disclosed herein. The channel measurement configuration manager 625 may be configured as or otherwise support a means for receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The measurement gap manager 630 may be configured as or otherwise support a means for selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The channel measurement manager 635 may be configured as or otherwise support a means for performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0127] In some examples, to support selecting the one of the first measurement gap or the second measurement gap, the prioritization manager 640 may be configured as or otherwise support a means for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap.

[0128] In some examples, to support selecting the one of the first measurement gap or the second measurement gap, the periodicity manager 645 may be configured as or otherwise support a means for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap.

[0129] In some examples, to support selecting the one of the first measurement gap or the second measurement gap, the prioritization manager 640 may be configured as or otherwise support a means for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with L1 measurements and a second priority level associated with L3 measurements. In some examples, the second priority level includes a higher priority level than the first priority level.

[0130] In some examples, to support selecting the one of the first measurement gap or the second measurement gap, the prioritization manager 640 may be configured as or otherwise support a means for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with traffic to be communicated based on a result of the first L1 measurement and a second priority level associated with traffic to be communicated based on a result of the one or more of the second L1 measurement or the L3 measurement.

[0131] In some examples, to support selecting the one of the first measurement gap or the second measurement gap, the prioritization manager 640 may be configured as or otherwise support a means for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with a first channel state information report to be communicated based on a result of the first L1 measurement and a second priority level associated with a second channel state information report to be communicated based on a result of one or more of the second L1 measurement or the L3 measurement.

[0132] In some examples, the prioritization manager 640 may be configured as or otherwise support a means for determining a first identifier associated with the first channel state information report and a second identifier associated with the second channel state information report, where the first priority level is based on the first identifier and the second priority level is based on the second identifier.

[0133] In some examples, to support selecting the one of the first measurement gap or the second measurement gap, the periodicity manager 645 may be configured as or otherwise support a means for prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity of a first channel state information report to be communicated based on a result of the first L1 measurement and a second periodicity of a second channel state information report to be communicated based on a result of one or more of the second L1 measurement or the L3 measurement.

[0134] In some examples, the channel measurement report manager 650 may be configured as or otherwise support a means for transmitting a channel measurement report in accordance with performing at least the portion of the set of channel measurements using the first measurement gap or the second measurement gap. In some examples, the first measurement gap and the second measurement gap include inter-frequency measurement gaps. In some examples, the first measurement gap is associated with a first channel state information report and the second measurement gap is associated with a second channel state information report.

[0135] **FIG. 7** illustrates a diagram of a system 700 including a device 705 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The device 705 may be an example of or include the components of a device 405, a device 505, or a UE 115 as described herein. The device 705 may communicate (e.g., wirelessly) with one or more network entities 105, one or more UEs 115, or any combination thereof. The device 705 may include components for bi-directional voice and data communications including components for transmitting and receiving communications, such as a communications manager 720, an input/output (I/O) controller 710, a transceiver 715, an antenna 725, a memory 730, code 735, and a processor 740. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more buses (e.g., a bus 745).

[0136] The I/O controller 710 may manage input and output signals for the device 705. The I/O controller 710 may also manage peripherals not integrated into the device 705. In some cases, the I/O controller 710 may represent a physical connection or port to an external peripheral. In some cases, the I/O controller 710 may utilize an operating system such as iOS®, ANDROID®, MS-DOS®, MS-WINDOWS®, OS/2®, UNIX®, LINUX®, or another known operating system. Additionally or alternatively, the I/O controller 710 may represent or interact with a modem, a keyboard, a mouse, a touchscreen, or a similar device. In some cases, the I/O controller 710 may be implemented as part of a processor, such as the processor 740. In some cases, a user may interact with the device 705 via the I/O controller 710 or via hardware components controlled by the I/O controller 710.

[0137] In some cases, the device 705 may include a single antenna 725. However, in some other cases, the device 705 may have more than one antenna 725, which may be capable of concurrently transmitting or receiving multiple wireless transmissions. The transceiver 715 may communicate bi-directionally, via the one or more antennas 725, wired, or wireless links as described herein. For example, the transceiver 715 may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 715 may also include a modem to modulate the packets, to provide the modulated packets to one or more antennas 725 for transmission, and to demodulate packets received from the one or more antennas 725. The transceiver

715, or the transceiver 715 and one or more antennas 725, may be an example of a transmitter 415, a transmitter 515, a receiver 410, a receiver 510, or any combination thereof or component thereof, as described herein.

[0138] The memory 730 may include random access memory (RAM) and read-only memory (ROM). The memory 730 may store computer-readable, computer-executable code 735 including instructions that, when executed by the processor 740, cause the device 705 to perform various functions described herein. The code 735 may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. In some cases, the code 735 may not be directly executable by the processor 740 but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some cases, the memory 730 may contain, among other things, a basic I/O system (BIOS) which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[0139] The processor 740 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, a GPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some cases, the processor 740 may be configured to operate a memory array using a memory controller. In some other cases, a memory controller may be integrated into the processor 740. The processor 740 may be configured to execute computer-readable instructions stored in a memory (e.g., the memory 730) to cause the device 705 to perform various functions (e.g., functions or tasks supporting overlapping measurement gaps in L1 and L3 measurements). For example, the device 705 or a component of the device 705 may include a processor 740 and memory 730 coupled with or to the processor 740, the processor 740 and memory 730 configured to perform various functions described herein.

[0140] The communications manager 720 may support wireless communications at a UE in accordance with examples as disclosed herein. For example, the communications manager 720 may be configured as or otherwise support a means for receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The communications manager 720 may be configured as or otherwise support a means for selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The communications manager 720 may be configured as or otherwise support a means for performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0141] By including or configuring the communications manager 720 in accordance with examples as described herein, the device 705 may support techniques for selecting between overlapping L1 and L1 or L3 channel measurements based on a prioritization rule associated with each measurement gap.

[0142] In some examples, the communications manager 720 may be configured to perform various operations (e.g., receiving, monitoring, transmitting) using or otherwise in cooperation with the transceiver 715, the one or more antennas 725, or any combination thereof. Although the communications manager 720 is illustrated as a separate component, in some examples, one or more functions described with reference to the communications manager 720 may be supported by or performed by the processor 740, the memory 730, the code 735, or any combination thereof. For example, the code 735 may include instructions executable by the processor 740 to cause the device 705 to perform various aspects of overlapping measurement gaps in L1 and L3 measurements as described herein, or the processor 740 and the memory 730 may be otherwise configured to perform or support such operations.

[0143] **FIG. 8** illustrates a flowchart illustrating a method 800 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The operations of the method 800 may be implemented by a UE or its components as described herein. For example, the operations of the method 800 may be performed by a UE 115 as described with reference to FIGs. 1 through 7. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

[0144] At 805, the method may include receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The operations of 805 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 805 may be performed by a channel measurement configuration manager 625 as described with reference to FIG. 6.

[0145] At 810, the method may include selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The operations of 810 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 810 may be performed by a measurement gap manager 630 as described with reference to FIG. 6.

[0146] At 815, the method may include performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting. The operations of 815 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 815 may be performed by a channel measurement manager 635 as described with reference to FIG. 6.

[0147] **FIG. 9** illustrates a flowchart illustrating a method 900 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The operations of the method 900 may be implemented by a UE or its components as described herein. For example, the operations of the method 900 may be performed by a UE 115 as described with reference to FIGs. 1 through 7. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

[0148] At 905, the method may include receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The operations of 905 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 905 may be performed by a channel measurement configuration manager 625 as described with reference to FIG. 6.

[0149] At 910, the method may include selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The operations of 910 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 910 may be performed by a measurement gap manager 630 as described with reference to FIG. 6.

[0150] At 915, the method may include prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap. The operations of 915 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 915 may be performed by a prioritization manager 640 as described with reference to FIG. 6.

[0151] At 920, the method may include performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting. The operations of 920 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 920 may be performed by a channel measurement manager 635 as described with reference to FIG. 6.

[0152] **FIG. 10** illustrates a flowchart illustrating a method 1000 that supports overlapping measurement gaps in L1 and L3 measurements in accordance with one or more aspects of the present disclosure. The operations of the method 1000 may be implemented by a UE or its components as described herein. For example, the operations of the method 1000 may be performed by a UE 115 as described with reference to FIGs. 1 through 7. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

[0153] At 1005, the method may include receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements. The operations of 1005 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 1005 may be performed by a channel measurement configuration manager 625 as described with reference to FIG. 6.

[0154] At 1010, the method may include selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap. The operations of 1010 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 1010 may be performed by a measurement gap manager 630 as described with reference to FIG. 6.

[0155] At 1015, the method may include prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap. The operations of 1015 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 1015 may be performed by a periodicity manager 645 as described with reference to FIG. 6.

[0156] At 1020, the method may include performing at least a portion of the set of channel measurements and based on the first measurement gap or the second measurement gap according to the selecting. The operations of 1020 may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of 1020 may be performed by a channel measurement manager 635 as described with reference to FIG. 6.

[0157] The following provides an overview of aspects of the present disclosure:

[0158] Aspect 1: A method for wireless communications at a UE, comprising: receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first L1 measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second L1 measurement of the set of channel measurements or a L3 measurement of the set of channel measurements; selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap; and performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

[0159] Aspect 2: The method of aspect 1, wherein selecting the one of the first measurement gap or the second measurement gap comprises: prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap.

[0160] Aspect 3: The method of any of aspects 1 through 2, wherein selecting the one of the first measurement gap or the second measurement gap comprises: prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap.

[0161] Aspect 4: The method of any of aspects 1 through 3, wherein selecting the one of the first measurement gap or the second measurement gap comprises: prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with L1 measurements and a second priority level associated with L3 measurements.

[0162] Aspect 5: The method of aspect 4, wherein the second priority level comprises a higher priority level than the first priority level.

[0163] Aspect 6: The method of any of aspects 1 through 5, wherein selecting the one of the first measurement gap or the second measurement gap comprises: prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with traffic to be communicated based on a result of the first L1 measurement and a second priority level associated with traffic to be communicated based on a result of the one or more of the second L1 measurement or the L3 measurement.

[0164] Aspect 7: The method of any of aspects 1 through 6, wherein selecting the one of the first measurement gap or the second measurement gap comprises: prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with a first channel state information report to be communicated based on a result of the first L1 measurement and a second priority level associated with a second channel state information report to be communicated based on a result of one or more of the second L1 measurement or the L3 measurement.

[0165] Aspect 8: The method of aspect 7, further comprising: determining a first identifier associated with the first channel state information report and a second identifier associated with the second channel state information report, wherein the first priority level is based on the first identifier and the second priority level is based on the second identifier.

[0166] Aspect 9: The method of any of aspects 1 through 8, wherein selecting the one of the first measurement gap or the second measurement gap comprises: prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity of a first channel state information report to be communicated based on a result of the first L1 measurement and a second periodicity of a second channel state information report to be communicated based on a result of one or more of the second L1 measurement or the L3 measurement.

[0167] Aspect 10: The method of any of aspects 1 through 9, further comprising: transmitting a channel measurement report in accordance with performing at least the portion of the set of channel measurements using the first measurement gap or the second measurement gap.

[0168] Aspect 11: The method of any of aspects 1 through 10, wherein the first measurement gap and the second measurement gap comprise inter-frequency measurement gaps.

[0169] Aspect 12: The method of any of aspects 1 through 11, wherein the first measurement gap is associated with a first channel state information report and the second measurement gap is associated with a second channel state information report.

[0170] Aspect 13: An apparatus for wireless communications at a UE, comprising at least one processor; and memory coupled with the at least one processor, the memory storing instructions executable by the at least one processor to cause the UE to perform a method of any of aspects 1 through 12.

[0171] Aspect 14: An apparatus for wireless communications at a UE, comprising at least one means for performing a method of any of aspects 1 through 12.

[0172] Aspect 15: A non-transitory computer-readable medium storing code for communications at a UE, the code comprising instructions executable by at least one processor to perform a method of any of aspects 1 through 12.

[0173] It should be noted that the methods described herein describe possible implementations, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible. Further, aspects from two or more of the methods may be combined.

[0174] Although aspects of an LTE, LTE-A, LTE-A Pro, or NR system may be described for purposes of example, and LTE, LTE-A, LTE-A Pro, or NR terminology may be used in much of the description, the techniques described herein are applicable beyond LTE, LTE-A, LTE-A Pro, or NR networks. For example, the described techniques may be applicable to various other wireless communications systems such as Ultra Mobile Broadband (UMB), Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM, as well as other systems and radio technologies, including future systems and radio technologies, not explicitly mentioned herein.

[0175] Information and signals described herein may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[0176] The various illustrative blocks and components described in connection with the disclosure herein may be implemented or performed using a general-purpose processor, a DSP, an ASIC, a CPU, a GPU, an FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor but, in the alternative, the processor may be any processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices (e.g., a combination of a DSP and a microprocessor, multiple microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration).

[0177] The functions described herein may be implemented using hardware, software (e.g., executable by a processor), or any combination thereof. 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, or functions, whether referred to as software, firmware, middleware, microcode, hardware description language, or otherwise. If implemented using software executed by a processor, the functions may be stored as or transmitted using one or more instructions or code of a computer-readable medium. Other examples and implementations are within the scope of the disclosure and appended claims. For example, due to the nature of software, functions described herein may be implemented using software executed by a processor, hardware, hardwiring, or combinations of any of these. Features implementing functions may also be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations.

[0178] Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one location to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer. By way of example, and not limitation, non-transitory computer-readable media may include RAM, ROM, electrically erasable programmable ROM (EEPROM), flash memory, phase change memory, compact disk (CD) ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other non-transitory medium that may be used to carry or store desired program code means in the form of instructions or data structures and that may be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of computer-readable medium. Disk and disc, as used herein, include CD, laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc. Disks may reproduce data magnetically, and discs may reproduce data optically using lasers. Combinations of the above are also included within the scope of computer-readable media.

[0179] As used herein, including in the claims, "or" as used in a list of items (e.g., a list of items prefaced by a phrase such as "at least one of" or "one or more of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (e.g., A and B and C). Also, as used herein, the phrase "based on" shall not be construed as a reference to a closed set of conditions. For example, an example step that is described as "based on condition A" may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase "based on" shall be construed in the same manner as the phrase "based at least in part on." As used herein, the term "and/or," when used in a list of two or more items, means that any one of the listed items can be employed by itself, or any combination of two or more of the listed items can be employed. For example, if a composition is described as containing components A, B, and/or C, the composition can contain A alone; B alone; C alone; A and B in combination; A and C in combination; B and C in combination; or A, B, and C in combination.

[0180] The term "determine" or "determining" encompasses a variety of actions and, therefore, "determining" can include calculating, computing, processing, deriving, investigating, looking up (such as via looking up in a table, a database or another data structure), or ascertaining. Also, "determining" can include receiving (e.g., receiving information) or accessing (e.g., accessing data stored in memory). Also, "determining" can include resolving, obtaining, selecting, choosing, establishing, and other such similar actions.

[0181] In the appended figures, similar components or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If just the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label, or other subsequent reference label.

[0182] The description set forth herein, in connection with the appended drawings, describes example configurations and does not represent all the examples that may be implemented or that are within the scope of the claims. The term "example" used herein means "serving as an example, instance, or illustration," and not "preferred" or "advantageous over other examples." The detailed description includes specific details for the purpose of providing an understanding of the described techniques. These techniques, however, may be practiced without these specific details. In some instances, known structures and devices are shown in block diagram form in order to avoid obscuring the concepts of the described examples.

[0183] The description herein is provided to enable a person having ordinary skill in the art to make or use the disclosure. Various modifications to the disclosure will be apparent to a person having ordinary skill in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

CLAIMS

What is claimed is:

1. An apparatus for wireless communications at a user equipment (UE), comprising:

at least one processor; and

memory coupled with the at least one processor, the memory storing instructions executable by the at least one processor to cause the UE to:

receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements;

select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap; and

perform at least a portion of the set of channel measurements and based on the first measurement gap or the second measurement gap according to the selecting.

2. The apparatus of claim 1, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap.

3. The apparatus of claim 1, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap.

4. The apparatus of claim 1, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with layer one measurements and a second priority level associated with layer three measurements.

5. The apparatus of claim 4, wherein the second priority level comprises a higher priority level than the first priority level.

6. The apparatus of claim 1, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with traffic to be communicated based on a result of the first layer one measurement and a second priority level associated with traffic to be communicated based on a result of the one or more of the second layer one measurement or the layer three measurement.

7. The apparatus of claim 1, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with a first channel state information report to be communicated based on a result of the first layer one measurement and a second priority level associated with a second channel state information report to be communicated based on a result of one or more of the second layer one measurement or the layer three measurement.

8. The apparatus of claim 7, wherein the instructions are further executable by the at least one processor to cause the UE to:

determine a first identifier associated with the first channel state information report and a second identifier associated with the second channel state information report, wherein the first priority level is based on the first identifier and the second priority level is based on the second identifier.

9. The apparatus of claim 1, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first periodicity of a first channel state information report to be communicated based on a result of the first layer one measurement and a second periodicity of a second channel state information report to be communicated based on a result of one or more of the second layer one measurement or the layer three measurement.

10. The apparatus of claim 1, wherein the instructions are further executable by the at least one processor to cause the UE to:

transmit a channel measurement report in accordance with performing at least the portion of the set of channel measurements using the first measurement gap or the second measurement gap.

11. The apparatus of claim 1, wherein the first measurement gap and the second measurement gap comprise inter-frequency measurement gaps.

12. The apparatus of claim 1, wherein the first measurement gap is associated with a first channel state information report and the second measurement gap is associated with a second channel state information report.

13. A method for wireless communications at a user equipment (UE), comprising:

receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements;

selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap; and

performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

14. The method of claim 13, wherein selecting the one of the first measurement gap or the second measurement gap comprises:

prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap.

15. The method of claim 13, wherein selecting the one of the first measurement gap or the second measurement gap comprises:

prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap.

16. The method of claim 13, wherein selecting the one of the first measurement gap or the second measurement gap comprises:

prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with layer one measurements and a second priority level associated with layer three measurements.

17. The method of claim 16, wherein the second priority level comprises a higher priority level than the first priority level.

18. The method of claim 13, wherein selecting the one of the first measurement gap or the second measurement gap comprises:

prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with traffic to be communicated based on a result of the first layer one measurement and a second priority level associated with traffic to be communicated based on a result of the one or more of the second layer one measurement or the layer three measurement.

19. The method of claim 13, wherein selecting the one of the first measurement gap or the second measurement gap comprises:

prioritizing between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with a first channel state information report to be communicated based on a result of the first layer one measurement and a second priority level associated with a second channel state information report to be communicated based on a result of one or more of the second layer one measurement or the layer three measurement.

20. The method of claim 19, further comprising:

determining a first identifier associated with the first channel state information report and a second identifier associated with the second channel state information report, wherein the first priority level is based on the first identifier and the second priority level is based on the second identifier.

21. The method of claim 13, wherein selecting the one of the first measurement gap or the second measurement gap comprises:

prioritizing between the first measurement gap and the second measurement gap according to a difference between a first periodicity of a first channel state information report to be communicated based on a result of the first layer one measurement and a second periodicity of a second channel state information report to be communicated based on a result of one or more of the second layer one measurement or the layer three measurement.

22. The method of claim 13, further comprising:

transmitting a channel measurement report in accordance with performing at least the portion of the set of channel measurements using the first measurement gap or the second measurement gap.

23. The method of claim 13, wherein the first measurement gap and the second measurement gap comprise inter-frequency measurement gaps.

24. The method of claim 13, wherein the first measurement gap is associated with a first channel state information report and the second measurement gap is associated with a second channel state information report.

25. A non-transitory computer-readable medium storing code for communications, the code comprising instructions executable by at least one processor to cause a user equipment (UE) to:

receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements;

select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap; and

perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting.

26. The non-transitory computer-readable medium of claim 25, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap.

27. The non-transitory computer-readable medium of claim 25, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap.

28. The non-transitory computer-readable medium of claim 25, wherein the instructions to select the one of the first measurement gap or the second measurement gap are executable by the at least one processor to cause the UE to:

prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with layer one measurements and a second priority level associated with layer three measurements.

29. The non-transitory computer-readable medium of claim 28, wherein the second priority level comprises a higher priority level than the first priority level.

30. An apparatus for wireless communications at a user equipment (UE), comprising:

means for receiving one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements;

means for selecting one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap; and means for performing at least a portion of the set of channel measurements and using the first measurement gap or the second measurement gap according to the selecting.

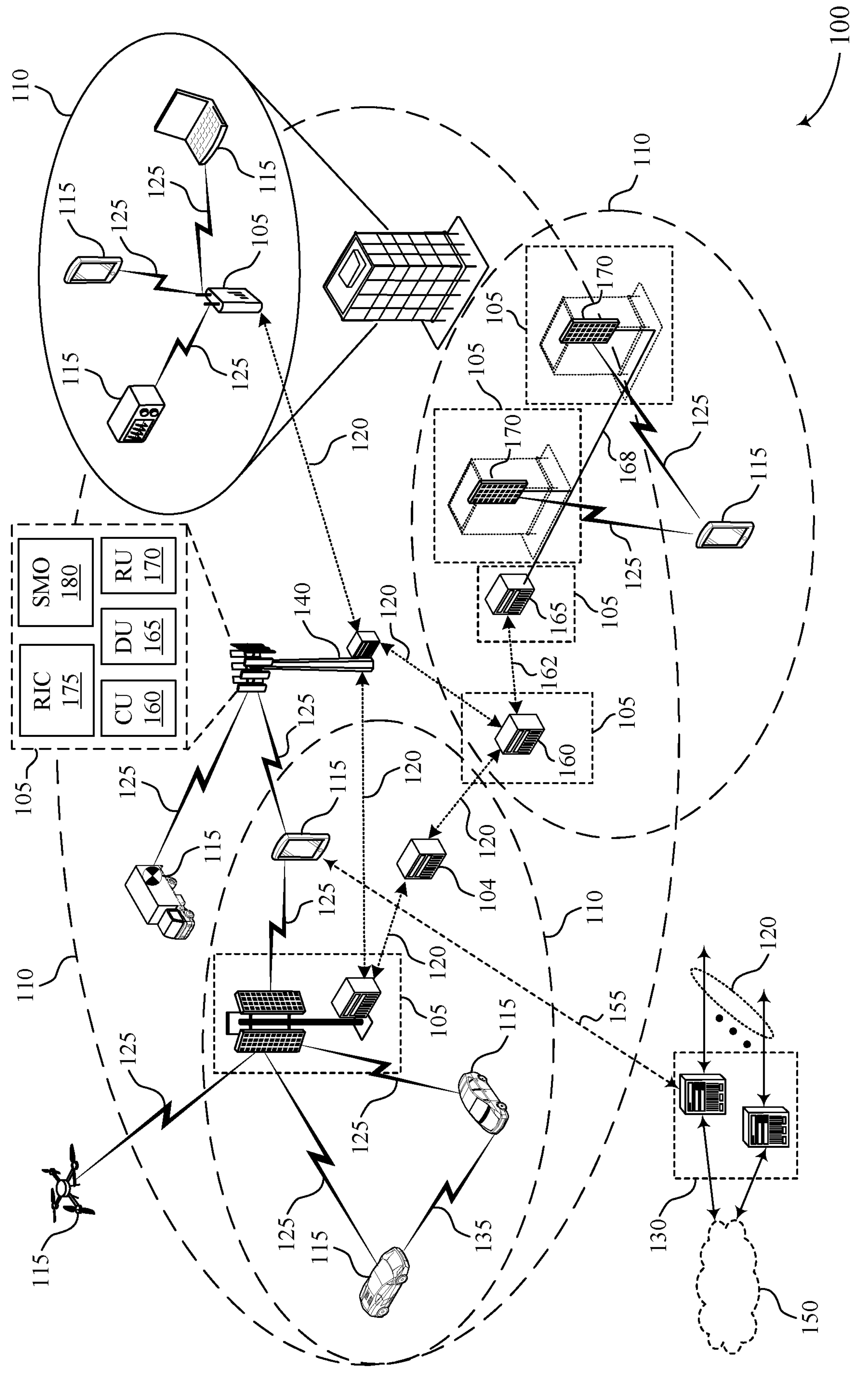
100
110
105
115
125
120
140
RIC 175
SMO 180
CU 160
DU 165
RU 170
104
155
130
135
150
160
162
165
168
170

FIG. 1

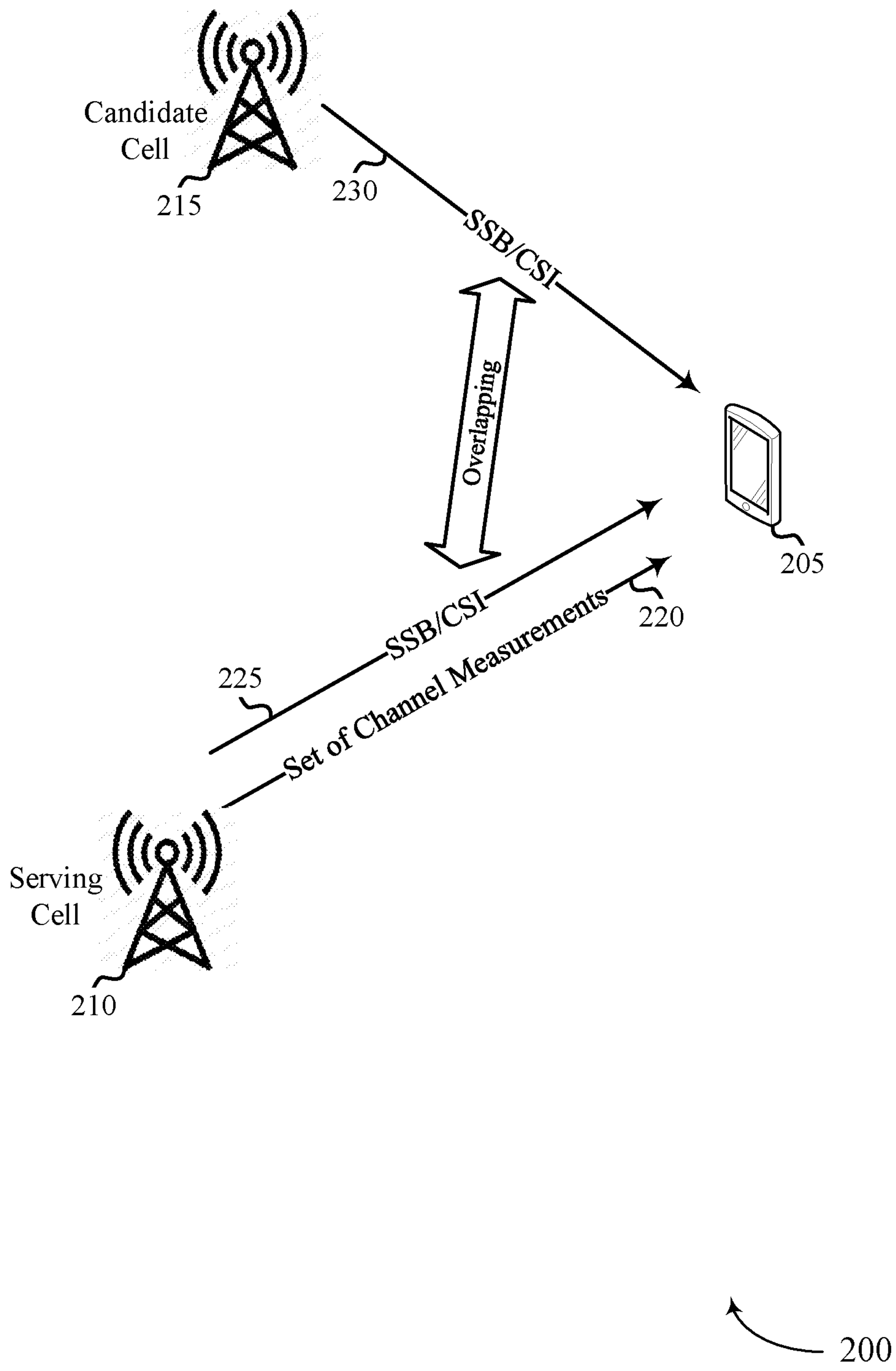
Candidate
Cell
215
230
SSB/CSI
Overlapping
205
SSB/CSI
220
225
Set of Channel Measurements
Serving
Cell
210
200

FIG. 2

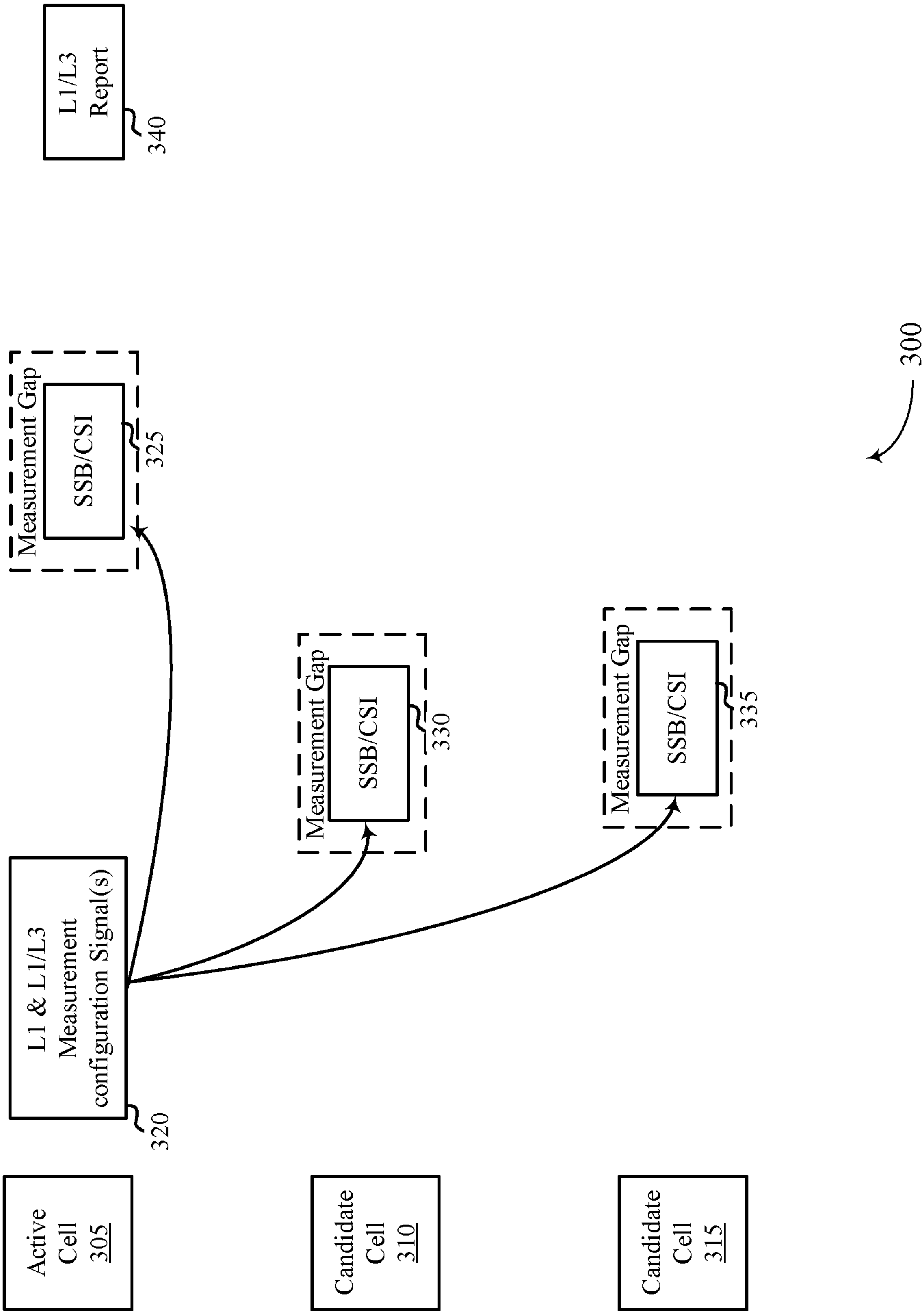
L1/L3
Report
340
Measurement Gap
SSB/CSI
325
Measurement Gap
SSB/CSI
330
Measurement Gap
SSB/CSI
335
300
L1 & L1/L3
Measurement
configuration Signal(s)
320
Active
Cell
305
Candidate
Cell
310
Candidate
Cell
315

FIG. 3

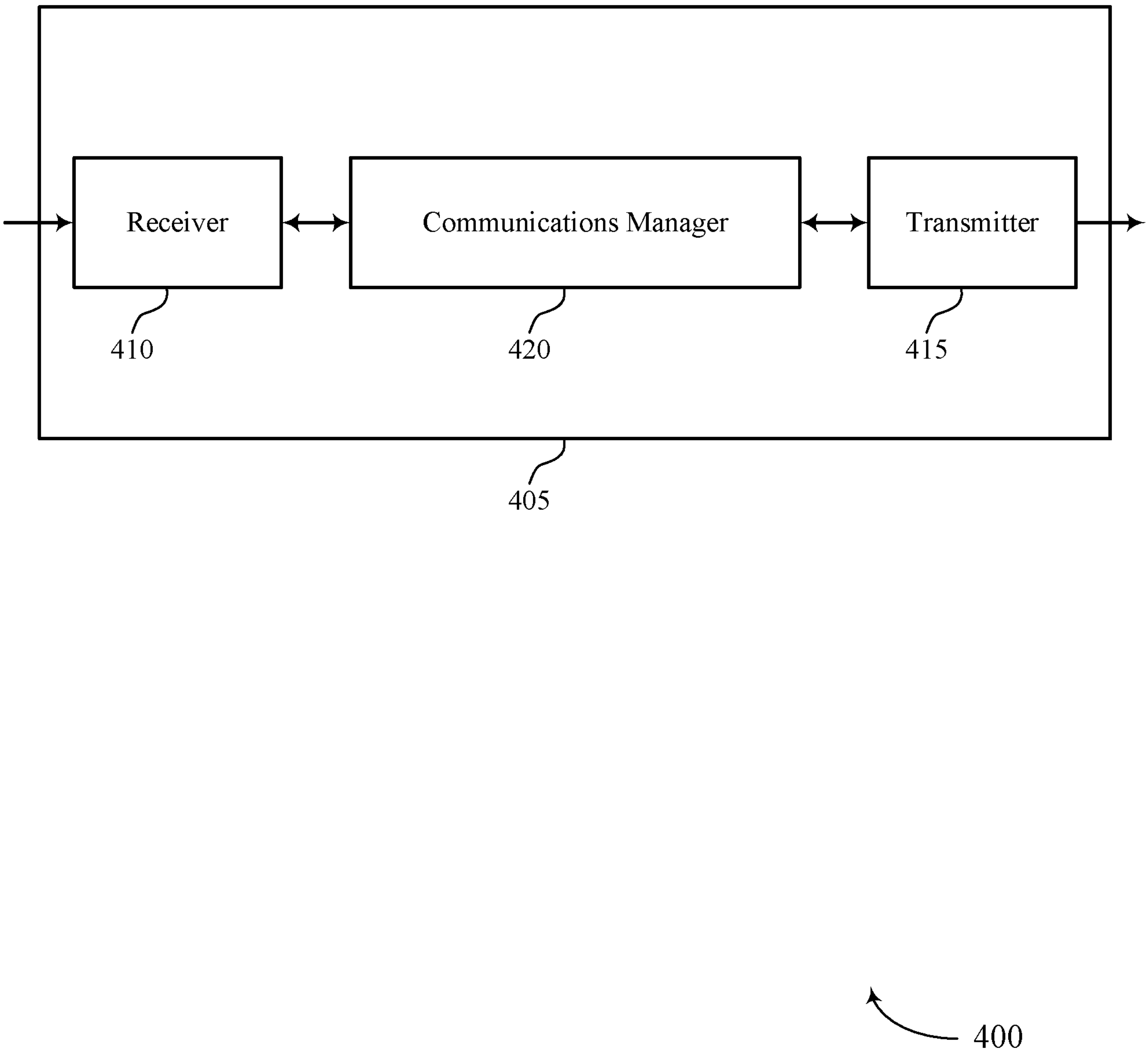
Receiver
Communications Manager
Transmitter
410
420
415
405
400

FIG. 4

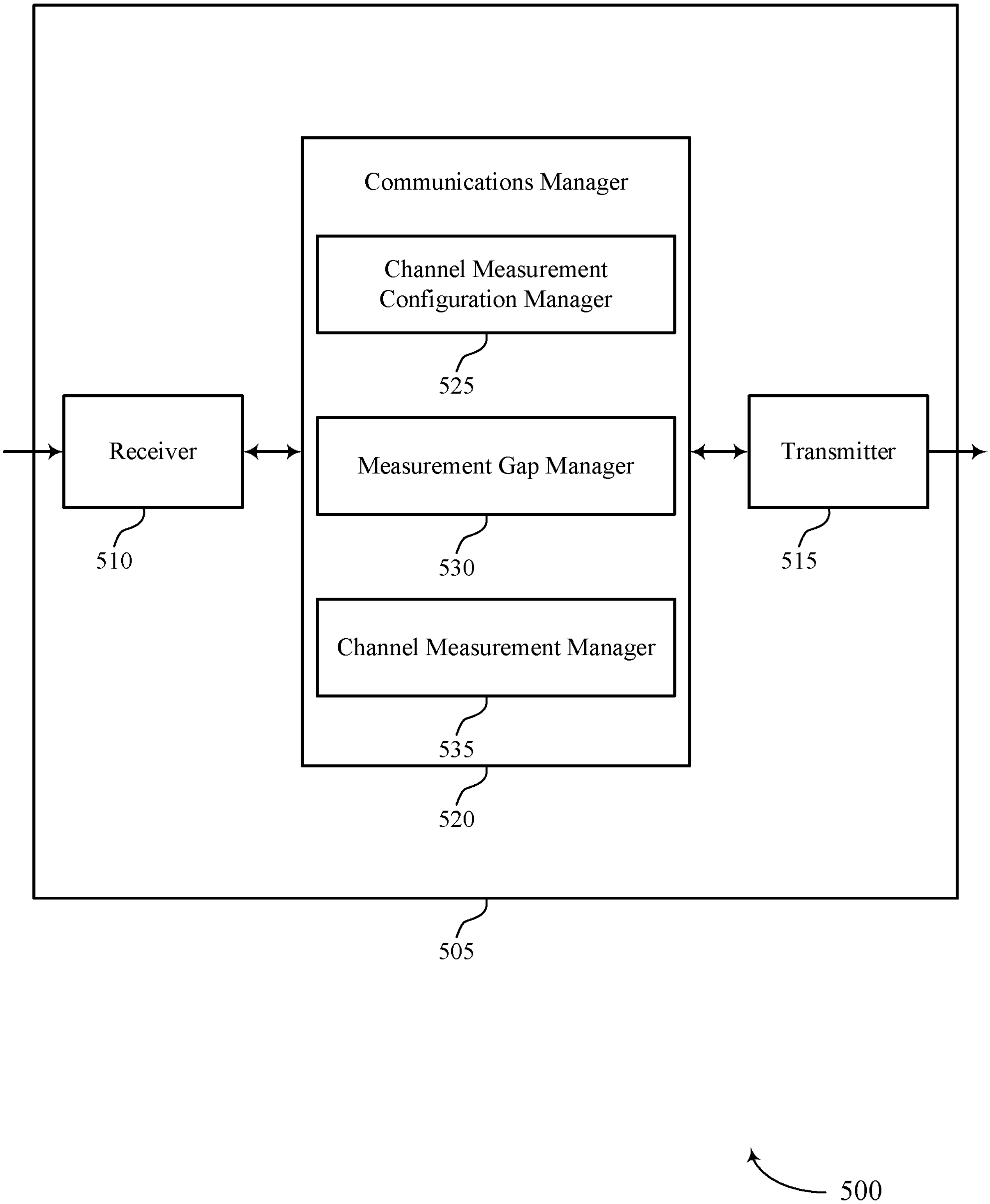
Communications Manager
Channel Measurement Configuration Manager
525
Receiver
Measurement Gap Manager
Transmitter
510
530
515
Channel Measurement Manager
535
520
505
500

FIG. 5

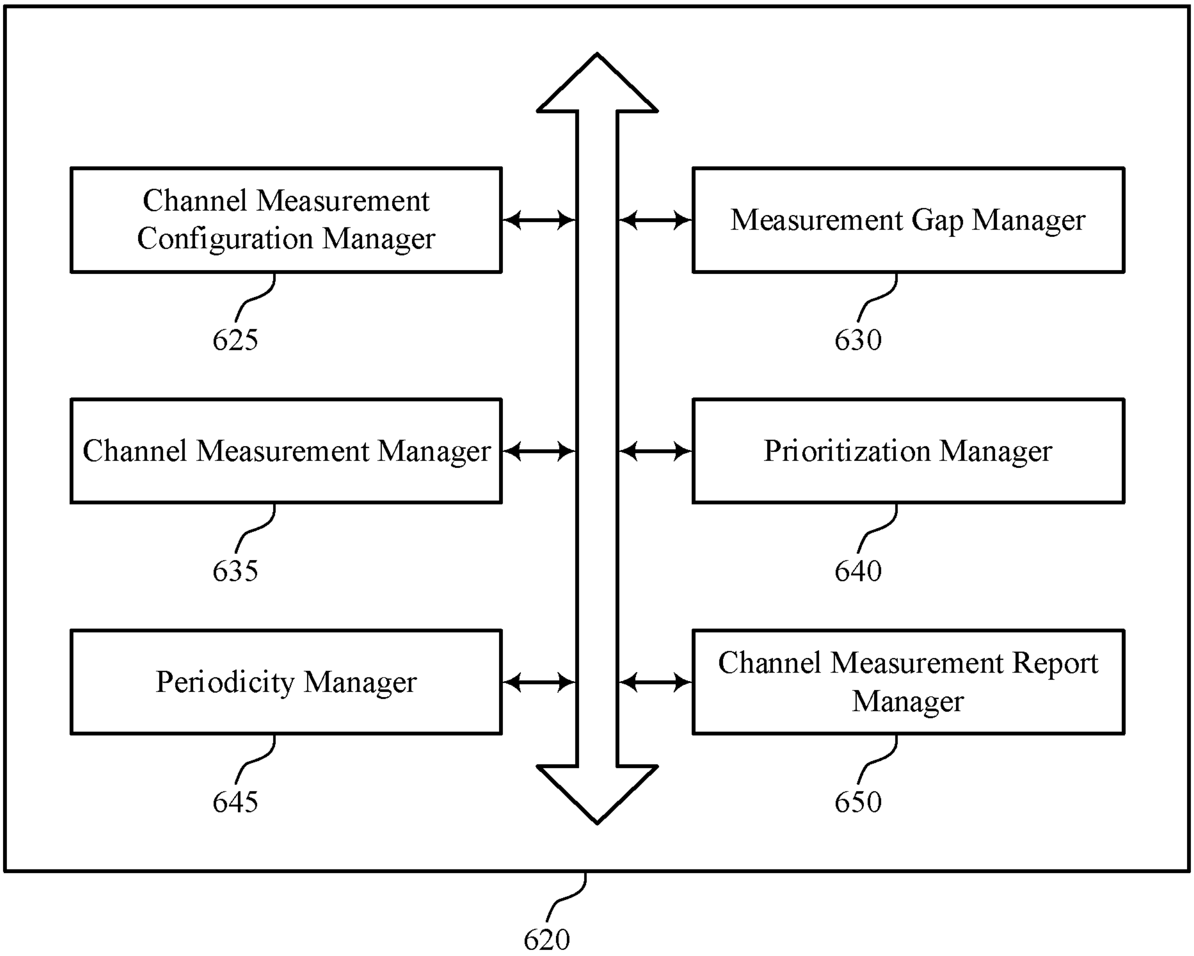
Channel Measurement Configuration Manager
625
Measurement Gap Manager
630
Channel Measurement Manager
635
Prioritization Manager
640
Periodicity Manager
645
Channel Measurement Report Manager
650
620
600

FIG. 6

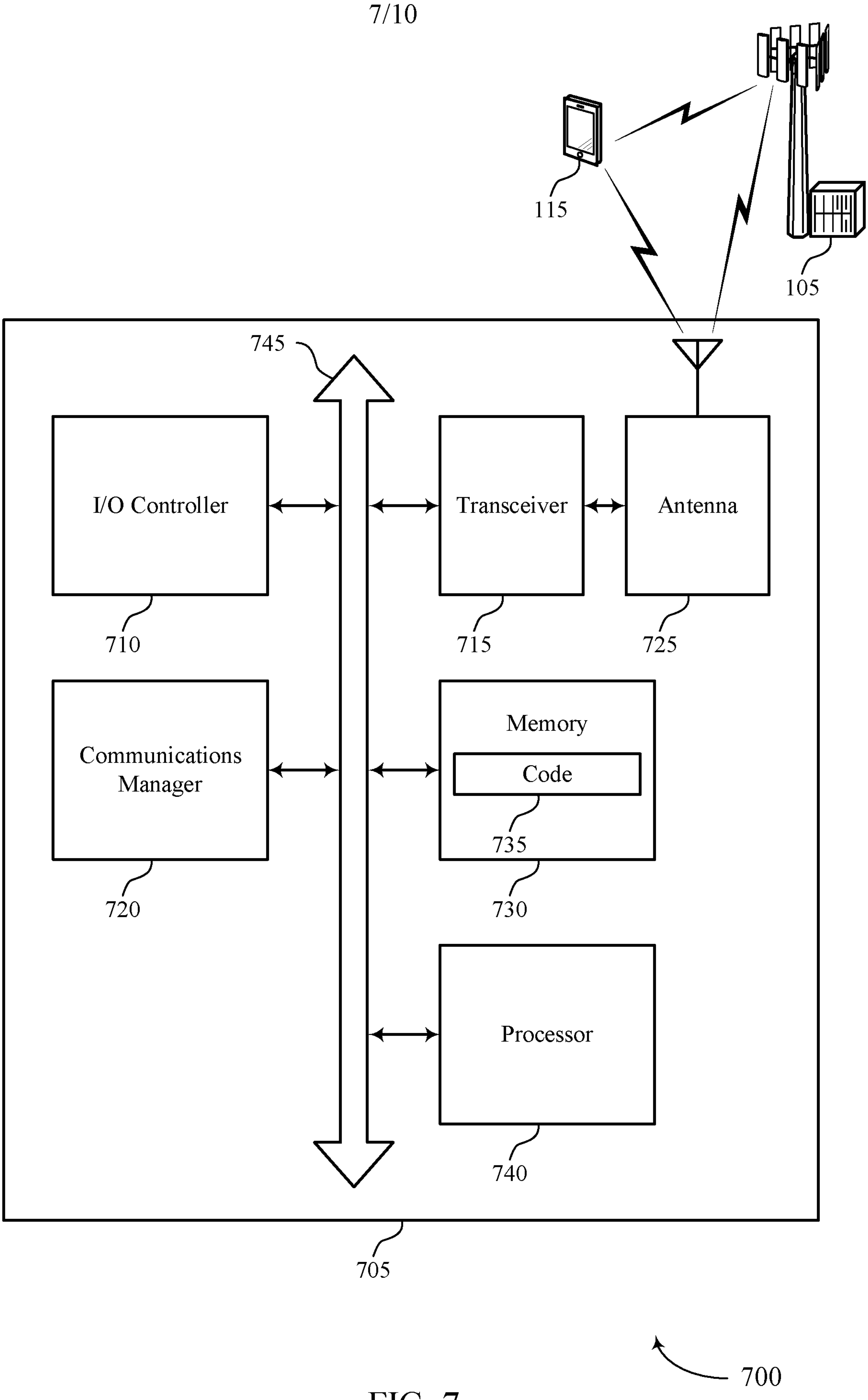
115
105
745
I/O Controller
Transceiver
Antenna
710
715
725
Communications Manager
Memory
Code
735
720
730
Processor
740
705
700

FIG. 7

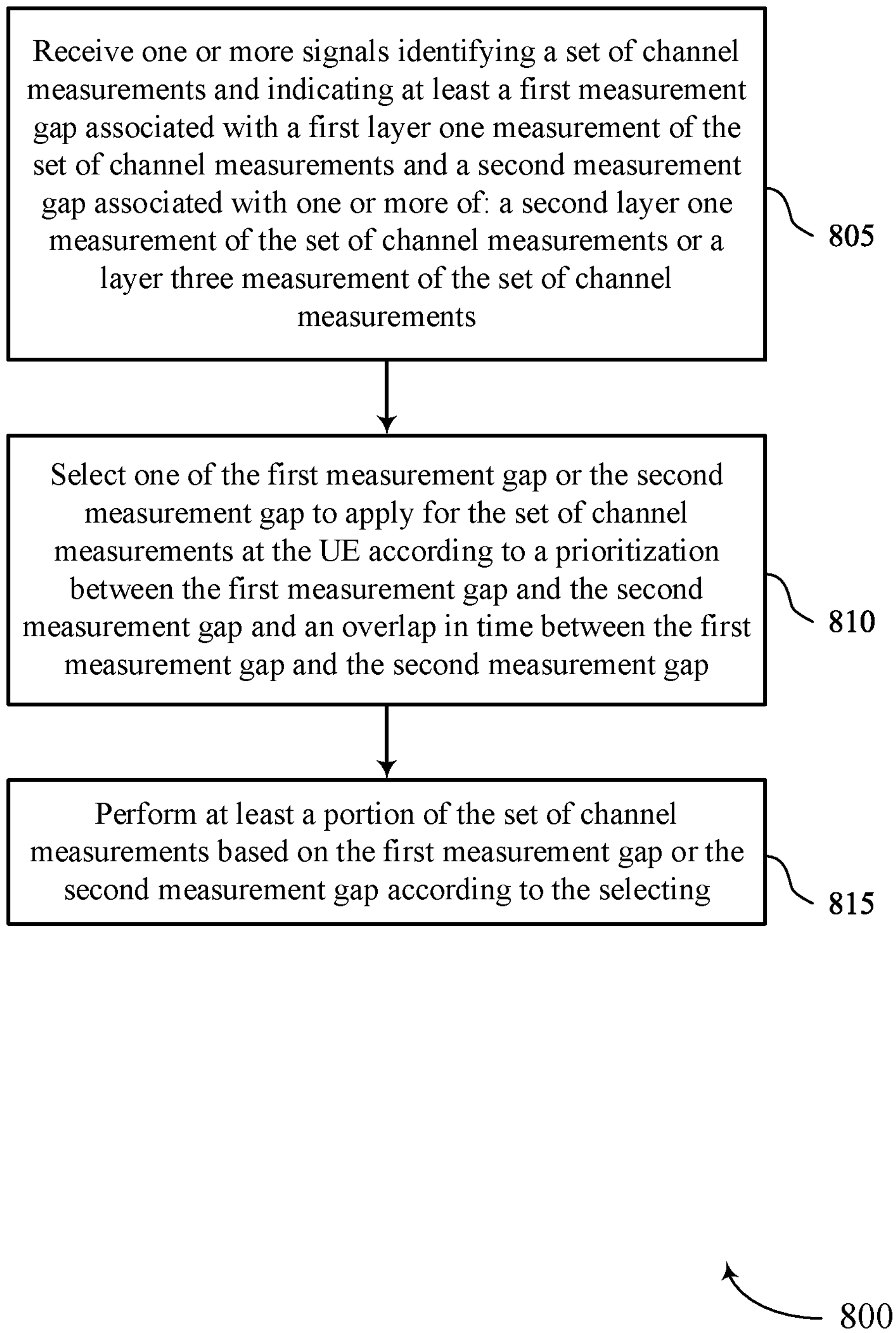
Receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements
805
Select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap
810
Perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting
815
800

FIG. 8

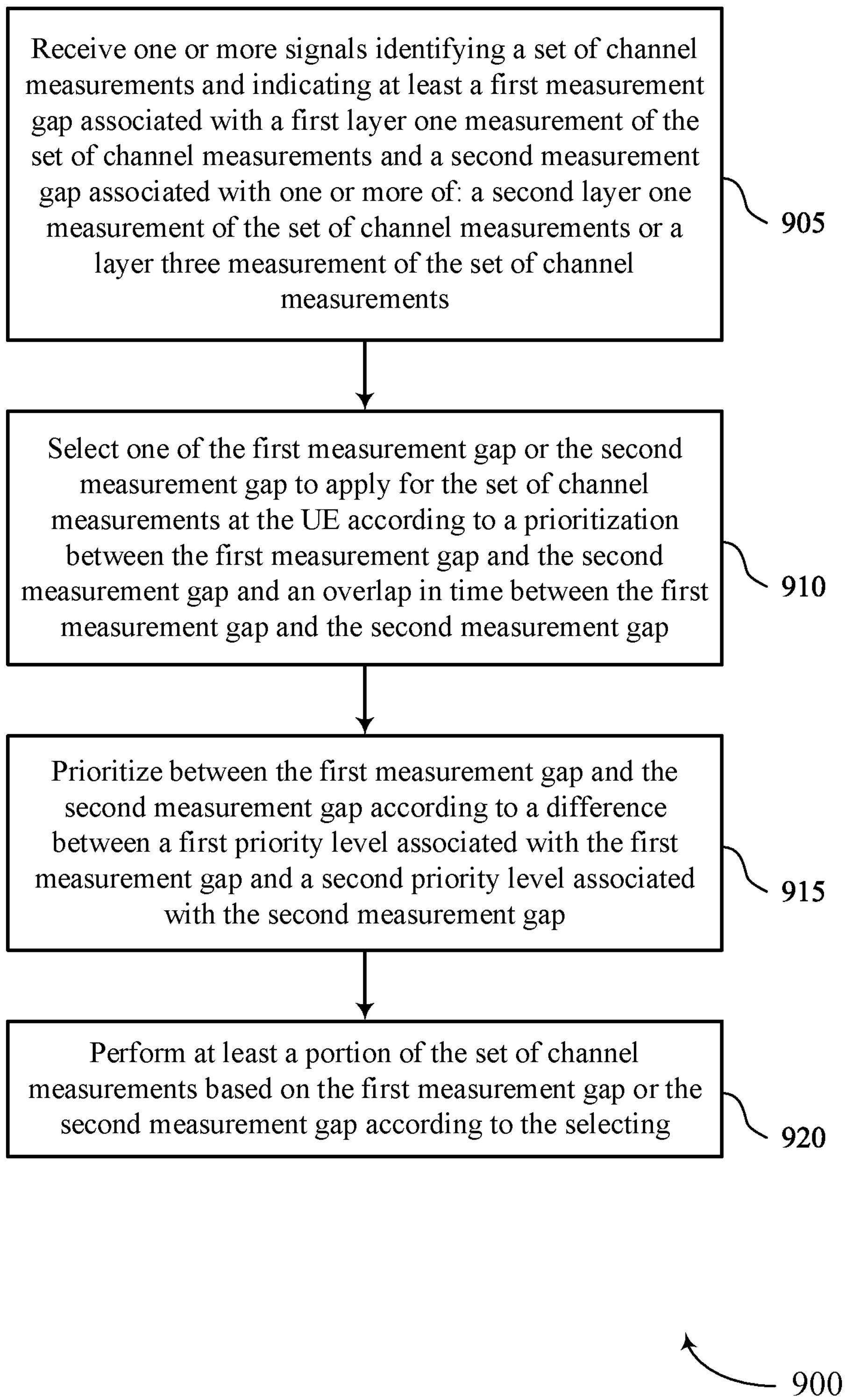
Receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements
905
Select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap
910
Prioritize between the first measurement gap and the second measurement gap according to a difference between a first priority level associated with the first measurement gap and a second priority level associated with the second measurement gap
915
Perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting
920
900

FIG. 9

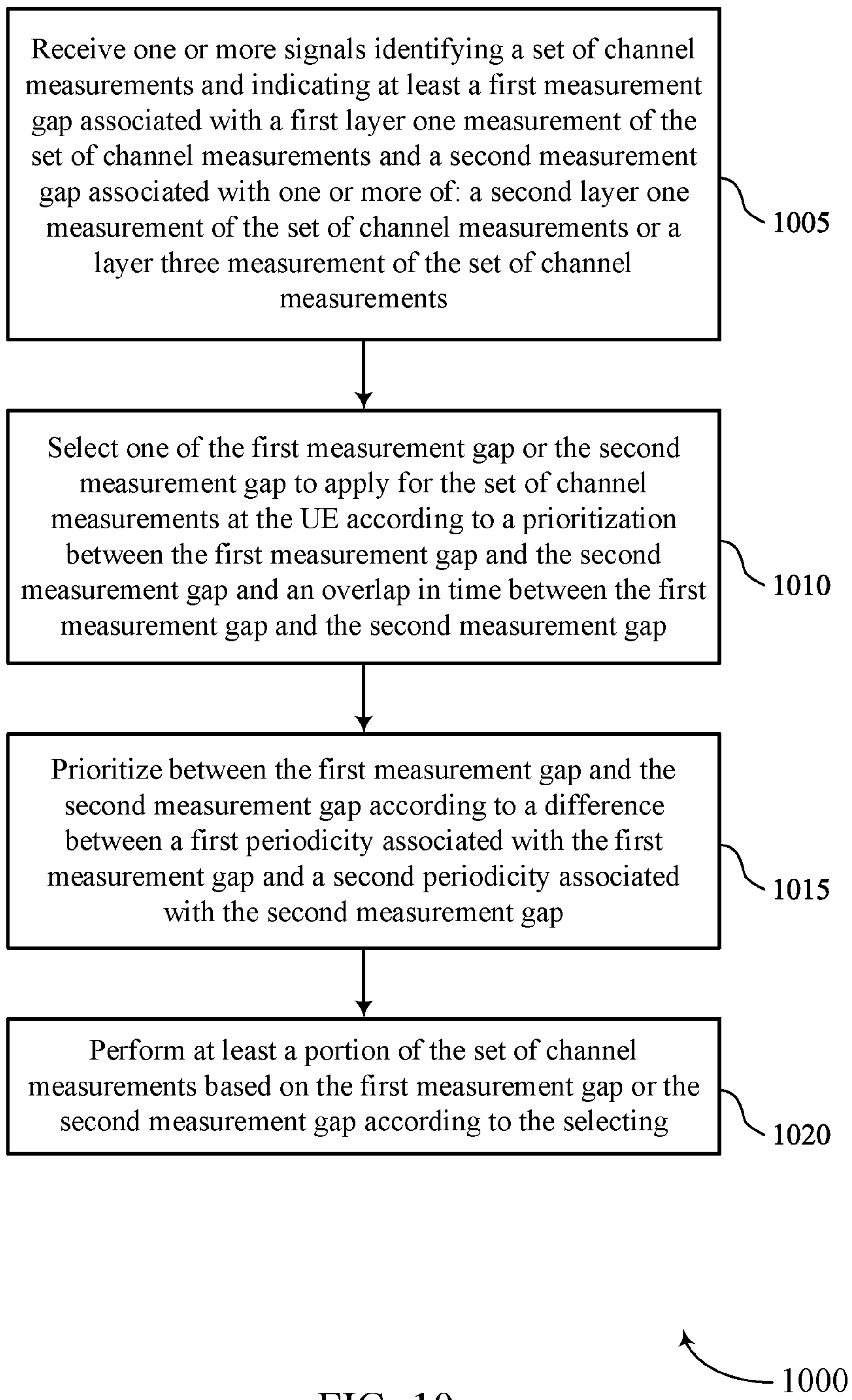
Receive one or more signals identifying a set of channel measurements and indicating at least a first measurement gap associated with a first layer one measurement of the set of channel measurements and a second measurement gap associated with one or more of: a second layer one measurement of the set of channel measurements or a layer three measurement of the set of channel measurements
1005
Select one of the first measurement gap or the second measurement gap to apply for the set of channel measurements at the UE according to a prioritization between the first measurement gap and the second measurement gap and an overlap in time between the first measurement gap and the second measurement gap
1010
Prioritize between the first measurement gap and the second measurement gap according to a difference between a first periodicity associated with the first measurement gap and a second periodicity associated with the second measurement gap
1015
Perform at least a portion of the set of channel measurements based on the first measurement gap or the second measurement gap according to the selecting
1020
1000

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/128876

A. CLASSIFICATION OF SUBJECT MATTER

H04W24/10(2009.01)i; H04W72/04(2023.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04W

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

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

3GPP,CNTXT,DWPI,ENTXT,VEN,WPABS:gap+,L1,L3,L2Priority,select+,measurement, overlap+,concurrent,prioritize+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MEDIATEK INC. "R4-2117604 Discussion on concurrent gaps" *3GPP TSG-RAN WG4 Meeting #101-e,* 12 November 2021 (2021-11-12), sections 4,7	1-30
X	WO 2022082590 A1 (APPLE INC.) 28 April 2022 (2022-04-28) description, paragraphs[0093]-[0153]	1-30
A	US 2022217562 A1 (MEDIATEK SINGAPORE PTE.LTD.) 07 July 2022 (2022-07-07) the whole document	1-30

☐ Further documents are listed in the continuation of Box C.

☑ See patent family annex.

* Special categories of cited documents:

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

"D" document cited by the applicant in the international application

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 June 2023	**21 June 2023**

Name and mailing address of the ISA/CN	Authorized officer
CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China**	**ZHANG,HuaJing** Telephone No. **(+86) 010-53961629**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/128876

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
WO	2022082590	A1	28 April 2022	None			
US	2022217562	A1	07 July 2022	TW	202228471	A	16 July 2022
				CN	114727315	A	08 July 2022