

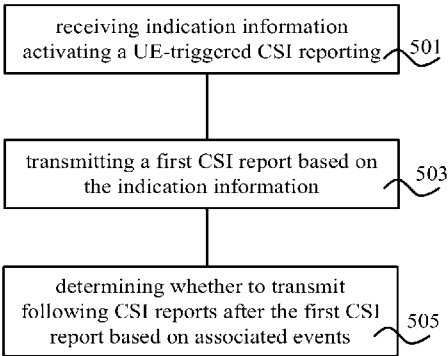
- (51) International Patent Classification:
H04W 24/10 (2009.01)
- (21) International Application Number:
PCT/CN2024/071924
- (22) International Filing Date:
12 January 2024 (12.01.2024)
- (25) Filing Language:
English
- (26) Publication Language:
English
- (71) Applicant: LENOVO (BEIJING) LIMITED [CN/CN]; 6
Shangdi West Road, Haidian District, Beijing 100085 (CN).
- (72) Inventors: LING, Wei; Lenovo HQ East, Building, No.1,
No.10 Xibeiwang East Road, Haidian District, Beijing
100094 (CN). LIU, Bingchao; Lenovo HQ East, Building,
No.1, No.10 Xibeiwang East Road, Haidian District, Bei-
jing 100094 (CN). ZHANG, Yi; Lenovo HQ East, Build-
ing, No.1, No.10 Xibeiwang East Road, Haidian District,
Beijing 100094 (CN).
- (74) Agent: LEE AND LI-LEAVEN IPR AGENCY LTD.;
Unit 2202, Tower A, Beijing Pudi Hotel, No. 7, Jian Guo
Men South Avenue, Dongcheng District, Beijing 100005
(CN).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,
KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,
MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,

- TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).
- Published:
- with international search report (Art. 21(3))

— before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))

— upon request of the applicant, before the expiration of the
time limit referred to in Article 21(2)(a)

(54) Title: METHOD AND APPARATUS OF SUPPORTING CHANNEL STATE INFORMATION REPORTING



(57) Abstract: Various aspects of the present disclosure relate to a method and apparatus of supporting channel state information reporting. An exemplary method performed by a UE includes: receiving indication information activating a UE-triggered CSI reporting; transmitting a first CSI report based on the indication information; and determining whether to transmit following CSI reports after the first CSI report based on associated events.

Figure 5

METHOD AND APPARATUS OF SUPPORTING CHANNEL STATE INFORMATION REPORTING

TECHNICAL FIELD

[0001] The present disclosure relates to wireless communications, and more specifically to technologies of supporting channel state information (CSI) reporting.

BACKGROUND

[0002] A wireless communications system may include one or multiple network communication devices, such as base stations, which 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 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, or the like). Additionally, the wireless communications system may support wireless communications across various radio access technologies including third generation (3G) radio access 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)).

SUMMARY

[0003] 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.

[0004] Some implementations of the methods and apparatuses described herein may further include a UE for wireless communication, which includes: at least one memory; and at least one processor coupled with the at least one memory and configured to cause the UE to: receive indication information activating a UE-triggered CSI reporting; transmit a first CSI report based on the indication information; and determine whether to transmit following CSI reports after the first CSI report based on associated events.

[0005] In some implementations of the methods and apparatuses described herein, in response to determining to transmit a following CSI report based on the associated events, the at least one processor is configured to cause the UE to transmit the following CSI report on a media access control (MAC) control element (CE).

[0006] In some implementations of the methods and apparatuses described herein, the indication information is carried in a physical downlink control channel (PDCCH) scrambled with cell-radio network temporary identifier (C-RNTI), and wherein a CSI field in downlink control information (DCI) of the PDCCH indicates the UE-triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI aperiodic trigger state where the UE triggered CSI reporting is configured.

[0007] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to: receive a radio resource control (RRC) signaling indicating stopping the UE triggered CSI reporting; and stop the UE triggered CSI reporting in response to the RRC signaling, wherein, one CSI processing unit (CPU) is occupied from a first symbol after a last symbol of the PDCCH or a first slot containing available reference signal (RS) resources associated with the UE-triggered CSI reporting after the PDCCH to a last symbol of the RRC signaling.

[0008] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to: receive a MAC CE indicating stopping the UE triggered CSI reporting; and stop the UE triggered CSI reporting in response to the MAC CE, wherein, one CPU is occupied from a first symbol or first slot containing available RS resources associated with the UE-triggered CSI reporting after a last symbol of the PDCCH to a last symbol of a predefined time after a physical uplink control channel (PUCCH) carrying hybrid automatic repeat request-acknowledge (HARQ-ACK) corresponding to a physical downlink shared channel (PDSCH) carrying the MAC CE.

[0009] In some implementations of the methods and apparatuses described herein, the DCI of the PDCCH further includes an indication field indicating starting the UE triggered CSI reporting, and the at least one processor is configured to cause the UE to: receive another PDCCH, wherein an indication field in DCI in the other PDCCH indicates stopping the UE triggered CSI reporting; and stop the UE triggered CSI reporting in response to the indication field indicating stopping the UE triggered CSI reporting, wherein, one CPU is occupied from a first symbol or first slot containing available RS resources associated with the UE-triggered CSI reporting after a last symbol of the PDCCH to a last symbol of the other PDCCH.

[0010] In some implementations of the methods and apparatuses described herein, the indication information is carried in a PDCCH scrambled with semi-persistent (SP) CSI RNTI (SP-CSI-RNTI), and wherein a CSI field in DCI of the PDCCH indicates the UE triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI SP trigger state where the UE triggered CSI reporting is configured.

[0011] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to: receive another PDCCH scrambled with SP-CSI-RNTI, wherein DCI in the other PDCCH indicates stopping the UE triggered CSI reporting; and stop the UE triggered CSI reporting in response to the DCI indicating stopping the UE triggered CSI reporting, wherein, one CPU is occupied from a first symbol or first slot containing available RS resources associated with the UE-triggered CSI reporting after a last symbol of the PDCCH to a last symbol of the other PDCCH.

[0012] In some implementations of the methods and apparatuses described herein, the indication information is carried in a PDCCH scrambled with a RNTI different from C-RNTI

and SP-CSI-RNTI, and wherein a CSI field in DCI of the PDCCH indicates the UE triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI trigger state where the UE triggered CSI reporting is configured.

[0013] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to: receive another PDCCH scrambled with a RNTI different from C-RNTI and SP-CSI-RNTI, wherein DCI in the other PDCCH indicates stopping the UE triggered CSI reporting; and stop the UE triggered CSI reporting in response to the DCI indicating stopping the UE triggered CSI reporting, wherein, one CPU is occupied from a first symbol or first slot containing available RS resources associated with the UE-triggered CSI reporting after a last symbol of the PDCCH to a last symbol of the other PDCCH.

[0014] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to transmit the first CSI report in a PUSCH scheduled by the PDCCH.

[0015] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to determine a priority of the first CSI report according to an aperiodic CSI report.

[0016] In some implementations of the methods and apparatuses described herein, the indication information is carried in a first MAC CE, and the at least one processor is configured to transmit the first report in a second MAC CE.

[0017] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to: receive another MAC CE indicating stopping the UE triggered CSI reporting; and stop the UE triggered CSI reporting in response to the other MAC CE, wherein, one CPU is occupied from a first symbol or first slot containing available RS resources associated with the UE-triggered CSI reporting after a predefined time after a PUCCH carrying HARQ-ACK corresponding to the MAC CE to a last symbol of the predefined time after a PUCCH carrying HARQ-ACK corresponding to a PDSCH carrying the other MAC CE.

[0018] In some implementations of the methods and apparatuses described herein, the at least one processor is configured to cause the UE to determine to transmit a following CSI report in response to any one of following events is satisfied: at least one CSI-RS resource indicator (CRI) or SS/PBCH block resource indicator (SSBRI) which is selected to be reported is different from previous reported CRIs or SSBRI; and largest layer 1 (L1)-reference signal receiving power (RSRP) or L1- signal to interference plus noise ratio (SINR) which is selected to be reported is below a corresponding threshold.

[0019] Some implementations of the methods and apparatuses described herein may further include a processor for wireless communication, which includes: at least one controller coupled with at least one memory and configured to cause the processor to: receive indication information activating a UE-triggered CSI reporting; transmit a first CSI report based on the indication information; and determine whether to transmit following CSI reports after the first CSI report based on associated events.

[0020] Some implementations of the methods and apparatuses described herein may further include a network equipment (NE) for wireless communication, which includes: at least one memory; and at least one processor coupled with the at least one memory and configured to cause the NE to: transmit indication information activating a UE-triggered CSI reporting; receive a first CSI report based on the indication information; and receive following CSI reports after the first CSI report, wherein the following CSI reports are based on associated events.

[0021] Some implementations of the methods and apparatuses described herein may further include a method performed by a UE, which includes: receiving indication information activating a UE-triggered CSI reporting; transmitting a first CSI report based on the indication information; and determining whether to transmit following CSI reports after the first CSI report based on associated events.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Figure 1 illustrates an example of a wireless communications system in accordance with aspects of the present disclosure.

[0023] Figure 2 illustrates an example of a UE in accordance with aspects of the present disclosure.

[0024] Figure 3 illustrates an example of a processor in accordance with aspects of the present disclosure.

[0025] Figure 4 illustrates an example of a NE in accordance with aspects of the present disclosure.

[0026] Figure 5 illustrates a flowchart of method performed by a UE in accordance with aspects of the present disclosure.

[0027] Figure 6 illustrates a flowchart of method performed by a NE in accordance with aspects of the present disclosure.

DETAILED DESCRIPTION

[0028] Regarding CSI reporting, e.g., beam reporting, legacy 3rd generation partnership project (3GPP) specifications only provide mechanisms or schemes initiated (e.g., configured, or activated or triggered or the like) by the network side. Generally, there are three types of network side initiated CSI reporting, which are periodic CSI reporting, SP CSI reporting and aperiodic CSI reporting. For periodic CSI reporting, it is reported on PUCCH resource (or PUCCH) periodically according to corresponding RRC configuration. For SP CSI reporting, it may be reported on PUCCH resource with a configured period which is triggered by a MAC CE. Alternatively, the SP CSI reporting may be reported on a PUSCH resource (or PUSCH) with a configured period which is activated by DCI, e.g., on a PDCCH resource (or PDCCH) with (or scrambled with) a SP-CSI-RNTI, wherein a CSI field in the DCI is mapped to a parameter, CSI-SemiPersistentOnPUSCH-TriggerStateList. For aperiodic CSI reporting, it is reported on a PUSCH which is scheduled by DCI, e.g., on a PDCCH scrambled with C-RNTI, wherein a CSI field in the DCI is mapped to a parameter, CSI-AperiodicTriggerStateList. For periodic or SP CSI reporting, corresponding CSI reports are transmitted periodically; while for aperiodic CSI reporting, one corresponding CSI report is transmitted only one shot. In addition, for all the three types of CSI reporting, the network side, e.g., gNB can know the report time of the corresponding CSI report in advance.

[0029] However, the quality of beam, e.g., represented by associated RSs is monitored by UE. Therefore, it will be more efficient to update the CSI reporting, especially beam report according to UE's measurement rather than the network side's scheduling or configuration.

[0030] At least considering that, aspects of the present disclosure provide a technical solution of supporting CSI reporting, e.g., a method and apparatus of supporting CSI reporting, wherein, the CSI report(s), e.g., beam report(s) is initiated or triggered by UE (or driven by event(s)). That is, a new configuration type of CSI report is provided in addition to the legacy network side initiated CSI reporting. Except for the first CSI report, UE will only transmit the CSI report(s), e.g., beam report(s) when an event defined for UE-triggered CSI reporting is triggered (or is satisfied or occurs or the like). The contents of each CSI report of a UE-triggered CSI reporting, e.g., L1-RSRP or L1-SINR are the same as those specified in legacy 3GPP specifications.

[0031] For example, in accordance with aspects of the present disclosure, different from legacy CSI reporting, one or more events (or referred to as trigger events) will be defined for UE-triggered CSI reporting. Exemplary events may include one or both of the following: an event that at least one CRI (e.g., CSI-RS resource index) or SSBRI (e.g., SSB resource index) which is selected to be reported is different from previous reported CRIs or SSBRI; and an event that the largest L1-RSRP or L1-SINR which is selected to be reported is below a corresponding threshold (e.g., a configured one).

[0032] The network side, e.g., a NE will transmit indication information (or referred to as activation information) to UE, activating (or trigger or start or the like) a UE-triggered CSI reporting. In response to receiving the indication information activating a UE-triggered CSI reporting, UE will transmit a first CSI report, e.g. first beam report including L1-RSRP and L1-SINR which is according to report quantity configured for the UE-triggered CSI reporting if any in a PUSCH or MAC CE. UE will also determine whether to transmit following CSI report(s) after the first CSI report based on the associated events. For example, UE will monitor RSs (e.g., perform beam management) to decide whether the associated trigger event(s) is satisfied. Exemplary RSs are periodic or SP CSI RS resource(s) and/or SSB resource(s) configured for the UE-triggered CSI reporting. In response to any one of the associated events is satisfied, e.g., at least one CRI or SSBRI which is selected to be reported

is different from previous reported CRIs or SSBRIs, UE will determine to transmit a following CSI report, e.g., in a MAC CE. Otherwise, there will be no following CSI report(s) corresponding to the indicated UE-triggered CSI reporting.

[0033] The network side, e.g., the NE may transmit indication information (or referred to as deactivation information), indicating stopping (or deactivating or the like) the UE-triggered CSI reporting. For a following CSI report, if UE receives the indication information deactivating the UE-triggered CSI reporting before transmitting the following CSI report, UE will drop (not transmit) the following CSI report.

[0034] Besides updating CSI reporting more efficiently, aspects of the present disclosure will also reduce overhead and/or latency for beam management etc., assuming the unified transmission configuration indication (TCI) while leveraging (as much as possible) legacy CSI measurement and reporting configuration frameworks.

[0035] Aspects of the present disclosure are described in the context of a wireless communications system.

[0036] Figure 1 illustrates an example of a wireless communications system 100 in accordance with aspects of the present disclosure. The wireless communications system 100 may include one or more NE 102, one or more UE 104, and a core network (CN) 106. 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 an LTE network or an LTE-Advanced (LTE-A) network. In some other implementations, the wireless communications system 100 may be a NR network, such as a 5G network, a 5G-Advanced (5G-A) network, or a 5G ultrawideband (5G-UWB) 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, for example, 6G. 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.

[0037] The one or more NE 102 may be dispersed throughout a geographic region to form the wireless communications system 100. One or more of the NE 102 described herein may be or include or may be referred to as a network node, a base station, a network element, a network function, a network entity, a radio access network (RAN), a NodeB, an eNodeB (eNB), a next-generation NodeB (gNB), or other suitable terminology. An NE 102 and a UE 104 may communicate via a communication link, which may be a wireless or wired connection. For example, an NE 102 and a UE 104 may perform wireless communication (e.g., receive signaling, transmit signaling) over a Uu interface.

[0038] An NE 102 may provide a geographic coverage area for which the NE 102 may support services for one or more UEs 104 within the geographic coverage area. For example, an NE 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, an NE 102 may be moveable, for example, a satellite associated with a non-terrestrial network (NTN). 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 may be associated with different NE 102.

[0039] The one or more UE 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 remote unit, a mobile device, a wireless device, a remote device, a subscriber device, a transmitter device, a receiver 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.

[0040] A UE 104 may be able to support wireless communication directly with other UEs 104 over a communication link. 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. For example, a UE 104 may support wireless communication directly with another UE 104 over a PC5 interface.

[0041] An NE 102 may support communications with the CN 106, or with another NE 102, or both. For example, an NE 102 may interface with other NE 102 or the CN 106 through one or more backhaul links (e.g., S1, N2, N2, or network interface). In some implementations, the NE 102 may communicate with each other directly. In some other implementations, the NE 102 may communicate with each other or indirectly (e.g., via the CN 106). In some implementations, one or more NE 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 a radio heads, smart radio heads, or transmission-reception points (TRPs).

[0042] The CN 106 may support user authentication, access authorization, tracking, connectivity, and other access, routing, or mobility functions. The CN 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), 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, etc.) for the one or more UEs 104 served by the one or more NE 102 associated with the CN 106.

[0043] The CN 106 may communicate with a packet data network over one or more backhaul links (e.g., via an S1, N2, N2, or another network interface). The packet data network may include an application server. In some implementations, one or more UEs 104 may communicate with the application server. A UE 104 may establish a session (e.g., a protocol data unit (PDU) session, or the like) with the CN 106 via an NE 102. The CN 106 may route traffic (e.g., control information, data, and the like) between the UE 104 and the application server using the established session (e.g., the established PDU session). The PDU

session may be an example of a logical connection between the UE 104 and the CN 106 (e.g., one or more network functions of the CN 106).

[0044] In the wireless communications system 100, the NEs 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, carriers)) to perform various operations (e.g., wireless communications). In some implementations, the NEs 102 and the UEs 104 may support different resource structures. For example, the NEs 102 and the UEs 104 may support different frame structures. In some implementations, such as in 4G, the NEs 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 NEs 102 and the UEs 104 may support various frame structures (i.e., multiple frame structures). The NEs 102 and the UEs 104 may support various frame structures based on one or more numerologies.

[0045] 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.

[0046] 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.

[0047] 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.

[0048] 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 NEs 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 NEs 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 NEs 102 and the UEs 104, among other equipment or devices for short-range, high data rate capabilities.

[0049] 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.

[0050] In accordance with aspects of the present disclosure, a UE-triggered CSI reporting can be activated or deactivated by the network side, e.g., by gNB in various manners. Details are illustrated in view of the following exemplary implementations of the present disclosure.

[0051] In accordance with some aspects of the present disclosure (scheme 1), the indication information activating a UE-triggered CSI reporting, e.g., UE-triggered beam reporting is carried in DCI in a PDCCH scrambled with C-RNTI, which is similar to a legacy aperiodic CSI report.

[0052] In some implementations of the present disclosure, the UE-triggered CSI reporting is configured in a list of CSI aperiodic trigger state, e.g., in a parameter CSI-AperiodicTriggerStateList or the like, which is configured for legacy aperiodic CSI reporting. A CSI field (or CSI request field) in the DCI will be used to indicate the UE-triggered CSI reporting by mapping the CSI codepoint in the CSI field to the list of CSI aperiodic trigger state. In some cases, this DCI will trigger the UE-triggered CSI reporting only based on the CSI field, that is, the CSI field will be used to trigger or activate the UE-triggered CSI reporting (e.g., in the cases that different type signaling is used to deactivate the UE-triggered CSI reporting). In some other cases, there will be another indication field besides the CSI field, which indicates the UE-triggered CSI reporting indicated in the CSI field is activated (e.g., in the cases that the same type signaling is used to deactivate the UE-triggered CSI reporting). In any of the aforementioned cases, in response to the DCI, UE will report the

first UE-triggered CSI report in the PUSCH scheduled by the PDCCH carrying the DCI, which is similar to an aperiodic CSI reporting in legacy specification. UE will also begin to monitor the RSs associated with the UE-triggered CSI reporting, e.g., monitor SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting to determine whether the events are triggered or occur. In response to occurrence of any one of the associated events, UE will transmit a following CSI report in MAC CE; otherwise, no following CSI report will be transmitted.

[0053] More details regarding scheme 1 for UE-triggered CSI reporting can refer to aperiodic CSI report, which works that drafted in TS38.214, e.g., as recited in the following.

"For CSI-RS resource sets associated with Resource Settings configured with the higher layer parameter *resourceType* set to 'aperiodic', 'periodic', or 'semi-persistent', trigger states for Reporting Setting(s) (configured with the higher layer parameter *reportConfigType* set to 'aperiodic') and/or Resource Setting for channel and/or interference measurement on one or more component carriers are configured using the higher layer parameter *CSI-AperiodicTriggerStateList*. For aperiodic CSI report triggering, a single set of CSI triggering states are higher layer configured, wherein the CSI triggering states can be associated with any candidate DL BWP. A UE is not expected to receive more than one DCI with non-zero *CSI request* field per slot per cell. A UE is not expected to receive DCI with non-zero *CSI request* field within a cell group in a slot overlapping with any slot receiving DCI with non-zero *CSI request* field in the same cell group. A UE is not expected to be configured with different *TCI-StateId*s for the same aperiodic CSI-RS resource ID configured in multiple aperiodic CSI-RS resource sets with the same triggering offset in the same aperiodic trigger state. A UE is not expected to receive more than one aperiodic CSI report request for transmission in a given slot per cell. A UE is not expected to receive an aperiodic CSI report request for transmission in a slot overlapping with any slot having an aperiodic CSI report transmission in the same cell group. If a UE does not indicate its capability of *CSItriggerStateContainingNonactiveBWP* the UE is not expected to be triggered with a CSI report for a non-active DL BWP. Otherwise, when a UE is triggered with a CSI report for a DL BWP that is non-active when expecting to receive the most recent occasion, no later than the CSI reference resource, of the associated NZP CSI-RS, the UE is not expected to report the CSI for the non-active DL BWP and the CSI report associated with that BWP is omitted. When a UE is triggered with aperiodic NZP CSI-RS in a DL BWP that is non-active when expecting to receive the NZP CSI-RS, the UE is not expected to measure the aperiodic CSI-RS. In the carrier of the serving cell expecting to receive that associated NZP CSI-RS, if the active DL BWP when receiving the NZP CSI-RS is different from the active DL BWP when receiving the triggering DCI,

A trigger state is initiated using the *CSI request* field in DCI.

- When all the bits of *CSI request* field in DCI are set to zero, no CSI is requested.

- When the number of configured CSI triggering states in *CSI-AperiodicTriggerStateList* is greater than $2^{N_{TS}} - 1$, where N_{TS} is the number of bits in the DCI *CSI request* field, the UE receives a subselection indication, as described in clause 6.1.3.13 of [10, TS 38.321], used to map up to $2^{N_{TS}} - 1$ trigger states to the codepoints of the *CSI request* field in DCI. N_{TS} is configured by the higher layer parameter *reportTriggerSize* where $N_{TS} \in \{0, 1, 2, 3, 4, 5, 6\}$. When the UE would transmit a PUCCH with HARQ-ACK information in slot n corresponding to the PDSCH carrying the subselection indication, the corresponding action in [10, TS 38.321] and UE assumption on the mapping of the selected CSI trigger state(s) to the codepoint(s) of DCI *CSI request* field shall be applied starting from the first slot that is after slot $n + 3N_{slot}^{subframe, \mu} + \frac{2^\mu}{2^{\mu k_{mac}}} \cdot k_{mac}$ where μ is the SCS configuration for the PUCCH and $\mu_{k_{mac}}$ is the subcarrier spacing configuration for k_{mac} with a value of 0 for frequency range 1, and k_{mac} is provided by *K-Mac* or $k_{mac} = 0$ if *K-Mac* is not provided.
- When the number of CSI triggering states in *CSI-AperiodicTriggerStateList* is less than or equal to $2^{N_{TS}} - 1$, the *CSI request* field in DCI directly indicates the triggering state."

[0054] Regarding how to stop the UE-triggered CSI reporting activated in scheme 1, there are various manners.

[0055] For example, in some implementations of the present disclosure (scheme 1-1), the UE-triggered CSI reporting is stopped or deactivated by a RRC signaling, e.g., RRC configuration signaling or RRC reconfiguration signaling indicating stopping the UE-triggered CSI reporting.

[0056] Regarding the CPU in scheme 1-1, one or more CPUs will be occupied from the first symbol or first slot containing available RSs, e.g., SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting after the last symbol of a PDCCH with the DCI activating the UE-triggered CSI reporting to the last symbol applying the RRC signaling deactivating the UE-triggered CSI reporting.

[0057] In some implementations of the present disclosure (scheme 1-2), the UE-triggered CSI reporting is stopped or deactivated according to a MAC CE.

[0058] Regarding the CPU in scheme 1-2, one or more CPUs will be occupied from the first symbol or first slot containing available RSs, e.g., SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting after the last symbol of a PDCCH with the DCI triggering the UE-triggered CSI reporting to the last symbol of a predefined time, e.g.,

3ms after a PUCCH carrying HARQ-ACK corresponding to a PDSCH carrying the MAC CE deactivating the UE-triggered CSI reporting.

[0059] In some implementations of the present disclosure (scheme 1-3), the UE-triggered CSI reporting is stopped or deactivated also according to DCI. For example, compared with legacy PDCCH, a new field (or a legacy reserved field) in DCI in a PDCCH scrambled with C-RNTI will be used to indicate activating or deactivating a UE-triggered CSI reporting, e.g., by 1bit. For example, in the case of the new field set as '1,' it means activating or starting the UE-triggered CSI reporting, while in the case of the new field set as '0,' it means to deactivating or stopping the UE-triggered CSI reporting. Therefore, when UE receives a PDCCH scrambled with C-RNTI, where the DCI in the PDCCH indicate a UE-triggered CSI reporting by mapping a CSI field in the DCI, UE will determine whether to start or stop the UE-triggered CSI reporting according to the new field.

[0060] Regarding the CPU in scheme 1-3, one or more CPUs will be occupied from the first symbol or first slot containing available RSs, e.g., SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting after the last symbol of a PDCCH with DCI activating the UE-triggered CSI reporting to the last symbol of another PDCCH with DCI deactivating the UE-triggered CSI reporting.

[0061] In accordance with some aspects of the present disclosure (scheme 2), the indication information activating a UE-triggered CSI reporting, e.g., UE-triggered beam reporting is also carried in DCI in a PDCCH, while the PDCCH is scrambled with SP-CSI-RNTI, which is similar to a legacy SP CSI reporting on PUSCH.

[0062] In some implementations of the present disclosure, the UE-triggered CSI reporting is configured in a list of CSI SP trigger state, e.g., by a parameter, CSI-SemiPersistentOnPUSCH-TriggerStateList or the like, which is configured for a legacy SP CSI reporting. A CSI field (or CSI request field) in the DCI will be used to trigger the UE-triggered CSI reporting by mapping the CSI codepoint of the CSI field to the list of CSI SP trigger state. In response to the DCI in a PDCCH activating the UE-triggered CSI reporting, UE will report the first UE-triggered CSI reporting in the PUSCH scheduled by the PDCCH, which is similar to the first reported SP CSI on PUSCH in legacy 3GPP specification. UE

will report the following CSI report(s) if any in MAC CE in the case of occurrence of any predefined event.

[0063] In addition, similar to a legacy SP CSI report on PUSCH, which is deactivated by a DCI, the UE-triggered CSI reporting will be stopped in a similar manner as that to a legacy CSI report on a PUSCH. For example, UE will receive another PDCCH scrambled with SP-CSI-RNTI, wherein DCI in the other PDCCH indicates stopping the UE triggered CSI reporting. Then, UE will stop the UE triggered CSI reporting in response to the DCI indicating stopping the UE triggered CSI reporting.

[0064] More details regarding scheme 2 for UE-triggered CSI reporting can refer to legacy SP CSI reporting on PUSCH, which works as that drafted in TS38.214, e.g., as recited in the following.

"A codepoint of the CSI request field in the DCI is mapped to a SP-CSI triggering state according to the order of the positions of the configured trigger states in *CSI-SemiPersistentOnPUSCH-TriggerStateList*, with codepoint '0' mapped to the triggering state in the first position. A UE validates, for semi-persistent CSI activation or release, a PDCCH on a DCI only if the following conditions are met:

- the CRC parity bits of the DCI format are scrambled with a SP-CSI-RNTI provided by higher layer parameter *sp-CSI-RNTI*
- Special fields for the DCI format are set according to Table 5.2.1.5.2-1 or Table 5.2.1.5.2-2.

If validation is achieved, the UE considers the information in the DCI format as a valid activation or valid release of semi-persistent CSI transmission on PUSCH, and the UE activates or deactivates a CSI Reporting Setting indicated by CSI request field in the DCI. If validation is not achieved, the UE considers the DCI format as having been detected with a non-matching CRC.

Table 5.2.1.5.2-1: Special fields for semi-persistent CSI activation PDCCH validation

	DCI format 0_1/0_2
HARQ process number (if present)	set to all '0's
Redundancy version (if present)	set to all '0's

Table 5.2.1.5.2-2: Special fields for semi-persistent CSI deactivation PDCCH validation

	DCI format 0_1/0_2
HARQ process number (if present)	set to all '0's
Modulation and coding scheme	set to all '1's
Resource block assignment	If higher layer configures RA type 0 only, set to all '0's; If higher layer configures RA type 1 only, set to all '1's; If higher layer configures dynamic switch between RA type 0 and 1, then if MSB is '0', set to all '0's; else, set to all '1's For DCI 0_1, if higher layer configures RA type 2, set to all '1's if $\mu = 0$; set to all '0's if $\mu = 1$
Redundancy version (if present)	set to all '0's

If the UE has an active semi-persistent CSI-RS/CSI-IM resource configuration, or an active semi-persistent ZP CSI-RS resource set configuration, and has not received a deactivation command, the activated semi-persistent CSI-RS/CSI-IM resource set or the activated semi-persistent ZP CSI-RS resource set configurations are considered to be active when the corresponding DL BWP is active, otherwise they are considered suspended.

If the UE is configured with carrier deactivation, the following configurations in the carrier in activated state would also be deactivated and need re-activation configuration(s): semi-persistent CSI-RS/CSI-IM resource, semi-persistent CSI reporting on PUCCH, semi-persistent SRS, semi-persistent ZP CSI-RS resource set."

[0065] Regarding the CPU in scheme 2, one or more CPUs will be occupied from the first symbol or first slot containing available RSs, e.g., SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting after the last symbol of a PDCCH with DCI activating the UE-triggered CSI reporting to the last symbol of another PDCCH with DCI deactivating the UE-triggered CSI reporting.

[0066] In accordance with some aspects of the present disclosure (scheme 3), the indication information activating a UE-triggered CSI reporting, e.g., UE-triggered CSI reporting is also carried in DCI in a PDCCH, which is similar to scheme 2 and legacy SP CSI reporting on PUSCH. However, the PDCCH in scheme 3 is scrambled by a dedicated (or new) RNTI configured for UE-triggered CSI reporting, which is different from SP-CSI-RNTI or C-RNTI.

[0067] Similarly, a CSI field (or CSI request) in DCI of the PDCCH indicates the UE triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI trigger state where the UE triggered CSI reporting is configured. In response to the DCI activating the UE triggered CSI reporting, UE will transmit a first UE-triggered CSI reporting on the PUSCH scheduled by the PDCCH with the DCI. UE will report the following CSI report(s) if any in MAC CE in the case of occurrence of any predefined event. UE will stop the UE-triggered CSI reporting in response to receiving DCI in another PDCCH scrambled by a dedicated RNTI, which indicating deactivation of the UE triggered CSI reporting similar to the deactivation of a SP CSI reporting.

[0068] Regarding the CPU in scheme 3, one or more CPUs will be occupied from the first symbol or first slot containing available RSs, e.g., SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting after the last symbol of a PDCCH with the DCI activating the UE-triggered CSI reporting to the last symbol of another PDCCH with the DCI deactivating the UE-triggered CSI reporting.

[0069] Since the first CSI report of a UE-triggered CSI reporting is transmitted in PUSCH, e.g., L1 PUSCH in schemes 1-3, a priority of the first CSI report needs to be determined. In some implementations of the present disclosure, the first CSI report of a UE triggered beam report will be considered to have a priority as a legacy aperiodic CSI report, and the priority of the first CSI report will be determined by reusing the legacy priority scheme for a legacy aperiodic CSI report.

[0070] In accordance with some aspects of the present disclosure (scheme 4), both the indication information activating a UE-triggered CSI reporting or deactivating a UE-triggered CSI reporting is carried in MAC CE. For example, if SP RSs, e.g., SP CSI-RSs are configured for channel measurement and interference measurement (if any) of a UE-triggered CSI reporting, the MAC CE for the CSI-RSs will also be used for the activation and deactivation of the UE-triggered CSI reporting.

[0071] In response to a MAC CE (or referred to as an activation MAC CE) activating a UE-triggered CSI reporting, UE will transmit a first CSI report, e.g., a first beam report to the network side. Different from schemes 1-3, the first UE-triggered CSI report in scheme 4 is transmitted in a MAC CE. The report contents in the MAC CE is the same as or similar to

those reported in the other three schemes. UE will report the following CSI report(s) if any in MAC CE in the case of occurrence of any predefined event.

[0072] In response to another MAC CE (or referred to as a deactivation MAC CE), which deactivates the UE-triggered CSI reporting, UE will stop the UE-triggered CSI reporting. Regarding the CPU in scheme 4, one or more CPUs will be occupied from the first symbol or first slot containing available SSB and/or CSI-RS resources associated with the UE-triggered CSI reporting after a predefined time, e.g., 3ms after a PUCCH carrying HARQ-ACK corresponding to an activation MAC CE of the UE-triggered CSI reporting to the last symbol of the same predefined time, e.g., 3ms after a PUCCH carrying HARQ-ACK corresponding to a deactivation MAC CE.

[0073] Figure 2 illustrates an example of a UE 200 in accordance with aspects of the present disclosure. The UE 200 may include a processor 202, a memory 204, a controller 206, and a transceiver 208. The processor 202, the memory 204, the controller 206, or the transceiver 208, or various combinations thereof or various components thereof may be examples of means for performing various aspects of the present disclosure as described herein. These components may be coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces.

[0074] The processor 202, the memory 204, the controller 206, or the transceiver 208, or various combinations or components thereof may be implemented in hardware (e.g., circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), or other programmable logic device, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure.

[0075] The processor 202 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, or any combination thereof). In some implementations, the processor 202 may be configured to operate the memory 204. In some other implementations, the memory 204 may be integrated into the processor 202. The processor 202 may be configured to execute computer-readable instructions stored in the memory 204 to cause the UE 200 to perform various functions of the present disclosure.

[0076] The memory 204 may include volatile or non-volatile memory. The memory 204 may store computer-readable, computer-executable code including instructions when executed by the processor 202 cause the UE 200 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such the memory 204 or another type of memory. 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.

[0077] In some implementations, the processor 202 and the memory 204 coupled with the processor 202 may be configured to cause the UE 200 to perform one or more of the functions described herein (e.g., executing, by the processor 202, instructions stored in the memory 204). For example, the processor 202 may support wireless communication at the UE 200 in accordance with examples as disclosed herein. The UE 200 may be configured to support a means for receiving indication information activating a UE-triggered CSI reporting; a means for transmitting a first CSI report based on the indication information; and a means for determining whether to transmit following CSI reports after the first CSI report based on associated events.

[0078] The controller 206 may manage input and output signals for the UE 200. The controller 206 may also manage peripherals not integrated into the UE 200. In some implementations, the controller 206 may utilize an operating system such as iOS®, ANDROID®, WINDOWS®, or other operating systems. In some implementations, the controller 206 may be implemented as part of the processor 202.

[0079] In some implementations, the UE 200 may include at least one transceiver 208. In some other implementations, the UE 200 may have more than one transceiver 208. The transceiver 208 may represent a wireless transceiver. The transceiver 208 may include one or more receiver chains 210, one or more transmitter chains 212, or a combination thereof.

[0080] A receiver chain 210 may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receiver chain 210 may include one or more antennas for receive the signal over the air or wireless medium. The

receiver chain 210 may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receiver chain 210 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 receiver chain 210 may include at least one decoder for decoding the processing the demodulated signal to receive the transmitted data.

[0081] A transmitter chain 212 may be configured to generate and transmit signals (e.g., control information, data, packets). The transmitter chain 212 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 transmitter chain 212 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 transmitter chain 212 may also include one or more antennas for transmitting the amplified signal into the air or wireless medium.

[0082] Figure 3 illustrates an example of a processor 300 in accordance with aspects of the present disclosure. The processor 300 may be an example of a processor configured to perform various operations in accordance with examples as described herein. The processor 300 may include a controller 302 configured to perform various operations in accordance with examples as described herein. The processor 300 may optionally include at least one memory 304, which may be, for example, an L1/L2/L3 cache. Additionally, or alternatively, the processor 300 may optionally include one or more arithmetic-logic units (ALUs) 306. 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).

[0083] The processor 300 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 300) or other memory (e.g., 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).

[0084] The controller 302 may be configured to manage and coordinate various operations (e.g., signaling, receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) of the processor 300 to cause the processor 300 to support various operations in accordance with examples as described herein. For example, the controller 302 may operate as a control unit of the processor 300, generating control signals that manage the operation of various components of the processor 300. These control signals include enabling or disabling functional units, selecting data paths, initiating memory access, and coordinating timing of operations.

[0085] The controller 302 may be configured to fetch (e.g., obtain, retrieve, receive) instructions from the memory 304 and determine subsequent instruction(s) to be executed to cause the processor 300 to support various operations in accordance with examples as described herein. The controller 302 may be configured to track memory address of instructions associated with the memory 304. The controller 302 may be configured to decode instructions to determine the operation to be performed and the operands involved. For example, the controller 302 may be configured to interpret the instruction and determine control signals to be output to other components of the processor 300 to cause the processor 300 to support various operations in accordance with examples as described herein. Additionally, or alternatively, the controller 302 may be configured to manage flow of data within the processor 300. The controller 302 may be configured to control transfer of data between registers, arithmetic logic units (ALUs), and other functional units of the processor 300.

[0086] The memory 304 may include one or more caches (e.g., memory local to or included in the processor 300 or other memory, such RAM, ROM, DRAM, SDRAM, SRAM, MRAM, flash memory, etc. In some implementations, the memory 304 may reside within or

on a processor chipset (e.g., local to the processor 300). In some other implementations, the memory 304 may reside external to the processor chipset (e.g., remote to the processor 300).

[0087] The memory 304 may store computer-readable, computer-executable code including instructions that, when executed by the processor 300, cause the processor 300 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 302 and/or the processor 300 may be configured to execute computer-readable instructions stored in the memory 304 to cause the processor 300 to perform various functions. For example, the processor 300 and/or the controller 302 may be coupled with or to the memory 304, the processor 300, the controller 302, and the memory 304 may be configured to perform various functions described herein. In some examples, the processor 300 may include multiple processors and the memory 304 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.

[0088] The one or more ALUs 306 may be configured to support various operations in accordance with examples as described herein. In some implementations, the one or more ALUs 306 may reside within or on a processor chipset (e.g., the processor 300). In some other implementations, the one or more ALUs 306 may reside external to the processor chipset (e.g., the processor 300). One or more ALUs 306 may perform one or more computations such as addition, subtraction, multiplication, and division on data. For example, one or more ALUs 306 may receive input operands and an operation code, which determines an operation to be executed. One or more ALUs 306 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 306 may support logical operations such as AND, OR, exclusive-OR (XOR), not-OR (NOR), and not-AND (NAND), enabling the one or more ALUs 306 to handle conditional operations, comparisons, and bitwise operations.

[0089] The processor 300 may support wireless communication in accordance with examples as disclosed herein. The processor 300 may be configured to or operable to support a means for receiving indication information activating a UE-triggered CSI reporting; a

means for transmitting a first CSI report based on the indication information; and a means for determining whether to transmit following CSI reports after the first CSI report based on associated events.

[0090] Figure 4 illustrates an example of a NE 400 in accordance with aspects of the present disclosure. The NE 400 may include a processor 402, a memory 404, a controller 406, and a transceiver 408. The processor 402, the memory 404, the controller 406, or the transceiver 408, or various combinations thereof or various components thereof may be examples of means for performing various aspects of the present disclosure as described herein. These components may be coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces.

[0091] The processor 402, the memory 404, the controller 406, or the transceiver 408, or various combinations or components thereof may be implemented in hardware (e.g., circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), or other programmable logic device, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure.

[0092] The processor 402 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, or any combination thereof). In some implementations, the processor 402 may be configured to operate the memory 404. In some other implementations, the memory 404 may be integrated into the processor 402. The processor 402 may be configured to execute computer-readable instructions stored in the memory 404 to cause the NE 400 to perform various functions of the present disclosure.

[0093] The memory 404 may include volatile or non-volatile memory. The memory 404 may store computer-readable, computer-executable code including instructions when executed by the processor 402 cause the NE 400 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such the memory 404 or another type of memory. 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.

[0094] In some implementations, the processor 402 and the memory 404 coupled with the processor 402 may be configured to cause the NE 400 to perform one or more of the functions described herein (e.g., executing, by the processor 402, instructions stored in the memory 404). For example, the processor 402 may support wireless communication at the NE 400 in accordance with examples as disclosed herein. The NE 400 may be configured to support a means for transmitting indication information activating a UE-triggered CSI reporting; a means for receiving a first CSI report based on the indication information; and a means for receiving following CSI reports after the first CSI report, wherein the following CSI reports are based on associated events.

[0095] The controller 406 may manage input and output signals for the NE 400. The controller 406 may also manage peripherals not integrated into the NE 400. In some implementations, the controller 406 may utilize an operating system such as iOS®, ANDROID®, WINDOWS®, or other operating systems. In some implementations, the controller 406 may be implemented as part of the processor 402.

[0096] In some implementations, the NE 400 may include at least one transceiver 408. In some other implementations, the NE 400 may have more than one transceiver 408. The transceiver 408 may represent a wireless transceiver. The transceiver 408 may include one or more receiver chains 410, one or more transmitter chains 412, or a combination thereof.

[0097] A receiver chain 410 may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receiver chain 410 may include one or more antennas for receive the signal over the air or wireless medium. The receiver chain 410 may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receiver chain 410 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 receiver chain 410 may include at least one decoder for decoding the processing the demodulated signal to receive the transmitted data.

[0098] A transmitter chain 412 may be configured to generate and transmit signals (e.g., control information, data, packets). The transmitter chain 412 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 transmitter chain 412 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 transmitter chain 412 may also include one or more antennas for transmitting the amplified signal into the air or wireless medium.

[0099] Figure 5 illustrates a flowchart of a method in accordance with aspects of the present disclosure. The operations of the method may be implemented by a UE as described herein. In some implementations, the UE may execute a set of instructions to control the function elements of the UE to perform the described functions.

[0100] At step 501, the method may include receiving indication information activating a UE-triggered CSI reporting. The operations of step 501 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 501 may be performed by a UE as described with reference to Figure 2.

[0101] At step 503, the method may include transmitting a first CSI report based on the indication information. The operations of step 503 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of step 503 may be performed by a UE as described with reference to Figure 2.

[0102] At step 505, the method may include determining whether to transmit following CSI reports after the first CSI report based on associated events. The operations of step 505 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of step 505 may be performed by a UE as described with reference to Figure 2.

[0103] It should be noted that the method described herein describes a possible implementation, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible.

[0104] Figure 6 illustrates a flowchart of a method in accordance with aspects of the present disclosure. The operations of the method may be implemented by a NE as described herein. In some implementations, the NE may execute a set of instructions to control the function elements of the NE to perform the described functions.

[0105] At step 601, the method may include transmitting indication information activating a UE-triggered CSI reporting. The operations of step 601 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of step 601 may be performed by a NE as described with reference to Figure 4.

[0106] At step 603, the method may include receiving a first CSI report based on the indication information. The operations of step 603 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of step 603 may be performed by a NE as described with reference to Figure 4.

[0107] At step 605, the method may include receiving following CSI reports after the first CSI report, wherein the following CSI reports are based on associated events. The operations of step 605 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of step 605 may be performed by a NE as described with reference to Figure 4.

[0108] It should be noted that the method described herein describes a possible implementation, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible.

[0109] 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) for wireless communication, comprising:
 - at least one memory; and
 - at least one processor coupled with the at least one memory and configured to cause the UE to:
 - receive indication information activating a UE-triggered channel state information (CSI) reporting;
 - transmit a first CSI report based on the indication information; and
 - determine whether to transmit following CSI reports after the first CSI report based on associated events.
2. The UE of claim 1, wherein, in response to determining to transmit a following CSI report based on the associated events, the at least one processor is configured to cause the UE to transmit the following CSI report on a media access control (MAC) control element (CE).
3. The UE of claim 1, wherein, the indication information is carried in a physical downlink control channel (PDCCH) scrambled with cell-radio network temporary identifier (C-RNTI), and wherein a CSI field in downlink control information (DCI) of the PDCCH indicates the UE-triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI aperiodic trigger state where the UE triggered CSI reporting is configured.
4. The UE of claim 3, wherein, the at least one processor is configured to cause the UE to:
 - receive a radio resource control (RRC) signaling indicating stopping the UE triggered CSI reporting; and
 - stop the UE triggered CSI reporting in response to the RRC signaling, wherein, one CSI processing unit (CPU) is occupied from a first symbol after a last symbol of the PDCCH

or a first slot containing available reference signal (RS) resources associated with the UE-triggered CSI reporting after the PDCCH to a last symbol of the RRC signaling.

5. The UE of claim 3, wherein, the at least one processor is configured to cause the UE to:

receive a media access control (MAC) control element (CE) indicating stopping the UE triggered CSI reporting; and

stop the UE triggered CSI reporting in response to the MAC CE, wherein, one CSI processing unit (CPU) is occupied from a first symbol or first slot containing available reference signal (RS) resources associated with the UE-triggered beam reporting after a last symbol of the PDCCH to a last symbol of a predefined time after a physical uplink control channel (PUCCH) carrying hybrid automatic repeat request-acknowledge (HARQ-ACK) corresponding to a physical downlink shared channel (PDSCH) carrying the MAC CE.

6. The UE of claim 3, wherein, the DCI of the PDCCH further comprises an indication field indicating starting the UE triggered CSI reporting, and the at least one processor is configured to cause the UE to:

receive another PDCCH, wherein an indication filed in DCI in the other PDCCH indicates stopping the UE triggered CSI reporting; and

stop the UE triggered CSI reporting in response to the indication field indicating stopping the UE triggered CSI reporting, wherein, one CSI processing unit (CPU) is occupied from a first symbol or first slot containing available reference signal (RS) resources associated with the UE-triggered beam reporting after a last symbol of the PDCCH to a last symbol of the other PDCCH..

7. The UE of claim 1, wherein, the indication information is carried in a physical downlink control channel (PDCCH) scrambled with semi-persistent (SP) CSI radio network temporary identifier (RNTI) (SP-CSI-RNTI), and wherein a CSI field in DCI of the PDCCH indicates the UE triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI SP trigger state where the UE triggered CSI reporting is configured.

8. The UE of claim 7, wherein, the at least one processor is configured to cause the UE to:

receive another PDCCH scrambled with SP-CSI-RNTI, wherein DCI in the other PDCCH indicates stopping the UE triggered CSI reporting; and

stop the UE triggered CSI reporting in response to the DCI indicating stopping the UE triggered CSI reporting, wherein, one CSI processing unit (CPU) is occupied from a first symbol or first slot containing available reference signal (RS) resources associated with the UE-triggered beam reporting after a last symbol of the PDCCH to a last symbol of the other PDCCH.

9. The UE of claim 1, wherein, the indication information is carried in a physical downlink control channel (PDCCH) scrambled with a radio network temporary identifier (RNTI) different from cell-RNTI (C-RNTI) and semi-persistent (SP) CSI RNTI (SP-CSI-RNTI), and wherein a CSI field in DCI of the PDCCH indicates the UE triggered CSI reporting by mapping a codepoint of the CSI field to a list of CSI trigger state where the UE triggered CSI reporting is configured.

10. The UE of claim 9, wherein, the at least one processor is configured to cause the UE to:

receive another PDCCH scrambled with a RNTI different from C-RNTI and SP-CSI-RNTI, wherein DCI in the other PDCCH indicates stopping the UE triggered CSI reporting; and

stop the UE triggered CSI reporting in response to the DCI indicating stopping the UE triggered CSI reporting, wherein, one CSI processing unit (CPU) is occupied from a first symbol or first slot containing available reference signal (RS) resources associated with the UE-triggered beam reporting after a last symbol of the PDCCH to a last symbol of the other PDCCH.

11. The UE of claim 3, 8 or 10, wherein, the at least one processor is configured to cause the UE to transmit the first CSI report in a physical uplink shared channel (PUSCH) scheduled by the PDCCH.

12. The UE of claim 11, wherein, the at least one processor is configured to cause the UE to determine a priority of the first CSI report according to an aperiodic CSI report.

13. The UE of claim 1, wherein, the indication information is carried in a first media access control (MAC) control element (CE), and the at least one processor is configured to transmit the first report in a second MAC CE.

14. The UE of claim 13, wherein, the at least one processor is configured to cause the UE to:

receive another MAC CE indicating stopping the UE triggered CSI reporting; and
stop the UE triggered CSI reporting in response to the other MAC CE, wherein, one CSI processing unit (CPU) is occupied from a first symbol or first slot containing available reference signal (RS) resources associated with the UE-triggered beam reporting after a predefined time after a physical uplink control channel (PUCCH) carrying hybrid automatic repeat request-acknowledge (HARQ-ACK) corresponding to the MAC CE to a last symbol of the predefined time after a PUCCH carrying HARQ-ACK corresponding to a physical downlink shared channel (PDSCH) carrying the other MAC CE.

15. The UE of claim 1, wherein, the at least one processor is configured to cause the UE to determine to transmit a following CSI report in response to any one of following events is satisfied:

at least one CSI-reference signal (RS) resource indicator (CRI) or SS/PBCH block resource indicator (SSBRI) which is selected to be reported is different from previous reported CRIs or SSBRI; and

largest layer 1 (L1)- reference signal receiving power (RSRP) or L1- signal to interference plus noise ratio (SINR) which is selected to be reported is below a corresponding threshold.

16. A processor for wireless communication, comprising:

at least one controller coupled with at least one memory and configured to cause the processor to:

receive indication information activating a UE-triggered channel state information (CSI) reporting;

transmit a first CSI report based on the indication information; and

determine whether to transmit following CSI reports after the first CSI report based on associated events.

17. A network equipment (NE) for wireless communication, comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the NE to:

transmit indication information activating a UE-triggered channel state information (CSI) reporting;

receive a first CSI report based on the indication information; and

receive following CSI reports after the first CSI report, wherein the following CSI reports are based on associated events.

18. A method performed by a user equipment (UE), comprising:

receiving indication information activating a UE-triggered channel state information (CSI) reporting;

transmitting a first CSI report based on the indication information; and

determining whether to transmit following CSI reports after the first CSI report based on associated events.

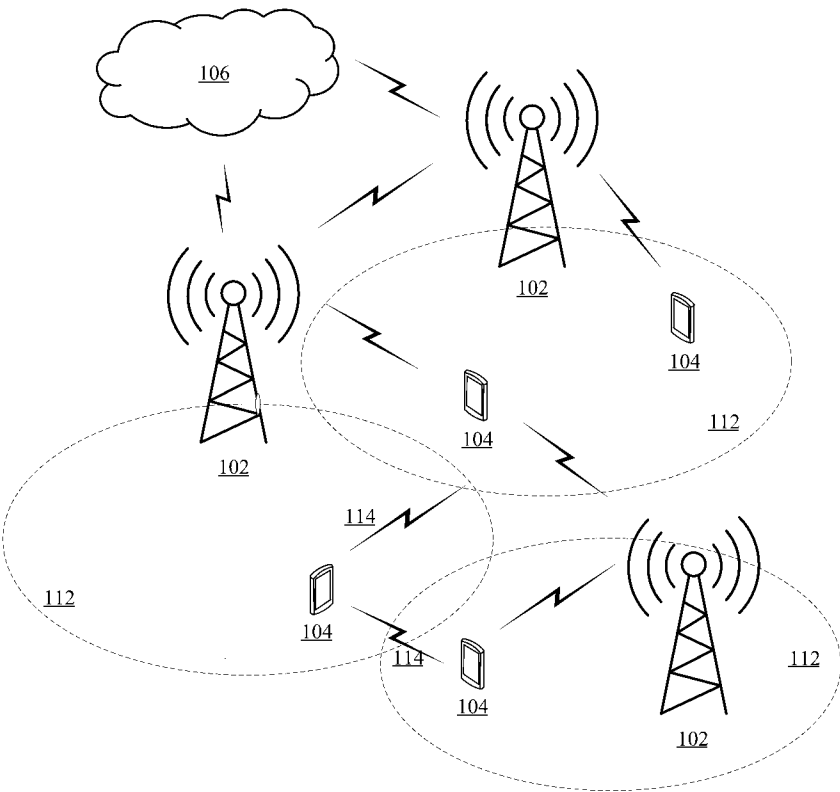


Figure 1

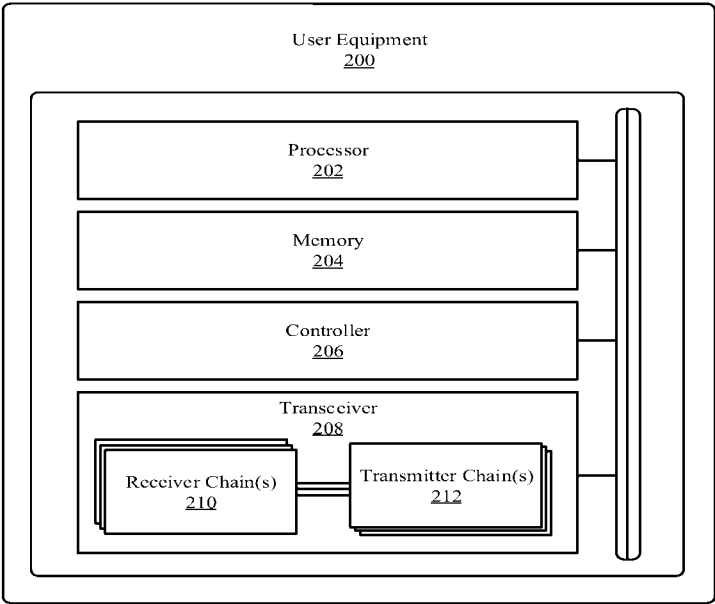


Figure 2

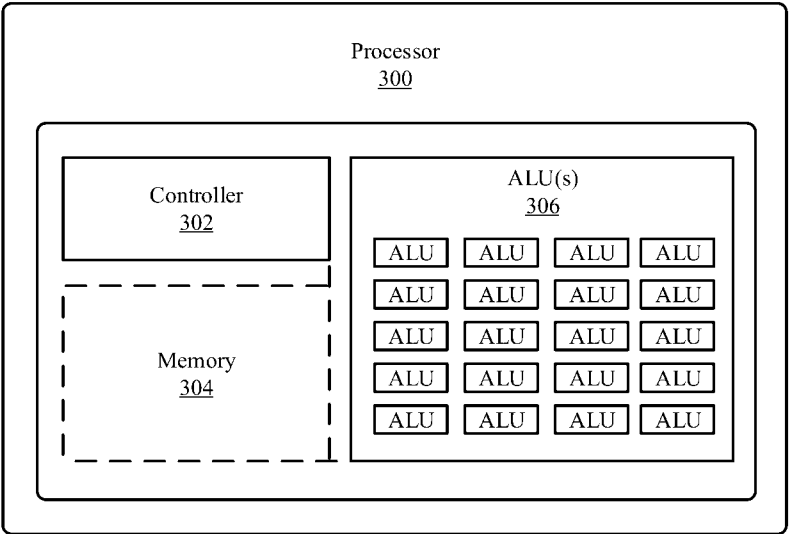


Figure 3

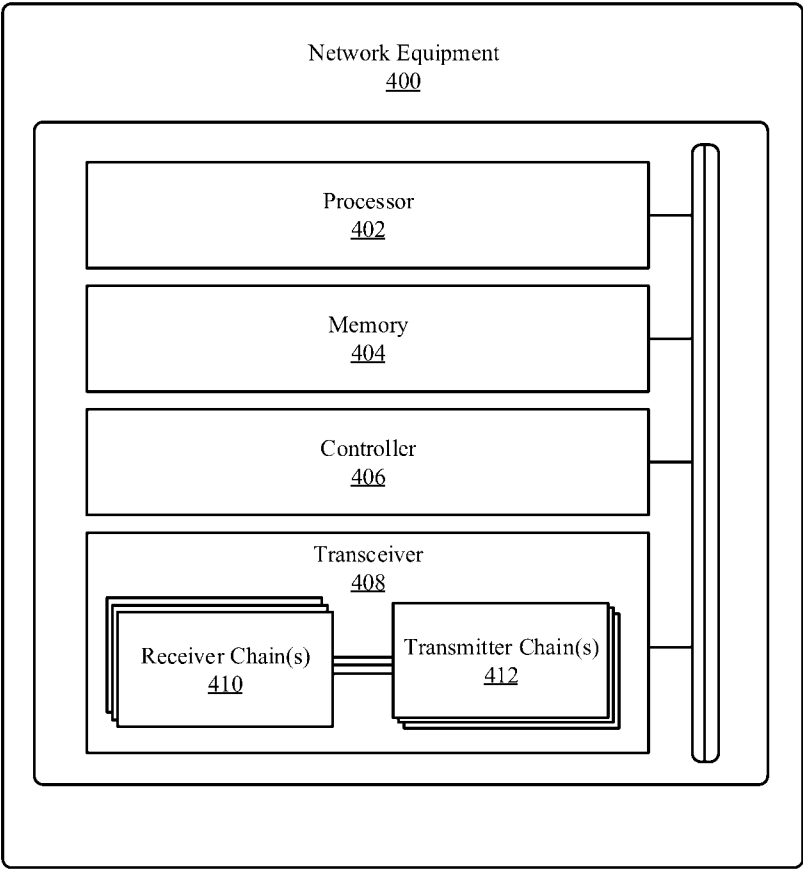


Figure 4

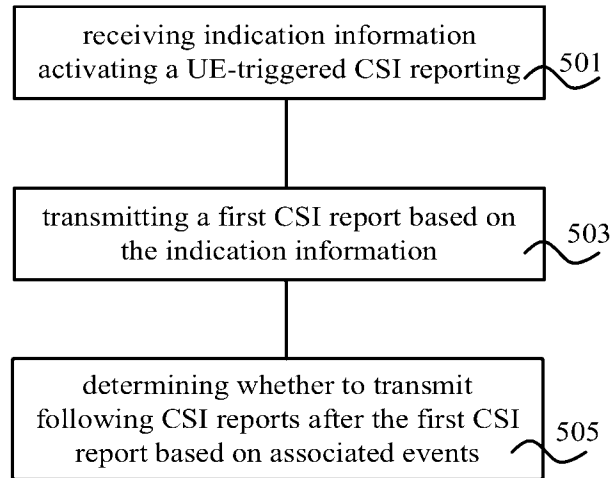


Figure 5

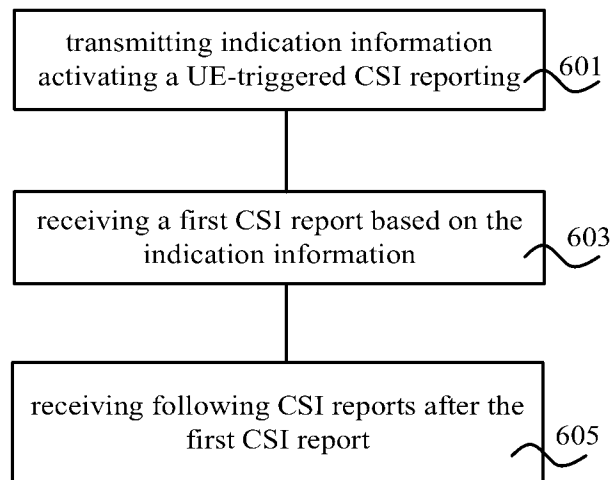


Figure 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/071924

A. CLASSIFICATION OF SUBJECT MATTER H04W 24/10(2009.01)i According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC:H04W,H04L Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) 3GPP,CNXTX,ENTXTC,DWPI:activate,activating, channel state information, CSI, UE, user equipment, reporting, event, condition, CRI, SSBRI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2022094505 A1 (ZTE CORPORATION) 24 March 2022 (2022-03-24) description, paragraphs [0033]-[0035], [0106]-[0137], figures 5-8	1-18
X	CN 110536339 A (VIVO MOBILE COMMUNICATION CO., LTD.) 03 December 2019 (2019-12-03) description, claim 24, paragraphs [0033]-[0102], figures 1-2	1-18
A	CN 117296362 A (BEIJING XIAOMI MOBILE SOFTWARE CO., LTD.) 26 December 2023 (2023-12-26) the whole document	1-18
A	CN 117337584 A (BEIJING XIAOMI MOBILE SOFTWARE CO., LTD.) 02 January 2024 (2024-01-02) the whole document	1-18
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed “T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family		
Date of the actual completion of the international search 18 September 2024		Date of mailing of the international search report 24 September 2024
Name and mailing address of the ISA/CN CHINA NATIONAL INTELLECTUAL PROPERTY ADMINISTRATION 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China		Authorized officer MEN,Le Telephone No. (+86) 010-53961687

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2024/071924

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
US	2022094505	A1	24 March 2022	WO	2020143775	A1	16 July 2020
				CN	111436126	A	21 July 2020
				EP	3911073	A1	17 November 2021
CN	110536339	A	03 December 2019	EP	3817442	A1	05 May 2021
				WO	2019223634	A1	28 November 2019
				US	2021075490	A1	11 March 2021
CN	117296362	A	26 December 2023	None			
CN	117337584	A	02 January 2024	None			