

PRACH PREAMBLE TRANSMISSION TRIGGERED BY CELL SWITCH COMMAND

TECHNICAL FIELD

[0001] The present disclosure relates to wireless communications, and more specifically to
5 a user equipment (UE), a base station (BS), methods, apparatuses, and computer readable
medium for a physical random access channel (PRACH) preamble transmission triggered by
a cell switch command (CSC).

BACKGROUND

[0002] A wireless communications system may include one or multiple network
10 communication devices, such as base stations, which may be otherwise known as an eNodeB
(eNB), a next-generation NodeB (gNB), or other suitable terminology. Each network
communication devices, such as a base station may support wireless communications for one
or multiple user communication devices, which may be otherwise known as user equipment
(UE), or other suitable terminology. The wireless communications system may support
15 wireless communications with one or multiple user communication devices by utilizing
resources of the wireless communication system (e.g., time resources (e.g., symbols, slots,
subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers).
Additionally, the wireless communications system may support wireless communications
across various radio access technologies including third generation (3G) radio access
20 technology, fourth generation (4G) radio access technology, fifth generation (5G) radio
access technology, among other suitable radio access technologies beyond 5G (e.g., sixth
generation (6G)).

[0003] Layer 1 and layer 2 triggered mobility (LTM) is supported in new radio (NR) release
18 (Rel-18) to reduce the handover (HO) latency compared with layer 3 based mobility.
25 LTM is performed based on L1 measurements on multiple candidate cells and early time
advance (TA) acquisition for candidate cells before perform HO to a new serving cell is
supported. When the network (NW) find a candidate cell is better enough, it will send a
cell switch command (CSC) medium access control (MAC) control element (CE) to tell the
UE to switch to the target cell from the current serving cell. A UE behavior for uplink (UL)
30 transmission triggered by the CSC MAC CE needs to be studied.

SUMMARY

[0004] The present disclosure relates to a base station, user equipment, methods, apparatuses, processors, and computer readable medium for PRACH preamble transmission triggered by a cell switch command. According to the proposed solution, the UE behavior
5 on the PRACH transmission is defined.

[0005] In some implementations, there is provided a UE. The UE comprises at least one memory; and at least one processor coupled with the at least one memory and configured to cause the UE to: receive, from a base station, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an
10 index of a first synchronization signal block (SSB) associated with the target cell and a first transmission configuration indicator (TCI) state for the target cell; determine transmit power for a PRACH preamble transmission based on the cell switch command; and transmit, to the base station, a PRACH preamble based on the transmit power.

[0006] In some implementations, there is provided a base station. The base station
15 comprises at least one memory; and at least one processor coupled with the at least one memory and configured to cause the base station to: transmit, to a UE, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell; determine transmit power for a PRACH preamble transmission based
20 on the cell switch command; and receive, from the UE, a PRACH preamble based on the transmit power.

[0007] In some implementations, there is provided a method performed by the UE. The method comprises: receiving, from a base station, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command
25 comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell; determining transmit power for a PRACH preamble transmission based on the cell switch command; and transmitting, to the base station, a PRACH preamble based on the transmit power.

[0008] In some implementations, there is provided a method performed by the base station.
30 The method comprises: transmitting, to a UE, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell;

determining transmit power for a PRACH preamble transmission based on the cell switch command; and receiving, from the UE, a PRACH preamble based on the transmit power.

[0009] In some implementations, there is provided a processor for wireless communication. The processor comprises at least one controller coupled with at least one memory and
5 configured to cause the processor to: receive, from a base station, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell; determine transmit power for a PRACH preamble transmission based on the cell switch command; and transmit, to the base station, a PRACH preamble based on
10 the transmit power.

[0010] In some implementations, there is provided a processor for wireless communication. The processor comprises at least one controller coupled with at least one memory and configured to cause the processor to: transmit, to a UE, a cell switch command in a MAC CE
15 indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell; determine transmit power for a PRACH preamble transmission based on the cell switch command; and receive, from the UE, a PRACH preamble based on the transmit power.

[0011] In some implementations of the methods and the UE described herein, further comprising: determining a downlink (DL) reference signal based on the first SSB or the first
20 TCI state; and determining the transmit power for the PRACH preamble transmission based on a DL pathloss of the DL reference signal.

[0012] In some implementations of the methods and the UE described herein, further comprising: determining QCL information for a reception of a random access response (RAR) corresponding to the PRACH preamble.

[0013] In some implementations of the methods and the UE described herein, further comprising: in accordance with a determination that the reference signal with a QCL type D is an SSB, determining that the second SSB is the reference signal indicated by the first TCI
25 state, or in accordance with a determination that the reference signal with a QCL type D is a tracking reference signal (TRS), determining that the second SSB is a further SSB QCLeD with the TRS.
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[0014] In some implementations of the methods and the UE described herein, further comprising: determining a time duration between a last symbol of a transmission of the cell

switch command or a last symbol of a transmission of an acknowledgement for the cell switch command and a first symbol of the PRACH preamble, wherein the time duration comprises a time gap and a time requirement length for the PRACH preamble transmission; and determining a transmission occasion for the PRACH preamble transmission based on the first SSB and the time duration.

[0015] In some implementations of the methods and the UE described herein, further comprising: determining a set of power control parameters for uplink transmissions based on the first TCI state; and performing the uplink transmissions based on the set of power control parameters.

[0016] In some implementations of the methods and the UE described herein, further comprising: receiving a further MAC CE indicating an activation or deactivation of one or more TCI states for at least one candidate cell.

[0017] In some implementations of the methods and the UE described herein, further comprising: in accordance with a determination that an uplink power control identifier in a first uplink bandwidth part (BWP) for the target cell is received, applying at least one parameter associated with the uplink power control identifier in the first uplink BWP for power control.

[0018] In some implementations of the methods and the UE described herein, further comprising: in accordance with a determination that an uplink power control identifier in the first uplink BWP for the target cell is not received, applying a list of parameters in an uplink power control with a lowest identifier configured for the target cell for power control.

[0019] In some implementations of the methods and the UE described herein, further comprising: receiving a physical downlink control channel (PDCCH) order comprising a cell indicator and a physical cell identifier (PCI) indicator; and in accordance with a determination that the cell indicator is zero and the PCI indicator is zero, triggering a PRACH preamble transmission towards a serving cell, in accordance with a determination that the cell indicator is non-zero and the PCI indicator is zero, triggering a PRACH preamble transmission towards a candidate cell associated with the cell indicator, or in accordance with a determination that the cell indicator is zero and the PCI indicator is non-zero, triggering a PRACH preamble transmission towards a further cell associated with the PCI indicator.

[0020] In some implementations of the methods and the base station described herein, further comprising: determining a DL reference signal based on the first SSB or the first TCI

state; and determining the transmit power for the PRACH preamble transmission based on a DL pathloss of the DL reference signal.

[0021] In some implementations of the methods and the base station described herein, further comprising: determining QCL information for a reception of a random access response (RAR) corresponding to the PRACH preamble; and transmitting, to the UE, the RAR corresponding to the PRACH preamble.

[0022] In some implementations of the methods and the base station described herein, further comprising: in accordance with a determination that the reference signal with a QCL type D is an SSB, determining that the second SSB is the reference signal indicated by the first TCI state, or in accordance with a determination that the reference signal with a QCL type D is a TRS, determining that the second SSB is a further SSB QCLed with the TRS.

[0023] In some implementations of the methods and the base station described herein, further comprising: determining a time duration between a last symbol of a transmission of the cell switch command or a last symbol of a transmission of an acknowledgement for the cell switch command and a first symbol of the PRACH preamble, wherein the time duration comprises a time gap and a time requirement length for the PRACH preamble transmission; and determining a transmission occasion for the PRACH preamble transmission based on the first SSB and the time duration.

[0024] In some implementations of the methods and the base station described herein, further comprising: transmitting, to the UE, a further MAC CE indicating an activation or deactivation of one or more TCI states for at least one candidate cell.

[0025] In some implementations of the methods, the UE, and the base station described herein, the DL reference signal is one of: the first SSB indicated by the cell switch command, or a second SSB determined based on the first TCI state.

[0026] In some implementations of the methods, the UE, and the base station described herein, the QCL information indicates that a demodulation reference signal (DMRS) of the RAR corresponding to the PRACH preamble is QCLed with one of: the first SSB indicated by the cell switch command, or a second SSB determined based on the first TCI.

[0027] In some implementations of the methods, the UE, and the base station described herein, the time gap comprises one of: a predefined time length, or a beam application time or a cell switch time configured by a network.

[0028] In some implementations of the methods, the UE, and the base station described herein, the time requirement length comprises one of: a first time length determined based on the index of the first SSB, and a second time length of a preparation for radio frequency (RF) or baseband (BB).

- 5 [0029] In some implementations of the methods, the UE, and the base station described herein, the further MAC CE comprises a bitmap for the at least one candidate cell, and each bit in the bitmap corresponds to a TCI state of the at least one candidate cell.

BRIEF DESCRIPTION OF THE DRAWINGS

- 10 [0030] FIG. 1 illustrates an example of a wireless communications system in which some embodiments of the present disclosure can be implemented;

[0031] FIG. 2 illustrates a signalling chart illustrating communication process in accordance with some example embodiments of the present disclosure;

[0032] FIG. 3 illustrates an example schematic of timing relation for a transmission of PRACH preamble in accordance with some example embodiments of the present disclosure;

- 15 [0033] FIG. 4A illustrates an example schematic of MAC CE for activation or deactivation of TCI states for at least one candidate cell in accordance with some example embodiments of the present disclosure;

- [0034] FIG. 4B illustrates another example schematic of MAC CE for activation or deactivation of TCI states for at least one candidate cell in accordance with some example
20 embodiments of the present disclosure;

[0035] FIG. 4C illustrates another example schematic of MAC CE for activation or deactivation of TCI states for at least one candidate cell in accordance with some example embodiments of the present disclosure;

- 25 [0036] FIG. 5 illustrates an example of a device that is suitable for implementing embodiments of the present disclosure;

[0037] FIG. 6 illustrates an example of a processor that is suitable for implementing some embodiments of the present disclosure;

[0038] FIG. 7 illustrates a flowchart of an example method implemented at a UE in accordance with aspects of the present disclosure; and

- 30 [0039] FIG. 8 illustrates a flowchart of an example method implemented at a BS in

accordance with aspects of the present disclosure.

[0040] Throughout the drawings, the same or similar reference numerals represent the same or similar element.

DETAILED DESCRIPTION

5 **[0041]** Principles of the present disclosure will now be described with reference to some embodiments. It is to be understood that these embodiments are described only for the purpose of illustration and help those skilled in the art to understand and implement the present disclosure, without suggesting any limitation as to the scope of the disclosure. The disclosure described herein can be implemented in various manners other than the ones
10 described below. In the following description and claims, unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skills in the art to which this disclosure belongs.

[0042] References in the present disclosure to “one embodiment,” “an example embodiment,” “an embodiment,” “some embodiments,” and the like indicate that the
15 embodiment(s) described may include a particular feature, structure, or characteristic, but it is not necessary that every embodiment includes the particular feature, structure, or characteristic. Moreover, such phrases do not necessarily refer to the same embodiment(s). Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to
20 affect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described.

[0043] It shall be understood that although the terms “first” and “second” or the like may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another element. For
25 example, a first element could also be termed as a second element, and similarly, a second element could also be termed as a first element, without departing from the scope of embodiments. As used herein, the term “and/or” includes any and all combinations of one or more of the listed terms. In some examples, values, procedures, or apparatuses are referred to as “best,” “lowest,” “highest,” “minimum,” “maximum,” or the like. It will be
30 appreciated that such descriptions are intended to indicate that a selection among many used functional alternatives can be made, and such selections need not be better, smaller, higher, or otherwise preferable to other selections.

[0044] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of embodiments. As used herein, the singular forms “a,” “an” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms “comprises,” “comprising,” “has,” “having,” “includes” and/or “including,” when used herein, specify the presence of stated features, elements, components and/or the like, but do not preclude the presence or addition of one or more other features, elements, components and/or combinations thereof. For example, the term “includes” and its variants are to be read as open terms that mean “includes, but is not limited to.” The term “based on” is to be read as “based at least in part on.” The term “one embodiment” and “an embodiment” are to be read as “at least one embodiment.” The term “another embodiment” is to be read as “at least one other embodiment.” The use of an expression such as “A and/or B” can mean either “only A” or “only B” or “both A and B.” Other definitions, explicit and implicit, may be included below.

[0045] FIG. 1 illustrates an example of a wireless communications system 100 in which some embodiments of the present disclosure can be implemented. The wireless communications system 100 may include one or more network entities 102 (also referred to as network equipment (NE)), one or more UEs 104, a core network 106, and a packet data network 108. The wireless communications system 100 may support various radio access technologies. In some implementations, the wireless communications system 100 may be a 4G network, such as a long term evolution (LTE) network or an LTE-Advanced (LTE-A) network. In some other implementations, the wireless communications system 100 may be a 5G network, such as a new radio (NR) network. In other implementations, the wireless communications system 100 may be a combination of a 4G network and a 5G network, or other suitable radio access technology including Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20. The wireless communications system 100 may support radio access technologies beyond 5G. Additionally, the wireless communications system 100 may support technologies, such as time division multiple access (TDMA), frequency division multiple access (FDMA), or code division multiple access (CDMA), etc.

[0046] The one or more network entities 102 may be dispersed throughout a geographic region to form the wireless communications system 100. One or more of the network entities 102 described herein may be or include or may be referred to as a network node, a base station, a network element, a radio access network (RAN), a base transceiver station, an

access point, a NodeB, an eNodeB (eNB), a next-generation NodeB (gNB), or other suitable terminology. A network entity 102 and a UE 104 may communicate via a communication link 110, which may be a wireless or wired connection. For example, a network entity 102 and a UE 104 may perform wireless communication (e.g., receive signaling, transmit signaling) over a Uu interface.

[0047] A network entity 102 may provide a geographic coverage area 112 for which the network entity 102 may support services (e.g., voice, video, packet data, message, broadcast, etc.) for one or more UEs 104 within the geographic coverage area 112. For example, a network entity 102 and a UE 104 may support wireless communication of signals related to services (e.g., voice, video, packet data, messaging, broadcast, etc.) according to one or multiple radio access technologies. In some implementations, a network entity 102 may be moveable, for example, a satellite associated with a non-terrestrial network. In some implementations, different geographic coverage areas 112 associated with the same or different radio access technologies may overlap, but the different geographic coverage areas 112 may be associated with different network entities 102. 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.

[0048] The one or more UEs 104 may be dispersed throughout a geographic region of the wireless communications system 100. A UE 104 may include or may be referred to as a mobile device, a wireless device, a remote device, a remote unit, a handheld device, or a subscriber device, or some other suitable terminology. In some implementations, the UE 104 may be referred to as a unit, a station, a terminal, or a client, among other examples. Additionally, or alternatively, the UE 104 may be referred to as an Internet-of-Things (IoT) device, an Internet-of-Everything (IoE) device, or machine-type communication (MTC) device, among other examples. In some implementations, a UE 104 may be stationary in the wireless communications system 100. In some other implementations, a UE 104 may be mobile in the wireless communications system 100.

[0049] The one or more UEs 104 may be devices in different forms or having different capabilities. Some examples of UEs 104 are illustrated in FIG. 1. A UE 104 may be capable of communicating with various types of devices, such as the network entities 102,

other UEs 104, or network equipment (e.g., the core network 106, the packet data network 108, a relay device, an integrated access and backhaul (IAB) node, or another network equipment), as shown in FIG. 1. Additionally, or alternatively, a UE 104 may support communication with other network entities 102 or UEs 104, which may act as relays in the wireless communications system 100.

[0050] A UE 104 may also be able to support wireless communication directly with other UEs 104 over a communication link 114. For example, a UE 104 may support wireless communication directly with another UE 104 over a device-to-device (D2D) communication link. In some implementations, such as vehicle-to-vehicle (V2V) deployments, vehicle-to-everything (V2X) deployments, or cellular-V2X deployments, the communication link 114 may be referred to as a sidelink (SL). For example, a UE 104 may support wireless communication directly with another UE 104 over a PC5 interface.

[0051] A network entity 102 may support communications with the core network 106, or with another network entity 102, or both. For example, a network entity 102 may interface with the core network 106 through one or more backhaul links 116 (e.g., via an S1, N2, N3, or another network interface). The network entities 102 may communicate with each other over the backhaul links 116 (e.g., via an X2, Xn, or another network interface). In some implementations, the network entities 102 may communicate with each other directly (e.g., between the network entities 102). In some other implementations, the network entities 102 may communicate with each other or indirectly (e.g., via the core network 106). In some implementations, one or more network entities 102 may include subcomponents, such as an access network entity, which may be an example of an access node controller (ANC). An ANC may communicate with the one or more UEs 104 through one or more other access network transmission entities, which may be referred to as radio heads, smart radio heads, or transmission-reception points (TRPs).

[0052] In some implementations, a network entity 102 may be configured in a disaggregated architecture, which may be configured to utilize a protocol stack physically or logically distributed among two or more network entities 102, 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 102 may include one or more of a central unit (CU), a distributed unit (DU), a radio unit (RU), a RAN Intelligent Controller (RIC) (e.g., a Near-Real Time RIC (Near-RT RIC), a Non-Real Time RIC (Non-RT RIC)), a Service Management and

Orchestration (SMO) system, or any combination thereof.

[0053] An RU 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 102 in a disaggregated RAN architecture may be co-located, or one or more components of the network entities 102 may be located in distributed locations (e.g., separate physical locations). In some implementations, one or more network entities 102 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)).

[0054] Split of functionality between a CU, a DU, and an RU may be flexible and may support different functionalities depending upon which functions (e.g., network layer functions, protocol layer functions, baseband functions, radio frequency functions, and any combinations thereof) are performed at a CU, a DU, or an RU. For example, a functional split of a protocol stack may be employed between a CU and a DU such that the CU may support one or more layers of the protocol stack and the DU may support one or more different layers of the protocol stack. In some implementations, the CU may host upper protocol layer (e.g., a layer 3 (L3), a layer 2 (L2)) functionality and signaling (e.g., Radio Resource Control (RRC), service data adaptation protocol (SDAP), Packet Data Convergence Protocol (PDCP)). The CU may be connected to one or more DUs or RUs, and the one or more DUs or RUs may host lower protocol layers, such as a layer 1 (L1) (e.g., physical (PHY) layer) or an 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.

[0055] Additionally, or alternatively, a functional split of the protocol stack may be employed between a DU and an RU such that the DU may support one or more layers of the protocol stack and the RU may support one or more different layers of the protocol stack. The DU may support one or multiple different cells (e.g., via one or more RUs). In some implementations, a functional split between a CU and a DU, or between a DU and an RU may be within a protocol layer (e.g., some functions for a protocol layer may be performed by one of a CU, a DU, or an RU, while other functions of the protocol layer are performed by a different one of the CU, the DU, or the RU).

[0056] A CU may be functionally split further into CU control plane (CU-CP) and CU user plane (CU-UP) functions. A CU may be connected to one or more DUs via a midhaul communication link (e.g., F1, F1-C, F1-U), and a DU may be connected to one or more RUs

via a fronthaul communication link (e.g., open fronthaul (FH) interface). In some implementations, a midhaul communication link or a fronthaul communication link may be implemented in accordance with an interface (e.g., a channel) between layers of a protocol stack supported by respective network entities 102 that are in communication via such
5 communication links.

[0057] The core network 106 may support user authentication, access authorization, tracking, connectivity, and other access, routing, or mobility functions. The core network 106 may be an evolved packet core (EPC), or a 5G core (5GC), which may include a control plane entity that manages access and mobility (e.g., a mobility management entity (MME),
10 an access and mobility management functions (AMF)) and a 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)). In some implementations, the control plane entity may manage non-access stratum (NAS) functions, such as mobility, authentication, and bearer management (e.g., data bearers, signal bearers,
15 etc.) for the one or more UEs 104 served by the one or more network entities 102 associated with the core network 106.

[0058] The core network 106 may communicate with the packet data network 108 over one or more backhaul links 116 (e.g., via an S1, N2, N3, or another network interface). The packet data network 108 may include an application server 118. In some implementations,
20 one or more UEs 104 may communicate with the application server 118. A UE 104 may establish a session (e.g., a protocol data unit (PDU) session, or the like) with the core network 106 via a network entity 102. The core network 106 may route traffic (e.g., control information, data, and the like) between the UE 104 and the application server 118 using the established session (e.g., the established PDU session). The PDU session may be an
25 example of a logical connection between the UE 104 and the core network 106 (e.g., one or more network functions of the core network 106).

[0059] In the wireless communications system 100, the network entities 102 and the UEs 104 may use resources of the wireless communications system 100 (e.g., time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers,
30 carriers)) to perform various operations (e.g., wireless communications). In some implementations, the network entities 102 and the UEs 104 may support different resource structures. For example, the network entities 102 and the UEs 104 may support different frame structures. In some implementations, such as in 4G, the network entities 102 and the

UEs 104 may support a single frame structure. In some other implementations, such as in 5G and among other suitable radio access technologies, the network entities 102 and the UEs 104 may support various frame structures (i.e., multiple frame structures). The network entities 102 and the UEs 104 may support various frame structures based on one or more numerologies.

[0060] One or more numerologies may be supported in the wireless communications system 100, and a numerology may include a subcarrier spacing and a cyclic prefix. A first numerology (e.g., $\mu=0$) may be associated with a first subcarrier spacing (e.g., 15 kHz) and a normal cyclic prefix. In some implementations, the first numerology (e.g., $\mu=0$) associated with the first subcarrier spacing (e.g., 15 kHz) may utilize one slot per subframe. A second numerology (e.g., $\mu=1$) may be associated with a second subcarrier spacing (e.g., 30 kHz) and a normal cyclic prefix. A third numerology (e.g., $\mu=2$) may be associated with a third subcarrier spacing (e.g., 60 kHz) and a normal cyclic prefix or an extended cyclic prefix. A fourth numerology (e.g., $\mu=3$) may be associated with a fourth subcarrier spacing (e.g., 120 kHz) and a normal cyclic prefix. A fifth numerology (e.g., $\mu=4$) may be associated with a fifth subcarrier spacing (e.g., 240 kHz) and a normal cyclic prefix.

[0061] A time interval of a resource (e.g., a communication resource) may be organized according to frames (also referred to as radio frames). Each frame may have a duration, for example, a 10 millisecond (*ms*) duration. In some implementations, each frame may include multiple subframes. For example, each frame may include 10 subframes, and each subframe may have a duration, for example, a 1 *ms* duration. In some implementations, each frame may have the same duration. In some implementations, each subframe of a frame may have the same duration.

[0062] Additionally or alternatively, a time interval of a resource (e.g., a communication resource) may be organized according to slots. For example, a subframe may include a number (e.g., quantity) of slots. The number of slots in each subframe may also depend on the one or more numerologies supported in the wireless communications system 100. For instance, the first, second, third, fourth, and fifth numerologies (i.e., $\mu=0$, $\mu=1$, $\mu=2$, $\mu=3$, $\mu=4$) associated with respective subcarrier spacings of 15 kHz, 30 kHz, 60 kHz, 120 kHz, and 240 kHz may utilize a single slot per subframe, two slots per subframe, four slots per subframe, eight slots per subframe, and 16 slots per subframe, respectively. Each slot may include a number (e.g., quantity) of symbols (e.g., OFDM symbols). In some implementations, the number (e.g., quantity) of slots for a subframe may depend on a numerology. For a normal

cyclic prefix, a slot may include 14 symbols. For an extended cyclic prefix (e.g., applicable for 60 kHz subcarrier spacing), a slot may include 12 symbols. The relationship between the number of symbols per slot, the number of slots per subframe, and the number of slots per frame for a normal cyclic prefix and an extended cyclic prefix may depend on a numerology. It should be understood that reference to a first numerology (e.g., $\mu=0$) associated with a first subcarrier spacing (e.g., 15 kHz) may be used interchangeably between subframes and slots.

[0063] In the wireless communications system 100, an electromagnetic (EM) spectrum may be split, based on frequency or wavelength, into various classes, frequency bands, frequency channels, etc. By way of example, the wireless communications system 100 may support one or multiple operating frequency bands, such as frequency range designations FR1 (410 MHz – 7.125 GHz), FR2 (24.25 GHz – 52.6 GHz), FR3 (7.125 GHz – 24.25 GHz), FR4 (52.6 GHz – 114.25 GHz), FR4a or FR4-1 (52.6 GHz – 71 GHz), and FR5 (114.25 GHz – 300 GHz). In some implementations, the network entities 102 and the UEs 104 may perform wireless communications over one or more of the operating frequency bands. In some implementations, FR1 may be used by the network entities 102 and the UEs 104, among other equipment or devices for cellular communications traffic (e.g., control information, data). In some implementations, FR2 may be used by the network entities 102 and the UEs 104, among other equipment or devices for short-range, high data rate capabilities.

[0064] FR1 may be associated with one or multiple numerologies (e.g., at least three numerologies). For example, FR1 may be associated with a first numerology (e.g., $\mu=0$), which includes 15 kHz subcarrier spacing; a second numerology (e.g., $\mu=1$), which includes 30 kHz subcarrier spacing; and a third numerology (e.g., $\mu=2$), which includes 60 kHz subcarrier spacing. FR2 may be associated with one or multiple numerologies (e.g., at least 2 numerologies). For example, FR2 may be associated with a third numerology (e.g., $\mu=2$), which includes 60 kHz subcarrier spacing; and a fourth numerology (e.g., $\mu=3$), which includes 120 kHz subcarrier spacing.

[0065] LTM is introduced in order to reduce the latency, overhead, and interruption time of the handover procedure. The LTM refers to a PCell (primary cell of a master cell group) or PSCell (primary cell of a secondary cell group) cell switch procedure that the network triggers via a medium access control (MAC) control element (CE) based on L1 measurements.

[0066] When the NW find a candidate cell is better enough compared with the current

serving cell, it will send a CSC MAC CE to tell the UE to switch to the target cell from the current serving cell. Some necessary information is contained in the CSC MAC CE, for example, a transmission configuration indicator (TCI) state, which is used for the channel/signal transmission and reception in the target cell, and a TA value for the UL transmission in the target cell. In some cases, the UE may not support early TA acquisition, or the NW does not obtain the TA for the target cell before sending the CSC MAC CE. In this case, a contention free random access (CFRA) procedure may be triggered by the CSC MAC CE. In other words, a transmission of a PRACH preamble triggered by the MAC CE should be supported for LTM. Therefore, a corresponding UE behavior on the PRACH transmission should be studied.

[0067] FIG. 2 illustrates a signalling chart illustrating communication process 200 in accordance with some example embodiments of the present disclosure. The process 200 may involve a UE 201 and a base station 202. With reference to FIG. 1, the UE 201 may be implemented as the UE 104 and the base station 202 may be implemented as the network entity 102. It would be appreciated that the process 200 may be applied to other communication scenarios, which will not be described in detail.

[0068] The base station 202 may transmit an RRC reconfiguration message to the UE 201, where the RRC reconfiguration message may include LTM candidate cell configurations for one or multiple candidate cells. The UE 201 may perform L1 measurements on the configured candidate cell(s) and further transmits L1 measurement reports to the base station 202.

[0069] In the process 200, the base station 202 transmits a cell switch command to the UE 201 at 210. Specifically, the cell switch command is used for indicating to the UE 201 to switch towards a target cell, for example, the cell switch command includes an identifier of the target cell.

[0070] In some examples, the current serving cell of the UE 201 may be provided by a source DU, and the target cell may be provided by a target DU. In some examples, the source DU and the target DU may be associated with (connect to) a same CU. In the present disclosure, the base station 202 may be regarded as the CU or a gNB, in some examples, the cell switch of the UE 201 may be referred to as an intra-CU inter DU LTM or intra-gNB LTM.

[0071] The cell switch command in the present disclosure is included in a MAC CE which is transmitted over a physical downlink shared channel (PDSCH) from the base station 202

to the UE 201. For example, the cell switch command may also be referred to as a CSC MAC CE.

[0072] In some implementations, the base station 202 may decide to execute cell switch to the target cell based on the L1 measurement reports from the UE 201 and may further transmit the MAC CE triggering cell switch by including the candidate configuration index of the target cell.

[0073] For the UE 201, upon receiving the cell switch command (i.e. a PDSCH carrying the CSC MAC CE), the UE 201 may further transmit a physical uplink control channel (PUCCH) or physical uplink shared channel (PUSCH) carrying a hybrid automatic repeat request (HARQ) acknowledgement (ACK) for the cell switch command (i.e. a PDSCH which carries CSC MAC CE).

[0074] In some implementations, the cell switch command includes an index of a first SSB (SSB index) associated with the target cell and a first TCI state for the target cell. For example, the first TCI state may be a UL TCI state or a joint TCI state or a DL TCI state.

[0075] In NR Release 17, DCI (Downlink Control Information) based unified TCI framework is supported. When joint DL/UL TCI (which means DL (downlink) RX (receiver) spatial filter and UL (uplink) TX (transmitter) spatial filter are determined by a same indicated TCI state) is configured, the DL RX spatial filter for a set of dedicated PDCCH (Physical Downlink Control Channel) receptions (a dedicated PDCCH reception is the PDCCH reception in RRC-connected mode) and all PDSCH (Physical Downlink Shared Channel) receptions and the UL TX spatial filter for a set of dedicated PUCCH transmissions (a dedicated PUCCH (Physical Uplink Control Channel) transmission is the PUCCH transmission in RRC-connected mode) and all PUSCH (Physical Uplink Shared Channel) transmissions are both determined by the QCL-TypeD RS contained in the joint DL/UL TCI state (referred to as joint TCI state hereinafter) indicated by a TCI field contained in a DCI or in a MAC CE (the MAC CE only activates one TCI state configured by RRC signaling). When separate DL/UL TCI (which means DL TCI state and UL TCI state are updated or activated separately) is configured, the DL RX spatial filter for a set of dedicated PDCCH receptions and all PDSCH receptions is determined by the QCL-TypeD RS contained in the DL TCI state indicated by a TCI field in a DCI or a MAC CE, while the UL TX spatial filter for a set of dedicated PUCCH transmissions and all PUSCH transmissions is directly indicated by the UL TCI state (i.e. the *spatialRelationInfo* RS contained in the UL TX state)

indicated by the TCI field in a DCI or a MAC CE. The joint TCI state or the DL TCI state can be configured by the RRC signaling.

[0076] The IE TCI state associates one or two DL reference signals with a corresponding quasi-colocation (QCL) type.

TCI state information element

TCI state ::=	SEQUENCE {
TCI stateId	TCI stateId,
qcl-Type1	QCL-Info,
qcl-Type2	QCL-Info
...	
}	
QCL-Info ::=	SEQUENCE {
cell	ServCellIndex
bwp-Id	BWP-Id
referenceSignal	CHOICE {
csi-rs	NZP-CSI-RS-ResourceId,
ssb	SSB-Index
},	
qcl-Type	ENUMERATED {typeA,
typeB, typeC, typeD},	
...	
}	

5

[0077] Each TCI state contains parameters for configuring a quasi co-location (QCL) relationship between one or two downlink reference signals and the DM-RS (Demodulation reference signal) ports of the PDSCH, the DM-RS port of PDCCH or the CSI-RS port(s) of a CSI-RS (Channel State Information reference signal) resource. The quasi co-location relationship is configured by the higher layer parameter qcl-Type1 for the first DL RS, and qcl-Type2 for the second DL RS (if configured). For the case of two DL RSs, the QCL types shall not be the same, regardless of whether the references are to the same DL RS or different DL RSs. The quasi co-location types corresponding to each DL RS are given by the higher layer parameter qcl-Type in QCL-Info and may take one of the following values:

10

- 'QCL-TypeA': {Doppler shift, Doppler spread, average delay, delay spread}
- 'QCL-TypeB': {Doppler shift, Doppler spread}
- 'QCL-TypeC': {Doppler shift, average delay}
- 'QCL-TypeD': {Spatial Rx parameter}.

5 **[0078]** If a DL RS is configured in a TCI state with QCL-TypeD, this DL RS is called as the QCL-TypeD RS. If a TCI state is configured for a DL signal or a DL channel, it means that the DL signal or the DL channel is QCLed with the RS(s) contained in the TCI state with a QCL type as indicated in the TCI state. The UE shall determine the DL RX spatial filter and the UL TX spatial filter according to the QCL-TypeD RS in the joint TCI state.

10 **[0079]** In some example embodiments, the UE 201 may not have a valid TA of the target cell, in this case, a random access procedure (may also be referred to as a CFRA procedure) may be performed by the UE 201 towards the target cell to obtain the TA for the target cell. For example, the UE 201 may need to initiate a transmission of a PRACH preamble towards the target cell.

15 **[0080]** In the present disclosure, the random access procedure (may also be referred to as a CFRA procedure) may be initiated by a transmission of a PRACH preamble, which is triggered by the CSC MAC CE.

20 **[0081]** In the process 200, the UE 201 determines transmit power for the PRACH preamble transmission at 220. In some implementations, the UE 201 may determine the transmit power based on a DL pathloss of a DL reference signal.

[0082] In some example embodiments, the UE 201 may determine a DL RS based on the cell switch command (the first SSB or the first TCI state), further determine a DL pathloss based on the DL RS, and then determine the transmit power of the PRACH preamble based on the DL pathloss.

25 **[0083]** In some examples, the DL RS may be the first SSB indicated by the cell switch command. In some other examples, the DL RS may be a second SSB which is determined based on the first TCI state indicated by the cell switch command. For example, the first TCI state may include a pair of a reference signal and corresponding QCL type. As an example, if the reference signal with QCL type D is an SSB, then the second SSB is the
30 reference signal indicated by the first TCI state. As another example, if the reference signal with QCL type D is a TRS, then the second SSB is another SSB that is QCLed with the TRS,

e.g. a source SSB which is QCLed with the TRS. The detailed description of the TCI state and the QCL are specified in 3GPP TS38.214 V18.0.0.

[0084] In addition or alternatively, the UE 201 may determine a transmission occasion for the PRACH preamble transmission based on the first SSB indicated by the cell switch command at 230. In some implementations, the index of the first SSB included in the cell switch command is used to determine a transmission occasion for the PRACH preamble.

[0085] In some implementations, the UE 201 may determine a time duration between a last symbol of a transmission of the cell switch command or a last symbol of a transmission of an acknowledgement for the cell switch command and a first symbol of the PRACH preamble transmission, and the UE 201 may further determine the transmission occasion based on the first SSB and the time duration.

[0086] For example, a timing relation for the PRACH preamble transmission may be determined based on the CSC MAC CE. In some implementations, the UE 201 may determine when to start a transmission of the PRACH preamble, e.g., a location of a first symbol of the PRACH preamble.

[0087] In some example embodiments, the UE 201 may determine a time duration between a last symbol of a transmission of the cell switch command and a first symbol of the PRACH preamble, or may determine a time duration between a last symbol of a transmission of an acknowledgement for the cell switch command and a first symbol of the PRACH preamble. In some examples, the time duration may include a time gap and a time requirement length for the PRACH preamble transmission.

[0088] In some examples, the time gap may include a predefined time length, such as 3 ms. In some examples, the time gap may include a beam application time or a cell switch time configured by a network, which may also be referred to as a cell switch application time.

[0089] In some examples, the time requirement length may include a first time length determined based on the index of the first SSB, and a second time length of a preparation for RF/BB. For example, the first time length may be represented as T_{SSB} , and the second time length may be represented as $\Delta_{RF/BB_preparation}$.

[0090] The time requirement length (or time requirement) may be larger than or equal to: $N_{T,2} + \Delta_{BWPSwitching} + \Delta_{Delay} + T_{switch} + T_{SSB} + \Delta_{RF/BB_preparation}$ msec or $N_{T,2} + \Delta_{Delay} + T_{switch} + T_{SSB} + \Delta_{RF/BB_preparation}$ msec, where

- $N_{T,2}$ is a time duration of N_2 symbols corresponding to a PUSCH preparation time for UE processing capability assuming μ corresponds to the smallest subcarrier spacing (SCS) configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission.
- 5 - $\Delta_{BWPSwitching}=0$.
- $\Delta_{Delay}=0.5$ msec for FR1 and $\Delta_{Delay}=0.25$ msec for FR2.
- T_{switch} is a switching gap duration.
- T_{SSB} : additional time for DL synchronization
 - If the index of the first SSB indicated in CSC MAC CE is in the active TCI state list, and measurement period of L1-RSRP is no longer than 160ms, the UE doesn't need additional time for SSB based T/F tracking to meet UL transmission timing requirements, that is, $T_{SSB} = 0$.
 - If the index of the first SSB indicated in CSC MAC CE is not in the active TCI state list that has been activated for the target cell, when the measurement period of L1-RSRP is no longer than 160ms, an additional delay is needed for T_{SSB} , that is, $T_{SSB} > 0$.
- 15 - $\Delta_{RF/BB_preparation}$: additional time for RF and/or BB preparation and retuning
 - For the case of PRACH bandwidth of the target cell is within an active UL BWP of the source cell, $\Delta_{RF/BB_preparation}=0$.
 - 20 • For the case of PRACH bandwidth is not within any of the configured UL BWPs of any active serving cell, $\Delta_{RF/BB_preparation}$ is defined for the time interval for RF/BB preparation and the RF retuning, which can be 1ms, 3ms, 5ms or 10ms according to UE capability report.

[0091] In some other implementations, the UE 201 may determine a minimum time duration, which may equal to a sum of a time gap and a time requirement length for the PRACH preamble transmission, where the time gap may equal to a predefined time length, or a beam application time or a cell switch time configured by a network, and where the time requirement length may equal to $N_{T,2} + \Delta_{BWPSwitching} + \Delta_{Delay} + T_{switch} + T_{SSB} + \Delta_{RF/BB_preparation}$ msec. In addition, the UE 201 may determine the first transmission occasion associated with

the SSB that is after the end of the minimum time duration, and the first transmission occasion is used for the PRACH preamble transmission.

[0092] In the process 200, the UE 201 transmits a PRACH preamble to the base station 202 at 240. Specification, the UE 201 may transmit the PRACH preamble by using the transmit power that determined at 220 on the transmission occasion that determined at 230.

[0093] On the other side of communication, the base station 202 determines transmit power for the PRACH preamble transmission at 225. Alternatively, the base station 202 may determine a transmission occasion of the PRACH preamble. The operations of 225 and 235 are similar with the operations 220 and 230 respectively, and thus will not be repeated herein.

10 [0094] Accordingly, the base station 202 may receive the PRACH preamble from the UE 201, e.g., by assuming the transmit power that determined at 225 on the transmission occasion that determined at 235.

[0095] In some implementations, the UE 201 may determine QCL information for a reception of a RAR corresponding to the PRACH preamble. In some example
15 embodiments, the QCL information may indicate that the DMRS of the PDCCH and the PDSCH associated with the RAR is QCLed with the first SSB or the second SSB discussed above.

[0096] In addition or alternatively, the UE 201 may detect or monitor the RAR on PDCCH or PDSCH. In some examples, if the UE 201 attempts to detect the DCI format 1_0 with
20 CRC scrambled by the corresponding RA-RNTI in response to a PRACH transmission initiated by a CSC MAC CE that triggers a contention-free random access procedure for the target cell, the UE 201 may assume that the DMRS port of the PDCCH format 1_0 and the DMRS ports of the corresponding PDSCH scheduled with RA-RNTI are quasi co-located with the same SS/PBCH block indicated in the CSC MAC CE with respect to Doppler shift,
25 Doppler spread, average delay, delay spread, spatial RX parameters when applicable, or are quasi co-located with the TCI state indicated in the CSC MAC CE.

[0097] As shown in FIG. 2, upon receiving a PRACH preamble, the base station 202 may transmit the RAR corresponding to the PRACH preamble at 250, and accordingly the UE 201 may receive the RAR.

30 [0098] In some implementations, the UE 201 may complete the LTM cell switch procedure by sending *RRCReconfigurationComplete* message to the target cell. For example, the UE 201 considers that LTM execution is successfully completed when the random access

procedure is successfully completed.

[0099] As shown in FIG. 2, the UE 201 may further perform a UL transmission in the target cell at 260. In some implementations, the UE 201 may determine a set of power control parameters for the UL transmission in the target cell, e.g., based on cell switch command.

5 In some example embodiments, the first TCI state indicated by the CSC MAC CE may be used for determining the set of power control parameters for the UL transmission in the target cell.

[00100] FIG. 3 illustrates an example schematic of timing relation 300 for a transmission of PRACH preamble in accordance with some example embodiments of the present disclosure.

10 As shown in FIG. 3, there are two options for determining the first symbol of the PRACH transmission.

[00101] As an example, a time duration between a last symbol of an ACK corresponding to the CSC MAC CE and the first symbol of the PRACH transmission includes a MAC-CEAppTime 312 and a Time Requirement for RACH 320.

15 **[00102]** In some examples, the MAC-CEAppTime may be a predefined time length, such as $3N_{slot}^{subframe,\mu}$, thus, the time requirement is defined between the first symbol that is $3N_{slot}^{subframe,\mu}$ after the last symbol of the PUCCH or PUSCH carrying the HARQ-ACK (for the PDSCH which carries CSC MAC CE) and the first symbol of the PRACH transmission.

20 **[00103]** As another example, a time duration between a last symbol of an ACK corresponding to the CSC MAC CE and the first symbol of the PRACH transmission includes a CSCAppTime 314 and a Time Requirement for RACH 320.

[00104] In some examples, the CSCAppTime may be configured by the NW, thus, the time requirement is defined between the first symbol that is CSC application time after the last symbol of the PUCCH or PUSCH carrying the HARQ-ACK (for the PDSCH which carries CSC MAC CE) and the first symbol of the PRACH transmission.

25

[00105] According to the embodiments with reference to FIGS. 2-3, in case the UE does not support early TA acquisition or the NW does not obtain the TA for a candidate cell before sending the CSC MAC CE, a random access procedure triggered by the CSC MAC CE is supported for the LTM and the UE behavior for the PRACH transmission is provided. As such, a cell switch of the UE can be enabled.

30

[00106] In some scenarios, to support UL transmission in the target cell with the indicated

TCI state carried in the LTM MAC CE, a DL RS for pathloss estimation will be configured for each of the joint or UL TCI state for each candidate cell for LTM, however, the other power control parameters including P0, alpha and closed loop index are not configured.

[00107] In the present disclosure, the UE may determine the power control parameters for the UL transmission in the target cell before indicated a new TCI state, e.g. according to a configuration from the base station.

[00108] In some implementations, if an uplink power control identifier, which identifies one or more sets of power control parameters for UL transmission, in the first uplink BWP for the target cell is received, the UE may apply at least one parameter associated with the uplink power control identifier in the first uplink BWP for determining the transmit power for the UL transmission using the indicated TCI state. In some implementations, if an uplink power control identifier in the first uplink BWP for the target cell is not received, the UE may apply a list of parameters in an uplink power control with a lowest identifier configured for the target cell for power control.

[00109] For example, a set of power control parameters for each channel/signal will be configured for the target cell, e.g., *uplink-PowerControlToReleaseList-r17* in *ServingCellConfig* of the target cell, and a dedicated power control parameter set, e.g., *Uplink-powerControlId-r17*, may be configured in the first UL BWP of the target cell. If an *Uplink-powerControlId-r17* is provided in the first UL BWP, then it will be used for the UL transmission using the indicate TCI state in the CSC until a new TCI state is indicated by the target cell. Otherwise, the UE shall apply the *p0AlphaSetforPUSCH*, *p0AlphaSetforPUCCH* and *p0AlphaSetforSRS* contained in the *Uplink-powerControl* with lowest *ul-powercontrolId* configured for the target cell for the UL transmission using the indicate TCI state in the CSC until a new TCI state is indicated by the target cell.

[00110] In some scenarios, a CSI priority calculation for LTM CSI report should be defined. In some implementations, each LTM CSI report shall have a priority value defined by:

$$\text{Pri}_{i\text{CSI}}(y, k, c, s_1) = 2 \cdot N_{\text{cells}} \cdot M_s \cdot y + N_{\text{cells}} \cdot M_s \cdot k + M_s \cdot c + s \quad (1)$$

where

- $y=0$ for AP LTM CSI, $y=1$ for SP LTM CSI on PUSCH, $y=2$ for SP LTM CSI on PUCCH, and $y=3$ for P LTM CSI;

- $k=0$ for LTM CSI carry RSRP or SINR, $k=1$ for CSI not carry RSRP or SINR;
 - N_{cells} is the value of the higher layer parameter *maxNrofServingCells*, i.e., the maximum number of serving cells configured for the UE;
 - M_s is the value of the higher layer parameter *maxNrofLTM-CSI-ReportConfigurations*,
5 i.e., the maximum number of *LTM-CSI-ReportConfig* configured for the serving cell;
 - c is the serving cell index for the LTM CSI resource configuration associated with this LTM CSI report
 - o Each *LTM-CSI-ReportConfig* should have a higher layer parameter, e.g., *carrier*, to indicate a serving cell for the UE to find the *LTM-CSI-ResourceConfig* associated with this *LTM-CSI-ReportConfig*.
10
 - o Alternatively, the UE shall assume that the *LTM-CSI-ResourceConfig* associated with this *LTM-CSI-ReportConfig* is provided in the same serving cell.
 - s is the value of higher layer parameter *LTM-CSI-ReportConfigId*.
- 15 **[00111]** In some scenarios, for the UE supports both feature of inter-cell multi-TRP with two TAs and early TA acquisition for LTM, separate DCI fields are contained in the PDCCH order for PRACH triggering. Cell indicator field with bitwidth $\lceil \log_2(C + 1) \rceil$ is used for early TA acquisition for candidate cell, where value 0 indicates the PRACH transmission towards serving cell and the other values indicate the PRACH transmission towards candidate cells.
- 20 PCI indicator field with a single bit is used for the TA acquisition for serving cell or active additional cell, where value 0 indicates the PRACH transmission towards serving cell and value 1 indicates the PRACH transmission towards active additional cell with PCI, which is different from the PCI of the serving cell.
- [00112]** In some implementations, the UE may receive a PDCCH order which includes both
25 the cell indicator and the PCI indicator. In some example embodiments, if the cell indicator is zero and the PCI indicator is zero, a PRACH preamble transmission may be triggered towards a serving cell. In some example embodiments, if the cell indicator is non-zero and the PCI indicator is zero, a PRACH preamble transmission may be triggered towards a candidate cell associated with the cell indicator. In some example embodiments, if the cell

indicator is zero and the PCI indicator is non-zero, a PRACH preamble transmission may be triggered towards a further cell associated with the PCI indicator. In some example embodiments, if the cell indicator is non-zero and the PCI indicator is non-zero, it is considered that an error occurs. As such, the UE behavior on the combined values of these two fields (i.e. the cell indicator field and the PCI indicator field) are defined.

[00113] DCI format 1_0 scrambled by C-RNTI and when the "Frequency domain resource assignment" field are of all ones, the DCI format 1_0 is for random access procedure initiated by a PDCCH order:

- PRACH triggering towards the serving cell is indicated when both cell indicator field and PCI indicator field are set to zero. When additional PCI is not configured for the serving cell and different coresetPoolIndex values are configured for the serving cell, the PRACH triggering towards coresetPoolIndex value 0 of serving cell is indicated.
- Combination of non-zero cell indicator field and zero PCI indicator field indicates the PRACH triggering for candidate cell for LTM, where the candidate cell is indicated by the non-zero cell indicator field.
- Combination of zero cell indicator field and non-zero PCI indicator field indicates the PRACH triggering for additional cell with activated PCI for inter-cell MTRP. When additional PCI is not configured for the serving cell and different coresetPoolIndex values are configured for the serving cell, the PRACH triggering towards coresetPoolIndex value 1 of serving cell is indicated.
- Combination of non-zero cell indicator field and non-zero PCI indicator field is an error case.

[00114] In some scenarios, early TCI state activation for candidate cells is supported before sending the CSC. However, if the NW sending a CSC to indicate to the UE to switch to a candidate cell, the NW may need to further deactivate the activated TCI states for some of the candidate cells.

[00115] In the present disclosure, a further MAC CE may be used for activation or deactivation of one or more TCI states of at least one candidate cell. In some implementations, the base station may transmit the further MAC CE to the UE, and accordingly the UE receives the further MAC CE. Therefore, the UE may be aware of which TCI state(s) is(are) activated or deactivated, among multiple TCI states of at least one candidate cell.

[00116] In some example embodiments, the further MAC CE may include an activation or deactivation field with one or more bits, and the activation or deactivation field may indicate that the further MAC CE is used to activate or deactivate the TCI state(s) contained in the further MAC CE for one or more candidate cells.

5 [00117] FIG. 4A illustrates an example schematic of MAC CE 410 for activation or deactivation of TCI states for at least one candidate cell in accordance with some example embodiments of the present disclosure. As shown in FIG. 4A, a candidate cell index is included in the MAC CE 410, and the MAC CE 410 is used for activating or deactivating the N TCI states for the specific candidate cell (with the candidate cell index).

10 [00118] Specifically, the MAC CE 410 includes the following fields:

- The serving cell index field indicates the serving cell for which the MAC CE applies.
 - The BWP ID field indicates the BWP of the serving cell for which the MAC CE applies.
 - 15 - The candidate cell index field indicates the candidate cell for which the MAC CE applies.
 - The D/A field indicates whether to activate or deactivate the indicated TCI state(s).
 - TCI state ID field indicates the TCI state which shall be activated or deactivated.
 - The D/U field indicates the following TCI state is a DL TCI state or a UL TCI state.
- 20

[00119] In some other example embodiments, the further MAC CE may include a bitmap for at least one candidate cell, and each bit may correspond to a TCI state.

[00120] In some examples, the further MAC CE may include a bitmap for TCI states of one candidate cell, for example, a bit in the bitmap may indicate a corresponding TCI state of the one candidate cell is activated or deactivated. FIG. 4B illustrates another example schematic of MAC CE 420 for activation or deactivation of TCI states for at least one candidate cell in accordance with some example embodiments of the present disclosure. As shown in FIG. 4B, a candidate cell index is included in the MAC CE 420, and the MAC CE 420 further includes a bitmap including T7-T0. For example, each of T7-T0 may indicate whether a corresponding TCI state for the specific candidate cell (with the candidate cell index) is activated or deactivated.

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[00121] Specifically, the MAC CE 420 includes the following fields:

- The serving cell index field indicates the serving cell for which the MAC CE applies.
- The BWP ID field indicates the BWP of the serving cell for which the MAC CE applies.
- The candidate cell index field indicates the candidate cell for which the MAC CE applies.
- The T_i field indicates the $(i+1)$ -th TCI state configured for the LTM for the indicated candidate cell is activated ($T_i=1$) or deactivated ($T_i=0$).
- D/U field indicates the following TCI state is a DL TCI state or a UL TCI state.

[00122] In some other examples, the further MAC CE may include a bitmap for all TCI states of multiple candidate cells, for example, a bit in the bitmap may indicate a corresponding TCI state is activated or deactivated. FIG. 4C illustrates another example schematic of MAC CE 430 for activation or deactivation of TCI states for at least one candidate cell in accordance with some example embodiments of the present disclosure.

[00123] As shown in FIG. 4C, the MAC CE 430 includes a bitmap including T_7-T_0 , $T_{15}-T_8$, ..., $T_{(N-2 \times 8 + 7)} - T_{(N-2 \times 8)}$. For example, each bit in the bitmap may indicate whether a corresponding TCI state is activated or deactivated.

[00124] Specifically, the MAC CE 420 includes the following fields:

- The serving cell index field indicates the serving cell for which the MAC CE applies.
- The BWP ID field indicates the BWP of the serving cell for which the MAC CE applies.
- The T_i field indicates the $(i+1)$ -th TCI state configured for the LTM for all the candidate cells configured for the serving cell is activated ($T_i=1$) or deactivated ($T_i=0$). The first K_1 TCI states are configured for the first candidate cell; the second K_2 TCI states are configured for the 2nd candidate cell and so on.

[00125] In this way, the base station can use the further MAC CE to activate/deactivate TCI state(s) for some or all candidate cells. For example, a deactivation function on the activated TCI states for at least one candidate cell in the further MAC CE is provided.

[00126] FIG. 5 illustrates an example of a device 500 that is suitable for implementing embodiments of the present disclosure. The device 500 may be an example of a base station or a UE as described herein. The device 500 may support wireless communication with a UE 201, a base station 202, or any combination thereof. The device 500 may include components for bi-directional communications including components for transmitting and receiving communications, such as a processor 502, a memory 504, a transceiver 506, and, optionally, an I/O controller 508. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces (e.g., buses).

[00127] The processor 502, the memory 504, the transceiver 506, or various combinations thereof or various components thereof may be examples of means for performing various aspects of the present disclosure as described herein. For example, the processor 502, the memory 504, the transceiver 506, or various combinations or components thereof may support a method for performing one or more of the operations described herein.

[00128] In some implementations, the processor 502, the memory 504, the transceiver 506, 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), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA) or other programmable logic device, a 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 implementations, the processor 502 and the memory 504 coupled with the processor 502 may be configured to perform one or more of the functions described herein (e.g., executing, by the processor 502, instructions stored in the memory 504).

[00129] For example, the processor 502 may support wireless communication at the device 500 in accordance with examples as disclosed herein. The processor 502 may be configured to operable to support a means for operations discussed above.

[00130] The processor 502 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, 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 implementations, the processor 502 may be configured to operate a memory array using a memory controller. In some other

implementations, a memory controller may be integrated into the processor 502. The processor 502 may be configured to execute computer-readable instructions stored in a memory (e.g., the memory 504) to cause the device 500 to perform various functions of the present disclosure.

5 [00131] The memory 504 may include random access memory (RAM) and read-only memory (ROM). The memory 504 may store computer-readable, computer-executable code including instructions that, when executed by the processor 502 cause the device 500 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. In some
10 implementations, the code may not be directly executable by the processor 502 but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some implementations, the memory 504 may include, 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.

15 [00132] The I/O controller 508 may manage input and output signals for the device 500. The I/O controller 508 may also manage peripherals not integrated into the device 500. In some implementations, the I/O controller 508 may represent a physical connection or port to an external peripheral. In some implementations, the I/O controller 508 may utilize an operating system such as iOS®, ANDROID®, MS-WINDOWS®, OS/2®, UNIX®,
20 LINUX®, or another known operating system. In some implementations, the I/O controller 508 may be implemented as part of a processor, such as the processor 502. In some implementations, a user may interact with the device 500 via the I/O controller 508 or via hardware components controlled by the I/O controller 508.

[00133] In some implementations, the device 500 may include a single antenna 510.
25 However, in some other implementations, the device 500 may have more than one antenna 510 (i.e., multiple antennas), including multiple antenna panels or antenna arrays, which may be capable of concurrently transmitting or receiving multiple wireless transmissions. The transceiver 506 may communicate bi-directionally, via the one or more antennas 510, wired, or wireless links as described herein. For example, the transceiver 506 may represent a
30 wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 506 may also include a modem to modulate the packets, to provide the modulated packets to one or more antennas 510 for transmission, and to demodulate packets received from the one or more antennas 510. The transceiver 506 may include one or more

transmit chains, one or more receive chains, or a combination thereof.

[00134] A transmit chain may be configured to generate and transmit signals (e.g., control information, data, packets). The transmit chain may include at least one modulator for modulating data onto a carrier signal, preparing the signal for transmission over a wireless medium. The at least one modulator may be configured to support one or more techniques such as amplitude modulation (AM), frequency modulation (FM), or digital modulation schemes like phase-shift keying (PSK) or quadrature amplitude modulation (QAM). The transmit chain may also include at least one power amplifier configured to amplify the modulated signal to an appropriate power level suitable for transmission over the wireless medium. The transmit chain may also include one or more antennas 510 for transmitting the amplified signal into the air or wireless medium.

[00135] A receive chain may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receive chain may include one or more antennas 510 for receive the signal over the air or wireless medium. The receive chain may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receive chain may include at least one demodulator configured to demodulate the receive signal and obtain the transmitted data by reversing the modulation technique applied during transmission of the signal. The receive chain may include at least one decoder for decoding the processing the demodulated signal to receive the transmitted data.

[00136] FIG. 6 illustrates an example of a processor 600 that is suitable for implementing some embodiments of the present disclosure. The processor 600 may be an example of a processor configured to perform various operations in accordance with examples as described herein. The processor 600 may include a controller 602 configured to perform various operations in accordance with examples as described herein. The processor 600 may optionally include at least one memory 604, such as L1/L2/L3 cache. Additionally, or alternatively, the processor 600 may optionally include one or more arithmetic-logic units (ALUs) 606. One or more of these components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces (e.g., buses).

[00137] The processor 600 may be a processor chipset and include a protocol stack (e.g., a software stack) executed by the processor chipset to perform various operations (e.g.,

receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) in accordance with examples as described herein. The processor chipset may include one or more cores, one or more caches (e.g., memory local to or included in the processor chipset (e.g., the processor 600) or other memory (e.g.,
5 random access memory (RAM), read-only memory (ROM), dynamic RAM (DRAM), synchronous dynamic RAM (SDRAM), static RAM (SRAM), ferroelectric RAM (FeRAM), magnetic RAM (MRAM), resistive RAM (RRAM), flash memory, phase change memory (PCM), and others).

[00138] The controller 602 may be configured to manage and coordinate various operations
10 (e.g., signaling, receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) of the processor 600 to cause the processor 600 to support various operations in accordance with examples as described herein. For example, the controller 602 may operate as a control unit of the processor 600, generating control signals that manage the operation of various components of the processor 600.
15 These control signals include enabling or disabling functional units, selecting data paths, initiating memory access, and coordinating timing of operations.

[00139] The controller 602 may be configured to fetch (e.g., obtain, retrieve, receive) instructions from the memory 604 and determine subsequent instruction(s) to be executed to cause the processor 600 to support various operations in accordance with examples as
20 described herein. The controller 602 may be configured to track memory address of instructions associated with the memory 604. The controller 602 may be configured to decode instructions to determine the operation to be performed and the operands involved. For example, the controller 602 may be configured to interpret the instruction and determine control signals to be output to other components of the processor 600 to cause the processor
25 600 to support various operations in accordance with examples as described herein. Additionally, or alternatively, the controller 602 may be configured to manage flow of data within the processor 600. The controller 602 may be configured to control transfer of data between registers, arithmetic logic units (ALUs), and other functional units of the processor 600.

[00140] The memory 604 may include one or more caches (e.g., memory local to or included in the processor 600 or other memory, such RAM, ROM, DRAM, SDRAM, SRAM, MRAM, flash memory, etc. In some implementations, the memory 604 may reside within or on a processor chipset (e.g., local to the processor 600). In some other implementations, the

memory 604 may reside external to the processor chipset (e.g., remote to the processor 600).

[00141] The memory 604 may store computer-readable, computer-executable code including instructions that, when executed by the processor 600, cause the processor 600 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. The controller 602 and/or the processor 600 may be configured to execute computer-readable instructions stored in the memory 604 to cause the processor 600 to perform various functions. For example, the processor 600 and/or the controller 602 may be coupled with or to the memory 604, the processor 600, the controller 602, and the memory 604 may be configured to perform various functions described herein. In some examples, the processor 600 may include multiple processors and the memory 604 may include multiple memories. One or more of the multiple processors may be coupled with one or more of the multiple memories, which may, individually or collectively, be configured to perform various functions herein.

[00142] The one or more ALUs 606 may be configured to support various operations in accordance with examples as described herein. In some implementations, the one or more ALUs 606 may reside within or on a processor chipset (e.g., the processor 600). In some other implementations, the one or more ALUs 606 may reside external to the processor chipset (e.g., the processor 600). One or more ALUs 606 may perform one or more computations such as addition, subtraction, multiplication, and division on data. For example, one or more ALUs 606 may receive input operands and an operation code, which determines an operation to be executed. One or more ALUs 606 be configured with a variety of logical and arithmetic circuits, including adders, subtractors, shifters, and logic gates, to process and manipulate the data according to the operation. Additionally, or alternatively, the one or more ALUs 606 may support logical operations such as AND, OR, exclusive-OR (XOR), not-OR (NOR), and not-AND (NAND), enabling the one or more ALUs 606 to handle conditional operations, comparisons, and bitwise operations.

[00143] The processor 600 may support wireless communication in accordance with examples as disclosed herein. The processor 600 may be configured to or operable to support a means for operations described in some embodiments of the present disclosure.

[00144] FIG. 7 illustrates a flowchart of a method 700 performed by a UE in accordance with aspects of the present disclosure. The operations of the method 700 may be implemented by a device or its components as described herein. For example, the operations of the

method 700 may be performed by the UE 201 in FIG. 2. In some implementations, the device may execute a set of instructions to control the function elements of the device to perform the described functions. Additionally, or alternatively, the device may perform aspects of the described functions using special-purpose hardware.

5 [00145] At 710, the method may include receiving, from a base station, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell. The operations of 710 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 710
10 may be performed by the UE 201 as described with reference to FIG. 2.

[00146] At 720, the method may include determining transmit power for a PRACH preamble transmission based on the cell switch command. The operations of 720 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 720 may be performed by the UE 201 as described with reference to FIG. 2.

15 [00147] At 730, the method may include transmitting, to the base station, a PRACH preamble based on the transmit power. The operations of 730 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 730 may be performed by the UE 201 as described with reference to FIG. 2.

[00148] FIG. 8 illustrates a flowchart of a method 800 performed by a base station in
20 accordance with aspects of the present disclosure. The operations of the method 800 may be implemented by a device or its components as described herein. For example, the operations of the method 800 may be performed by the BS 202 in FIG. 2. In some implementations, the device may execute a set of instructions to control the function elements of the device to perform the described functions. Additionally, or alternatively, the device
25 may perform aspects of the described functions using special-purpose hardware.

[00149] At 810, the method may include transmitting, at a base station to a UE, a cell switch command in a MAC CE indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first SSB associated with the target cell and a first TCI state for the target cell. The operations of 810 may be performed in accordance with
30 examples as described herein. In some implementations, aspects of the operations of 810 may be performed by the BS 202 as described with reference to FIG. 2.

[00150] At 820, the method may include determining transmit power for a PRACH preamble

transmission based on the cell switch command. The operations of 820 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 820 may be performed by the BS 202 as described with reference to FIG. 2.

5 [00151] At 830, the method may include receiving, from the UE, a PRACH preamble based on the transmit power. The operations of 830 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 830 may be performed by the BS 202 as described with reference to FIG. 2.

[00152] It should be noted that the methods described herein describes 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.

[00153] The various illustrative blocks and components described in connection with the disclosure herein may be implemented or performed with a general-purpose processor, a DSP, an ASIC, a CPU, 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).

[00154] The functions described herein may be implemented in hardware, software executed by a processor, firmware, or any combination thereof. If implemented in software executed by a processor, the functions may be stored on or transmitted over as one or more instructions or code on 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, firmware, 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.

30 [00155] 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 place 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, non-transitory computer-readable media may include RAM, ROM, electrically erasable programmable ROM (EEPROM), flash 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.

[00156] As used herein, including in the claims, an article “a” before an element is unrestricted and understood to refer to “at least one” of those elements or “one or more” of those elements. The terms “a,” “at least one,” “one or more,” and “at least one of one or more” may be interchangeable. 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” or “one or both 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 (i.e., 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. Further, as used herein, including in the claims, a “set” may include one or more elements.

[00157] 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. A user equipment (UE) comprising:
at least one memory; and
5 at least one processor coupled with the at least one memory and configured to cause the UE to:
receive, from a base station, a cell switch command in a medium access control (MAC) control element (CE) indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first synchronization signal block (SSB) associated with the target cell and a first transmission configuration indicator (TCI) state for
10 the target cell;
determine transmit power for a physical random access channel (PRACH) preamble transmission based on the cell switch command; and
transmit, to the base station, a PRACH preamble based on the transmit power.
15
2. The UE of claim 1, wherein the UE being caused to determine the transmit power comprises being caused to:
determine a downlink (DL) reference signal based on the first SSB or the first TCI state; and
20 determine the transmit power for the PRACH preamble transmission based on a DL pathloss of the DL reference signal.
3. The UE of claim 2, wherein the DL reference signal is one of:
the first SSB indicated by the cell switch command, or
25 a second SSB determined based on the first TCI state.
4. The UE of claim 1, wherein the UE is further caused to:
determine QCL information for a reception of a random access response (RAR) corresponding to the PRACH preamble.
30
5. The UE of claim 4, wherein the QCL information indicates that a demodulation reference signal (DMRS) of the RAR corresponding to the PRACH preamble is QCLED with one of:

the first SSB indicated by the cell switch command, or
a second SSB determined based on the first TCI.

6. The UE of claim 3 or 5, wherein the first TCI state comprises a pair of a
5 reference signal and a corresponding QCL type, and wherein the UE is further caused to:

in accordance with a determination that the reference signal with a QCL type D is an
SSB, determine that the second SSB is the reference signal indicated by the first TCI state,
or

in accordance with a determination that the reference signal with a QCL type D is a
10 tracking reference signal (TRS), determine that the second SSB is a further SSB QCLeD with
the TRS.

7. The UE of claim 1, wherein the UE is further caused to:

determine a time duration between a last symbol of a transmission of the cell switch
15 command or a last symbol of a transmission of an acknowledgement for the cell switch
command and a first symbol of the PRACH preamble, wherein the time duration comprises
a time gap and a time requirement length for the PRACH preamble transmission; and

determine a transmission occasion for the PRACH preamble transmission based on
the first SSB and the time duration.

20

8. The UE of claim 7, wherein the time gap comprises one of:

a predefined time length, or

a beam application time or a cell switch time configured by a network.

25 9. The UE of claim 8, wherein the time requirement length comprises one of:

a first time length determined based on the index of the first SSB, and

a second time length of a preparation for radio frequency (RF) or baseband (BB).

10. The UE of claim 1, wherein the UE is further caused to:

30 determine a set of power control parameters for uplink transmissions based on the
first TCI state; and

perform the uplink transmissions based on the set of power control parameters.

11. The UE of claim 1, wherein the UE is further caused to:

receive a further MAC CE indicating an activation or deactivation of one or more TCI states for at least one candidate cell.

12. The UE of claim 11, wherein the further MAC CE comprises a bitmap for the
5 at least one candidate cell, and each bit in the bitmap corresponds to a TCI state of the at least one candidate cell.

13. The UE of claim 1, wherein the UE is further caused to:
in accordance with a determination that an uplink power control identifier in a first
10 uplink bandwidth part (BWP) for the target cell is received, apply at least one parameter associated with the uplink power control identifier in the first uplink BWP for power control;
or

in accordance with a determination that an uplink power control identifier in the first
uplink BWP for the target cell is not received, apply a list of parameters in an uplink power
15 control with a lowest identifier configured for the target cell for power control.

14. The UE of claim 1, wherein the UE is further caused to:
receive a physical downlink control channel (PDCCH) order comprising a cell
indicator and a physical cell identifier (PCI) indicator; and
20 in accordance with a determination that the cell indicator is zero and the PCI indicator is zero, trigger a PRACH preamble transmission towards a serving cell,
in accordance with a determination that the cell indicator is non-zero and the PCI indicator is zero, trigger a PRACH preamble transmission towards a candidate cell associated with the cell indicator, or
25 in accordance with a determination that the cell indicator is zero and the PCI indicator is non-zero, trigger a PRACH preamble transmission towards a further cell associated with the PCI indicator.

15. A base station comprising:
30 at least one memory; and
at least one processor coupled with the at least one memory and configured to cause the base station to:

transmit, to a user equipment (UE), a cell switch command in a medium access control (MAC) control element (CE) indicating to the UE to switch towards a target cell,

wherein the cell switch command comprises an index of a first synchronization signal block (SSB) associated with the target cell and a first transmission configuration indicator (TCI) state for the target cell;

- 5 determine transmit power for a physical random access channel (PRACH) preamble transmission based on the cell switch command; and
 receive, from the UE, a PRACH preamble based on the transmit power.

16. The base station of claim 15, wherein the base station being caused to determine the transmit power comprises being caused to:

- 10 determine a downlink (DL) reference signal based on the first SSB or the first TCI state; and
 determine the transmit power for the PRACH preamble transmission based on a DL pathloss of the DL reference signal.

- 15 17. The base station of claim 16, wherein the DL reference signal is one of:
 the first SSB indicated by the cell switch command, or
 a second SSB determined based on the first TCI state.

18. The base station of claim 15, wherein the base station is further caused to:

- 20 determine QCL information for a reception of a random access response (RAR) corresponding to the PRACH preamble; and
 transmit, to the UE, the RAR corresponding to the PRACH preamble,
 wherein the QCL information indicates that a demodulation reference signal (DMRS) of the RAR corresponding to the PRACH preamble is QCLed with one of:
25 the first SSB indicated by the cell switch command, or
 a second SSB determined based on the first TCI.

19. A method comprising:

- 30 receiving, at a user equipment (UE) from a base station, a cell switch command in a medium access control (MAC) control element (CE) indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first synchronization signal block (SSB) associated with the target cell and a first transmission configuration indicator (TCI) state for the target cell;
 determining transmit power for a physical random access channel (PRACH) preamble

transmission based on the cell switch command; and
transmitting, to the base station, a PRACH preamble based on the transmit power.

20. A method comprising:

- 5 transmitting, at a base station to a user equipment (UE), a cell switch command in a medium access control (MAC) control element (CE) indicating to the UE to switch towards a target cell, wherein the cell switch command comprises an index of a first synchronization signal block (SSB) associated with the target cell and a first transmission configuration indicator (TCI) state for the target cell;
- 10 determining transmit power for a physical random access channel (PRACH) preamble transmission based on the cell switch command; and
- receiving, from the UE, a PRACH preamble based on the transmit power.