



(51) International Patent Classification:

H04W 4/06 (2009.01)

(21) International Application Number:

PCT/CN2023/075021

(22) International Filing Date:

08 February 2023 (08.02.2023)

(25) Filing Language:

English

(26) Publication Language:

English

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(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, 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))

(54) Title: METHODS AND APPARATUS TO ACQUIRE AND PERFORM CONFIGURATION BY MULTICAST MCCH FOR MULTICAST RECEPTION IN RRC INACTIVE STATE

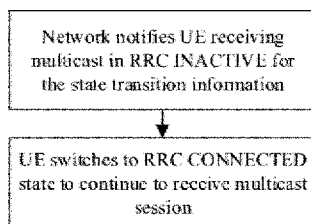


Fig 10

(57) Abstract: This disclosure describes methods and apparatus to support UE to acquire and perform configuration by multicast MCCH for multicast reception in RRC INACTIVE state. A particular procedure is introduced to configure multicast MCCH and MBS multicast configuration for UE receiving multicast in RRC INACTIVE state. The initial information for acquiring multicast MCCH is indicated by dedicated signaling. In one embodiment, the MBS multicast configurations for multiple MBS sessions share one common multicast MCCH. The MBS multicast configurations for different multicast sessions have different multicast MCCH transmission windows. The information for acquiring multicast MCCH from neighboring cell is indicated by MCCH in serving cell. The multicast session changes due to multicast service change or neighboring cell change and so on is notified to UE via the RRC signaling, MAC-CE, or DCI indication.

METHODS AND APPARATUS TO ACQUIRE AND PERFORM CONFIGURATION BY MULTICAST MCCH FOR MULTICAST RECEPTION IN RRC INACTIVE STATE

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FIELD

The present disclosure relates generally to communication systems, and more particularly, the method to acquire and perform configuration by multicast MCCH for multicast reception in RRC INACTIVE state.

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BACKGROUND

Various cellular systems, including both 4G/LTE and 5G/NR systems, may provide a multicast functionality, which allows user equipments (UEs) in the system to receive multicast services transported by the cellular system. A variety of applications may rely on communication over multicast transmission, such as live stream, video distribution, vehicle-to-everything (V2X) communication, public safety (PS) communication, file download, and so on. In legacy system, the multicast service is received by UE which in RRC CONNECTED state. For high load/congestion scenario, it may be possible for UE to receive multicast service in RRC INACTIVE state, which can improve the system load, service coverage and spectrum efficiency. In current NR multicast, UE receives multicast service in RRC CONNECTED, and the reception is indicated and updated by RRC message. For multicast reception via RRC INACTIVE state, some extra channel and signaling may be needed when the configuration of multicast needs to be updated.

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In this invention, apparatus and mechanisms are sought to support UE to acquire and perform configuration by multicast MCCH for multicast reception in RRC INACTIVE state.

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SUMMARY

The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key or critical elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

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In an aspect of the disclosure, a method, a computer-readable medium, and an apparatus are provided. The apparatus may be a UE. UE which has joined in one multicast session may receive

RRC signaling to indicate the configuration for UE to receive multicast session in RRC INACTIVE. In one embodiment, the configuration for multicast (i.e. MBS multicast configuration) is provided by multicast MCCH (MBS Control Channel). In one embodiment, the method to acquire multicast MCCH is provided by dedicated signaling from network. In one embodiment, the multicast session change is notified the UE receiving the multicast via RRC signaling, or MAC-CE or the DCI indication. In one embodiment, the multicast MCCH contains multiple MBS multicast configurations for multiple multicast sessions. After UE acquires the MBS multicast configuration from multicast MCCH, UE performs the configuration for multicast session and receives the multicast session in RRC INACTIVE. The multicast MCCH may also be referred to as a common multicast signaling, a common multicast message or a common RRC signaling used in the art. The MBS multicast configuration may also be referred to as multicast configuration, or configuration for multicast used in the art.

To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed, and this description is intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrate an exemplary overall flow for UE to configure to receives multicast session in RRC INACTIVE in accordance with the embodiments of the current invention.

Figure 2 illustrate an exemplary overall flow for UE to receive the multicast session change notification and updated multicast configuration in RRC INACTIVE state in accordance with the embodiments of the current invention.

Figure 3 illustrate an exemplary signalling overall flow for UE to obtain the information for multicast reception by common multicast MCCH in RRC INACTIVE state in accordance with the embodiments of the current invention.

Figure 4 illustrate an exemplary signalling overall flow for UE to obtain the information for multicast reception by certain multicast MCCH in RRC INACTIVE state in accordance with the embodiments of the current invention.

Figure 5 illustrate an exemplary common MCCH structure with multiple MBS multicast configurations by different MCCH window in accordance with the embodiments of the current invention.

Figure 6 illustrate an exemplary structure for multiple MBS multicast configurations by different MCCHs in accordance with the embodiments of the current invention.

Figure 7 illustrate an exemplary flowchart for UE to update the multicast configuration due to configuration change by network in accordance with the embodiments of the current invention.

5 Figure 8 illustrate an exemplary flowchart for UE to update the multicast configuration due to mobility in accordance with the embodiments of the current invention.

Figure 9 illustrate an exemplary flowchart for UE to receive the notification for session deactivation and stop receiving multicast session in accordance with the embodiments of the current invention.

10 Figure 10 illustrate an exemplary flowchart for UE to receive the notification for state transition and switches to RRC CONNECTED state to continue to receive multicast session in accordance with the embodiments of the current invention.

Figure 11 illustrates a schematic system diagram illustrating an exemplary wireless network in accordance with embodiments of the current invention.

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DETAILED DESCRIPTION

The detailed description set forth below in connection with the appended drawings is intended as a description of various configurations and is not intended to represent the only configurations in which the concepts described herein may be practiced. The detailed description includes
20 specific details for the purpose of providing a thorough understanding of various concepts. However, it will be apparent to those skilled in the art that these concepts may be practiced without these specific details. In some instances, well known structures and components are shown in block diagram form in order to avoid obscuring such concepts.

Several aspects of telecommunication systems will now be presented with reference to
25 various apparatus and methods. These apparatus and methods will be described in the following detailed description and illustrated in the accompanying drawings by various blocks, components, circuits, processes, algorithms, etc. (collectively referred to as “elements”). These elements may be implemented using electronic hardware, computer software, or any combination thereof. Whether such elements are implemented as hardware or software depends upon the particular
30 application and design constraints imposed on the overall system.

Aspects of the present disclosure provide methods, apparatus, processing systems, and computer readable mediums for NR (new radio access technology, or 5G technology) or other radio access technology. NR may support various wireless communication services. These services may have different quality of service (QoS) requirements e.g. latency and reliability

requirements.

Figure 1 illustrate an exemplary overall flow for UE to configure to receives multicast session in RRC INACTIVE in accordance with the embodiments of the current invention. For UE which has joined in one multicast session, the network may send RRC message to UE. In one embodiment, the RRC message contains the information to acquire multicast MCCH, and multicast MCCH contains the MBS multicast configuration for the certain multicast session. In one embodiment, the RRC message is a RRC Reconfiguration message. In one embodiment, the RRC message is a RRC Release message with suspendconfig. In one embodiment, UE receives the RRC message in RRC CONNECTED state. In one embodiment, UE receives the RRC message in RRC INACTIVE state. When UE acquires the MBS multicast configuration message from network, UE may perform multicast configuration and receives multicast session in RRC INACTIVE.

Figure 2 illustrate an exemplary overall flow for UE to receive the multicast session change notification and updated multicast configuration in RRC INACTIVE state in accordance with the embodiments of the current invention. As illustrated in the Figure 2, when the multicast session is changed due to the multicast service change or neighboring cell change and so on, the UE receiving the multicast service needs to be notified before the UE obtains the new updated MCCH configuration. The UE can be notified by the RRC message, MAC-CE or the DCI indication. Wherein the RRC message can be a group common signaling to notify the (sub-)group UEs, e.g., the (sub-)group UEs receiving the same multicast services with the same G-RNTI/TMGI. For the DCI indication mechanism, the DCI can reuse the current multicast DCI format with additional MCCH change notification fields, e.g., the 2bits notification field is added to the current multicast DCI format. Alternatively, the DCI format can be a new DCI format to notify the multicast session change information, e.g., new DCI filed with different service change intention is indicated. Wherein the new DCI format can be associated with current multicast RNTI or a new multicast change notification RNTI.

Figure 3 illustrate an exemplary signalling overall flow for UE to obtain the information for multicast reception by common multicast MCCH in RRC INACTIVE state in accordance with the embodiments of the current invention. UE receives the dedicated signalling by network after UE joins in one multicast session. In one embodiment, the dedicated signalling carries the information to acquire multicast MCCH. In one embodiment, the multicast MCCH transmissions (and the associated radio resources and MCS) are indicated via the PDCCH addressed to G-RNTI. In one embodiment, the multicast MCCH transmissions (and the associated radio resources and MCS) are indicated via the PDCCH addressed to multicast MCCH-RNTI.

The MBS multicast configurations contain the information of the parameters needed for

MTCH reception. In one embodiment, the MBS multicast configuration only contains the configuration for certain multicast session. In one embodiment, MBS multicast configurations for multiple MBS sessions share one multicast MCCH. In one embodiment, the MBS multicast configuration contains the information to acquire multicast MCCH from neighbor cell. In one embodiment, the MTCH and the information to acquire multicast MCCH from neighbor cell are indicated via the PDCCH addressed to G-RNTI.

Figure 4 illustrate an exemplary signalling overall flow for UE to obtain the information for multicast reception by certain multicast MCCH in RRC INACTIVE state in accordance with the embodiments of the current invention. UE receives the dedicated signalling by network after UE joins in one multicast session. In one embodiment, the dedicated signalling carries the information to acquire multicast MCCH for certain session (e.g., multicast MCCH 1 with MBS multicast configuration 1 for multicast session 1). In one embodiment, the dedicated signalling carries the information to acquire multicast MCCH for multiple sessions (e.g., multicast MCCH 1 with MBS multicast configuration 1 and 2 for session 1 and 2). In one embodiment, one MBS multicast configuration contains the configurations for multiple multicast sessions. (e.g., MBS multicast configuration 1 for session 1 and 2)

In one embodiment, the transmissions of the multicast MCCH for certain session(s) (and the associated radio resources and MCS) are indicated via the PDCCH addressed to G-RNTI, and the MTCH for multiple multicast sessions associate to one multicast MCCH are indicated via the PDCCH addressed to the same G-RNTI. In one embodiment, the transmissions of the multicast MCCH for certain sessions (and the associated radio resources and MCS) are indicated via the PDCCH addressed to one certain multicast MCCH-RNTI (e.g., multicast MCCH-RNTI 1), the MBS multicast configurations carried by certain multicast MCCH-RNTI can be associated to multiple sessions with the same G-RNTI.

The MBS multicast configuration for certain session contains the information of the parameters needed for MTCH reception for the same session. In one embodiment, the MBS multicast configuration for certain session contains the information to acquire multicast MCCH for the same session from neighbor cell.

Figure 5 illustrate an exemplary common MCCH structure with multiple MBS multicast configurations by different MCCH window in accordance with the embodiments of the current invention.

The multicast MCCH contains multiple MBS multicast configurations for multiple multicast sessions. In one embodiment, the MCCH content for different sessions (i.e., MBS multicast configurations) are transmitted within different time domain windows. The MCCH content for

different sessions transmitted within different time domain windows may also be referred to as a MCCH window used in the art.

In one embodiment, different MCCH windows in the same MCCH have the same or different repetition period, window duration and radio frame/slot offset; In one embodiment, the information to acquire MCCH window for different sessions are scrambled by different G-RNTI. In one embodiment, the information to acquire MCCH window for different sessions are scrambled by one multicast-MCCH-RNTI. In one embodiment, The RNTI(s) and the information to obtain MCCH window (e.g., repetition period, window duration and radio frame/slot offset) is indicated to UE by dedicated signaling.

Figure 6 illustrate an exemplary structure for multiple MBS multicast configurations by different MCCHs in accordance with the embodiments of the current invention. The multicast MCCH contains one or multiple MBS multicast configuration(s) for multicast session(s). In one embodiment, different MCCH windows in the same MCCH have the same or different repetition period, window duration and radio frame/slot offset; In one embodiment, the information to acquire MCCH window for different sessions are scrambled by the same G-RNTI. In one embodiment, the information to acquire MCCH window for different sessions are scrambled by one certain multicast MCCH-RNTI. In one embodiment, UE can obtain the MBS multicast configurations for multiple sessions which scrambled by the same G-RNTI from the same multicast MCCH. In one embodiment, The RNTI and the information to obtain MCCH window (e.g., repetition period, window duration and radio frame/slot offset) is indicated to UE by dedicated signaling.

Figure 7 illustrate an exemplary flowchart for UE to update the multicast configuration due to configuration change by network in accordance with the embodiments of the current invention. When the multicast configuration is changed (or going to change) by the network, network may notify UE about the configuration change for multicast session. In one embodiment, the notification is via multicast MCCH. In one embodiment, the notification is via DCI. In one embodiment, the notification is via group paging message.

In one embodiment, the network only notifies UE of configuration change if the configuration for the session in which the UE has joined in is changed. UE obtains updated configuration after being notified. In one embodiment, UE requires the updated configuration by Random access procedure, and obtains the updated configuration by RRC message. In one embodiment, the RRC message is a RRC Reconfiguration message. In one embodiment, the RRC message is a RRCRelease message with suspend config. In one embodiment, UE obtains the updated configuration by the information in previous MBS multicast configuration. After UE obtains the

updated configuration, UE continues to receive the multicast session and corresponding MBS multicast configuration.

Figure 8 illustrate an exemplary flowchart for UE to update the multicast configuration due to mobility in accordance with the embodiments of the current invention. When UE needs to update multicast configuration due to UE mobility, UE updates the MBS multicast configuration of the same multicast session for neighbor cell. In one embodiment, the information needed for the reception of MCCH of the same multicast session from neighboring cells is provided in the MBS multicast configuration for serving cell. After UE update the MBS multicast configuration, UE continues to receive the multicast session and corresponding MBS multicast configuration from the new cell.

Figure 9 illustrate an exemplary flowchart for UE to receive the notification for session deactivation and stop receiving multicast session in accordance with the embodiments of the current invention. When UE receiving multicast session in RRC INACTIVE state, UE may receive the session deactivation information from network. In one embodiment, the session deactivation information is carried in multicast MCCH. In one embodiment, the session deactivation information is carried by group paging message. In one embodiment, the session deactivation information is carried by MAC CE. In one embodiment, the session deactivation information is carried by DCI indication. When UE receives the session deactivation information, UE stops receiving the corresponding multicast session.

Figure 10 illustrate an exemplary flowchart for UE to receive the notification for state transition and switches to RRC CONNECTED state to continue to receive multicast session in accordance with the embodiments of the current invention. When UE receiving multicast session in RRC INACTIVE state, UE may be notified for the state transition from network. In one embodiment, the state transition information is carried in multicast MCCH. In one embodiment, the state transition information is carried by group paging message. In one embodiment, the state transition information is carried by MAC CE. In one embodiment, the state transition information is carried by DCI indication. When UE receives the state transition notification, UE switches to RRC CONNECTED state to continue to receive multicast session.

Figure 11 illustrates a schematic system diagram illustrating an exemplary wireless network in accordance with embodiments of the current invention. Wireless system includes one or more fixed base infrastructure units forming a network distributed over a geographical region. The base unit may also be referred to as an access point, an access terminal, a base station, a Node-B, an eNode-B, a gNB, or by other terminology used in the art. As an example, base stations serve a number of mobile stations within a serving area, for example, a cell, or within a cell sector. In

some systems, one or more base stations are coupled to a controller forming an access network that is coupled to one or more core networks. gNB 1 and gNB 2 are base stations in NR, the serving area of which may or may not overlap with each other. As an example, UE1 or mobile station is only in the service area of gNB 1 and connected with gNB1. UE1 is connected with gNB1 only, gNB1 is connected with gNB2 via Xn interface. UE2 is in the overlapping service area of gNB1 and gNB2. In one embodiment, both gNB1 and gNB2 provide the same MBS services, service continuity during handover is guaranteed when UE 2 moves from gNB1 to gNB2 and vice versa.

Figure 11 further illustrates simplified block diagrams for UE2 and gNB2, respectively. UE has an antenna, which transmits and receives radio signals. A RF transceiver, coupled with the antenna, receives RF signals from antenna, converts them to baseband signal, and sends them to processor. In one embodiment, the RF transceiver may comprise two RF modules (not shown). A first RF module is used for transmitting and receiving on one frequency band, and the other RF module is used for different frequency bands transmitting and receiving which is different from the first transmitting and receiving. RF transceiver also converts received baseband signals from processor, converts them to RF signals, and sends out to antenna. Processor processes the received baseband signals and invokes different functional modules to perform features in UE. Memory stores program instructions and data to control the operations of mobile station. UE also includes multiple function modules that carry out different tasks in accordance with embodiments of the current invention.

A RRC State controller, which controls UE RRC state according to network's command and UE conditions. RRC supports the following states, RRC_IDLE, RRC_CONNECTED and RRC_INACTIVE. In one embodiment, UE can receive the multicast services in RRC INACTIVE state. The UE applies the MRB establishment procedure to start receiving a session of a service it has joined in. The UE applies the MRB release procedure to stop receiving a session.

A MRB controller, which controls to establish/add, reconfigure/modify and release/remove a MRB based on different sets of conditions for MRB establishment, reconfiguration and release. A protocol stack controller, which manage to add, modify or remove the protocol stack for the MRB. The protocol Stack includes RLC, MAC and PHY layers. In one embodiment, the SDAP layer is optionally configured.

In one embodiment, the PDCP layer supports the functions of transfer of data, maintenance of PDCP SN, header compression and decompression using the ROHC protocol, ciphering and deciphering, integrity protection and integrity verification, timer based SDU discard, routing for split bearer, duplication, re-ordering and in-order delivery; out of order delivery and duplication discarding. In one embodiment, the receiving PDCP entity sends PDCP status report upon t-

Reordering expiry. In one embodiment, the PDCP status reports triggers PDCP retransmission at the peer transmitting PDCP entity at the network side.

In one embodiment, the RLC layer supports the functions of error correction through ARQ, segmentation and reassembly, re-segmentation, duplication detection, re-establishment, etc. In one embodiment, a new procedure for RLC reconfiguration is performed, which can reconfigure the RLC entity to associated to one or two logical channels.

In one embodiment, the MAC layer supports the following functions: mapping between logical channels and transport channels, multiplexing/demultiplexing, HARQ, radio resource selection, etc.

Similarly, gNB2 has an antenna, which transmits and receives radio signals. A RF transceiver, coupled with the antenna, receives RF signals from antenna, converts them to baseband signals, and sends them to processor. RF transceiver also converts received baseband signals from processor, converts them to RF signals, and sends out to antenna. Processor processes the received baseband signals and invokes different functional modules to perform features in gNB2. Memory stores program instructions and data to control the operations of gNB2. gNB2 also includes multiple function modules that carry out different tasks in accordance with embodiments of the current invention.

A RRC State controller, which performs access control for the UE.

A MRB controller, which controls to establish/add, reconfigure/modify and release/remove a MRB based on different sets of conditions for MRB establishment, reconfiguration and release. A protocol stack controller, which manage to add, modify or remove the protocol stack for the MRB. The protocol Stack includes SDAP, PDCP, RLC, MAC and PHY layers.

It is understood that the specific order or hierarchy of blocks in the processes / flowcharts disclosed is an illustration of exemplary approaches. Based upon design preferences, it is understood that the specific order or hierarchy of blocks in the processes / flowcharts may be rearranged. Further, some blocks may be combined or omitted. The accompanying method claims present elements of the various blocks in a sample order, and are not meant to be limited to the specific order or hierarchy presented.

The previous description is provided to enable any person skilled in the art to practice the various aspects described herein. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the claims are not intended to be limited to the aspects shown herein, but is to be accorded the full scope consistent with the language claims, wherein reference to an element in the singular is not intended to mean "one and only one" unless specifically so stated, but rather "one or more."

The word “exemplary” is used herein to mean “serving as an example, instance, or illustration.” Any aspect described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other aspects. Unless specifically stated otherwise, the term “some” refers to one or more. Combinations such as “at least one of A, B, or C,” “one or more of A, B, or C,” “at least one of A, B, and C,” “one or more of A, B, and C,” and “A, B, C, or any combination thereof” include any combination of A, B, and/or C, and may include multiples of A, multiples of B, or multiples of C. Specifically, combinations such as “at least one of A, B, or C,” “one or more of A, B, or C,” “at least one of A, B, and C,” “one or more of A, B, and C,” and “A, B, C, or any combination thereof” may be A only, B only, C only, A and B, A and C, B and C, or A and B and C, where any such combinations may contain one or more member or members of A, B, or C. All structural and functional equivalents to the elements of the various aspects described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. The words “module,” “mechanism,” “element,” “device,” and the like may not be a substitute for the word “means.” As such, no claim element is to be construed as a means plus function unless the element is expressly recited using the phrase “means for.”

While aspects of the present disclosure have been described in conjunction with the specific embodiments thereof that are proposed as examples, alternatives, modifications, and variations to the examples may be made. Accordingly, embodiments as set forth herein are intended to be illustrative and not limiting. There are changes that may be made without departing from the scope of the claims set forth below.

CLAIMS

1.A method for UE to acquire and perform configuration for multicast reception in RRC INACTIVE state, Comprising the step of:

acquires the MBS multicast configuration message from multicast MCCH;

5 performs the configuration for multicast session;

receives the data for multicast session in RRC INACTIVE.

2.The method of claim 1, wherein the MBS multicast configuration only contains the configuration information for certain multicast session.

10 3.The method of claim 1, wherein the MBS multicast configurations for multiple MBS sessions share one common multicast MCCH.

4.The method of claim 3, wherein the MBS multicast configurations for different multicast sessions have different multicast MCCH transmission windows.

15 5.The method of claim 4, wherein the different multicast MCCH transmission windows have the same or different MCCH repetition period, MCCH modification period, MCCH window duration and radio frame/slot offset.

6.The method of claim 1, wherein the MBS multicast configuration for multiple MBS sessions are delivered in different multicast MCCHs.

7.The method of claim 1, wherein the multicast MCCH transmissions (and the associated radio resources and MCS) are indicated via the PDCCH addressed to G-RNTI.

20 8.The method of claim 1, wherein the multicast MCCH transmissions (and the associated radio resources and MCS) are indicated via the PDCCH addressed to multicast-MCCH-RNTI.

9.The method of claim 1, wherein the MBS multicast configuration contains the information needed for the MCCH reception with the same multicast session from neighboring cells.

25 10.The method of claim 9, further comprising UE updates the MBS multicast configuration of neighbor cell by the information of MBS multicast configuration from serving cell for mobility.

11.The method of claim 1, further comprising UE to perform certain behaviors if UE is notified by network.

12.The method of claim 11, further comprising UE continue to receive the multicast session and update the multicast MCCH if UE is notified by multicast configuration change.

30 13.The method of claim 11, further comprising UE to stop receiving multicast session if UE is notified for session deactivate.

14.The method of claim 11, further comprising UE to switch to RRC CONNECTED state to continue to receive multicast session if UE is notified for state transition.

15.The method of claim 11, wherein the notification is notifying to UE receiving the multicast

session via RRC signaling or MAC CE or DCI indication.

16.The method of claim 15, wherein the RRC signaling is the group common message.

17.The method of claim 15, wherein the DCI format reuse the current multicast DCI with additional notification field.

5 18.The method of claim 15, wherein the DCI format is a new DCI with new change notification RNTI.

19.The method of claim 18, wherein the new change notification RNTI is a multicast MCCH-N-RNTI to scrambling the corresponding PDCCH.

10 20.A method for network to indicate configuration for UE to receive multicast in RRC INACTIVE state, comprising the step of:

providing MBS multicast configuration information in multicast MCCH;

notifying UE when certain conditions are met.

21.The method of claim 20, wherein the certain conditions include configuration change, session deactivation and state transition information.

15 22.The method of claim 20, wherein the network only notifies UE for the information of the session in which the UE has joined in is changed.

23.The method of claim 20, wherein the MBS multicast configuration is shared to all UEs which are authorized to receive the certain multicast session in the cell.

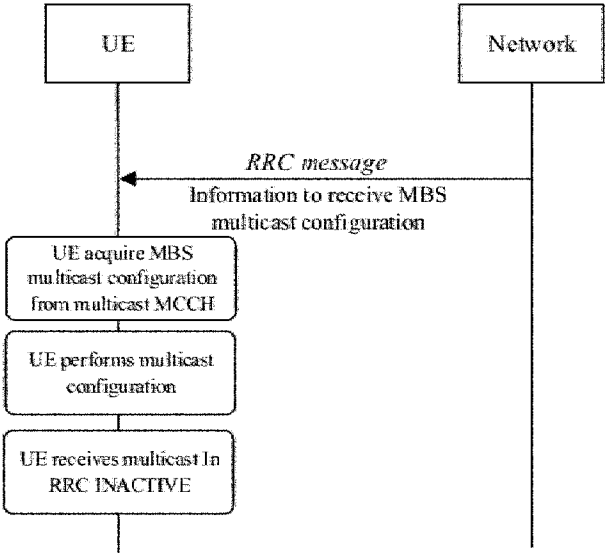


Fig 1

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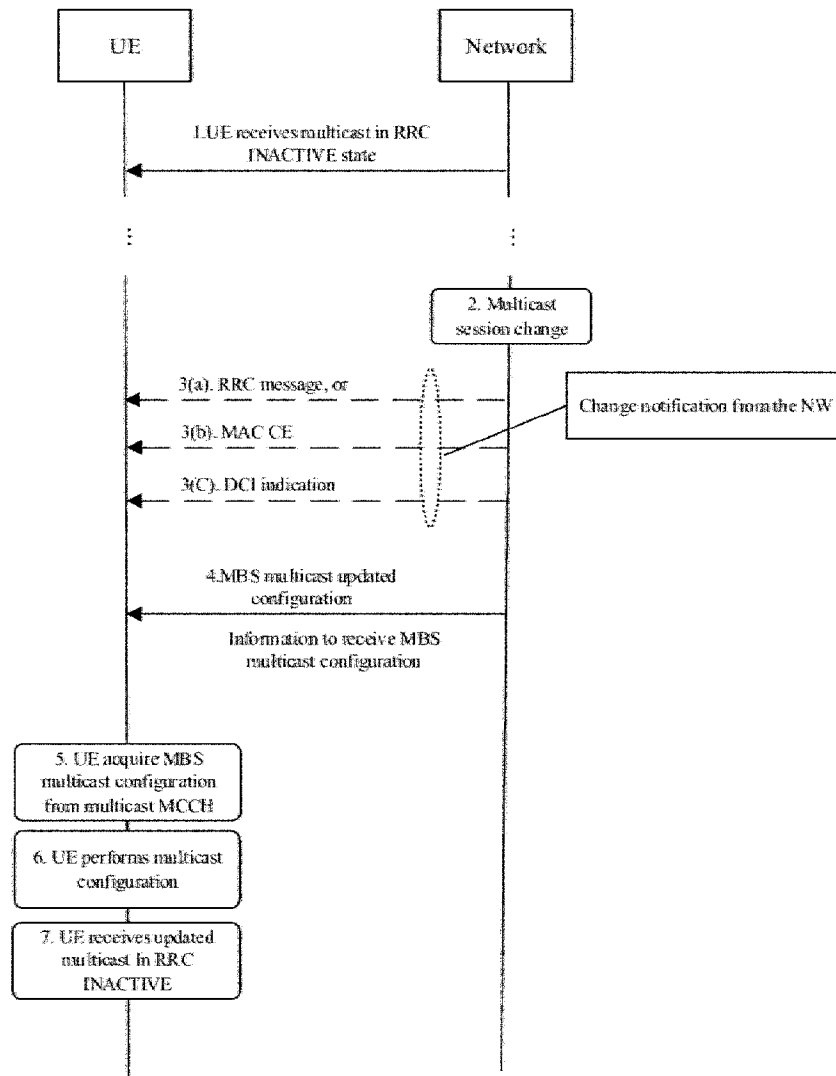


Fig 2

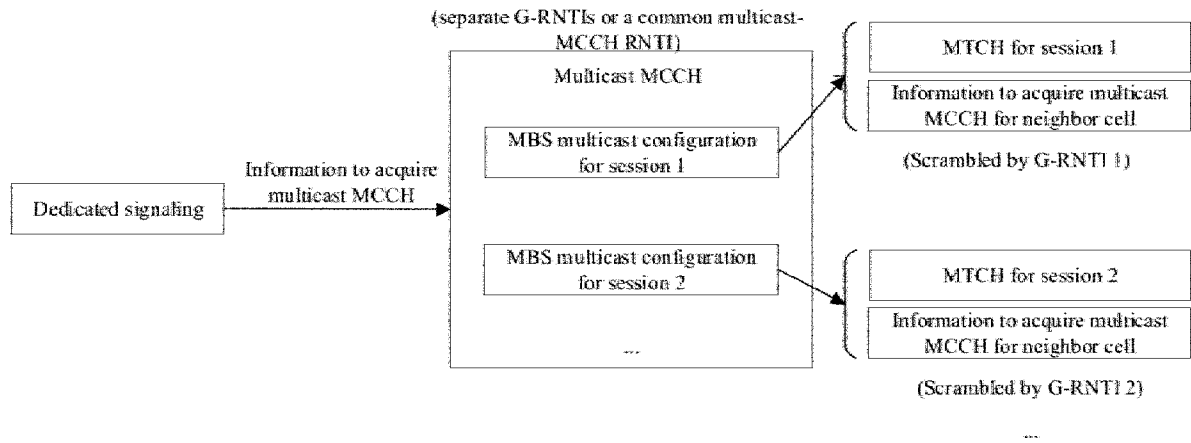


Fig 3

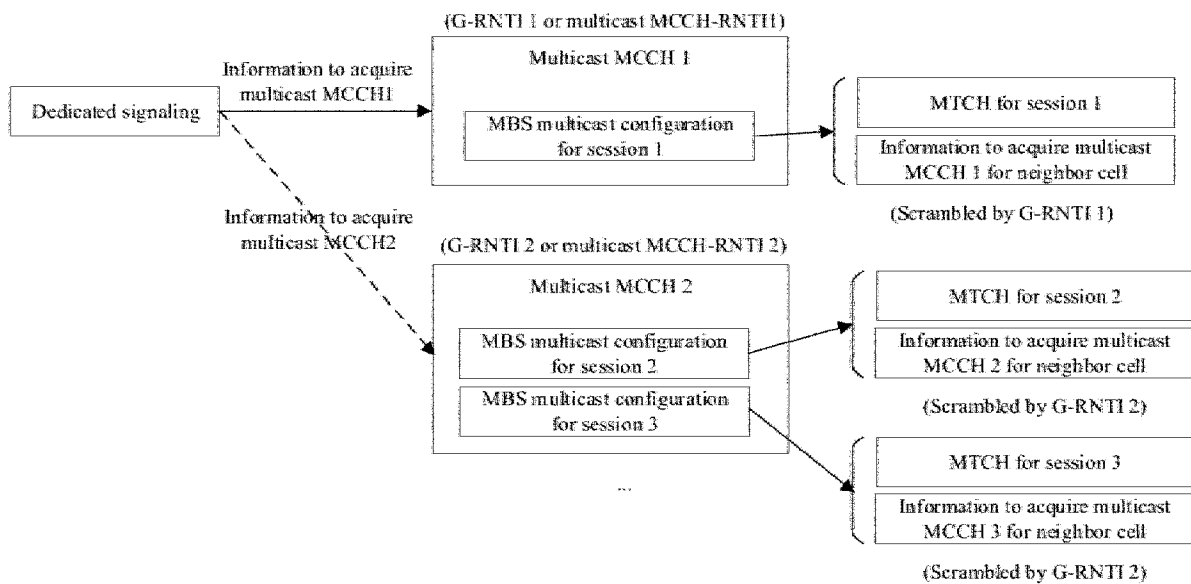


Fig 4

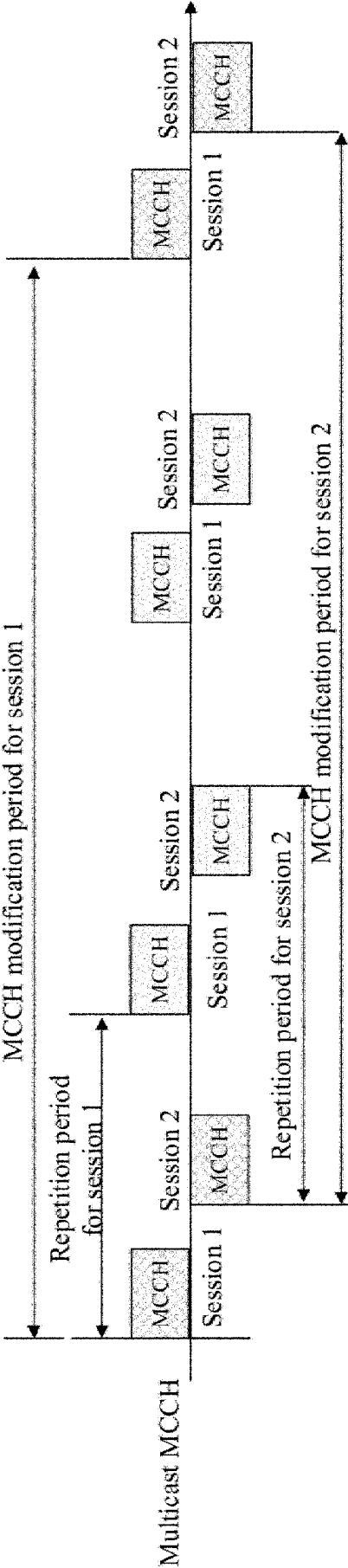


Fig 5

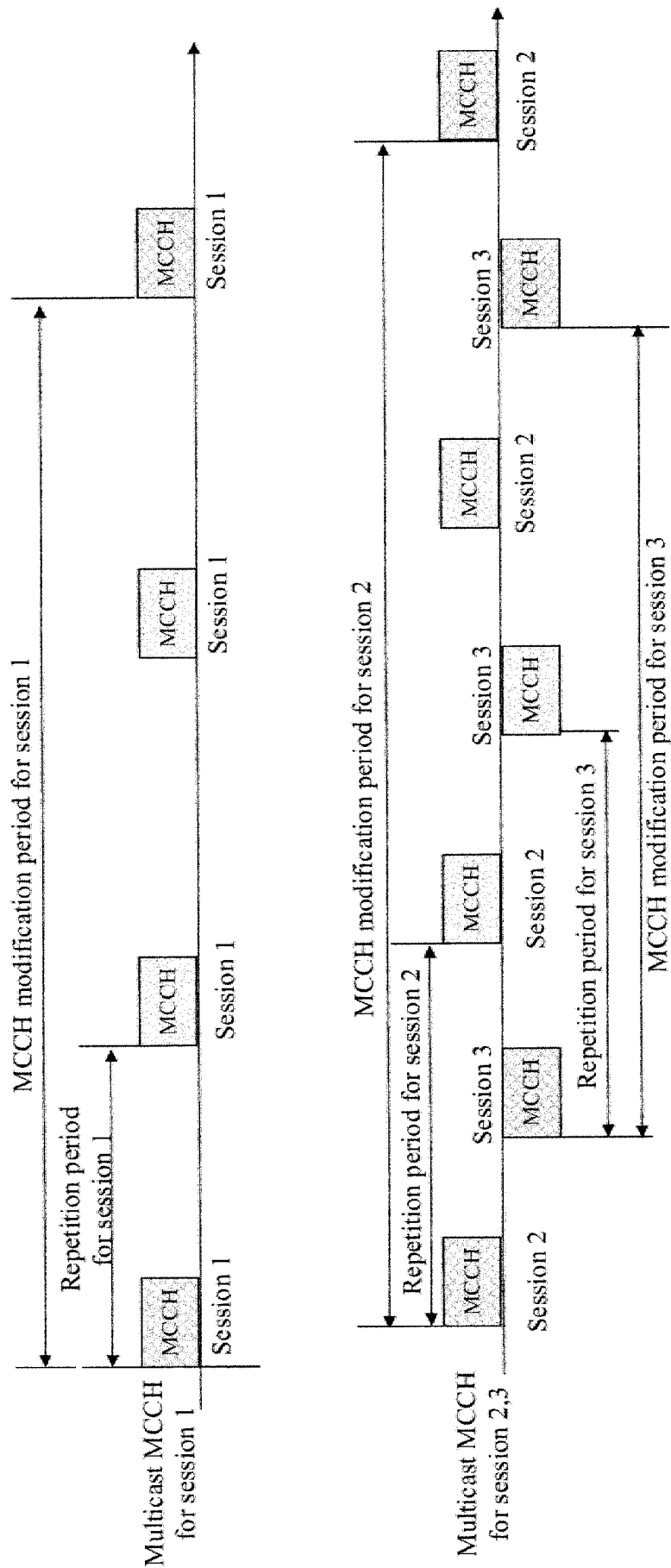


Fig 6

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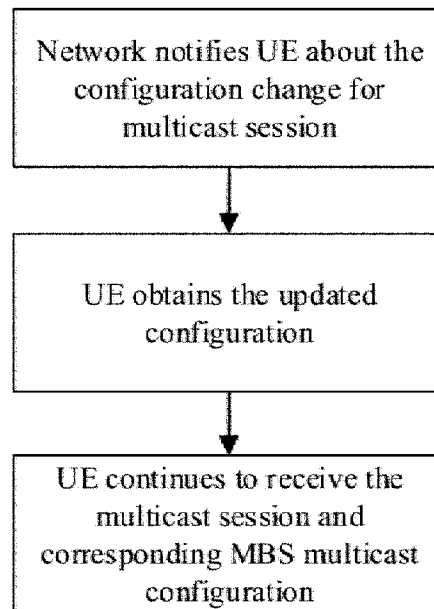


Fig 7

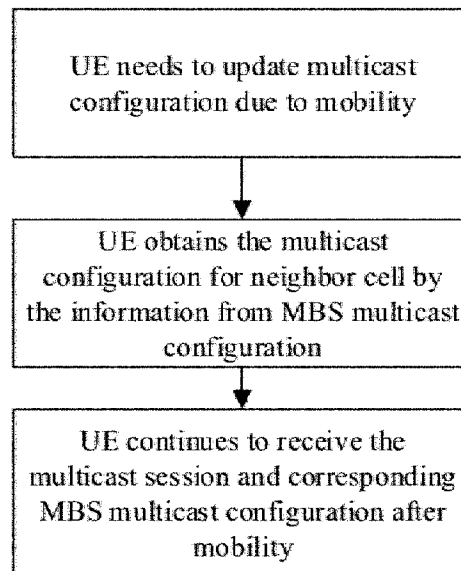


Fig 8

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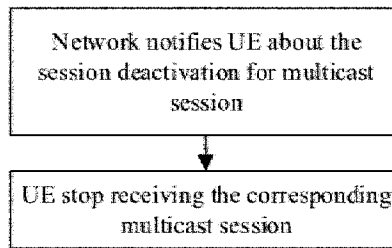


Fig 9

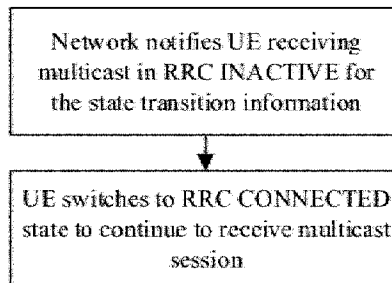


Fig 10

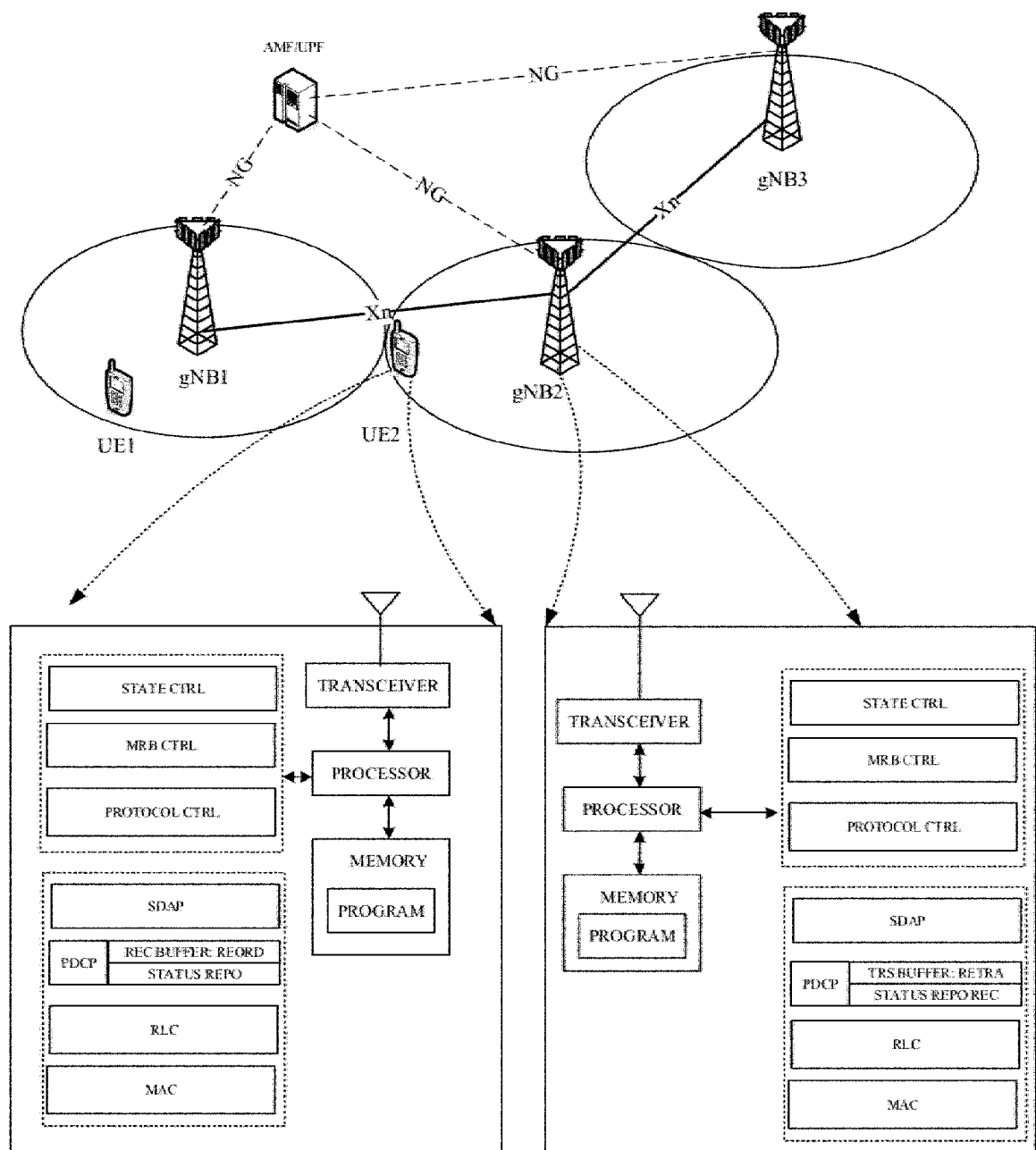


Fig 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/075021

A. CLASSIFICATION OF SUBJECT MATTER

H04W4/06(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)

CNTXT, ENTXT, ENTXTC, DWPI, VEN, 3GPP:RRC, inactive, idle, MBS, multicast, configuration, MCCH?, period, window, MCS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 4084377 A1 (SAMSUNG ELECTRONICS CO., LTD.) 02 November 2022 (2022-11-02) description, paragraphs 0049-0101	1-23
X	US 2021127448 A1 (QUALCOMM INCORPORATED) 29 April 2021 (2021-04-29) description, paragraphs 0045-0073	1-23
A	CN 111771422 A (NOKIA TECHNOLOGIES OY) 13 October 2020 (2020-10-13) the whole document	1-23
A	EP 4120792 A1 (SAMSUNG ELECTRONICS CO., LTD.) 18 January 2023 (2023-01-18) the whole document	1-23
A	EP 4124089 A1 (SAMSUNG ELECTRONICS CO., LTD.) 25 January 2023 (2023-01-25) the whole document	1-23



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

10 October 2023

Date of mailing of the international search report

13 October 2023

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2023/075021

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
EP	4084377	A1	02 November 2022	CN	115278550	A	01 November 2022
				KR	20220149447	A	08 November 2022
				US	2022360360	A1	10 November 2022
				TW	202249504	A	16 December 2022
US	2021127448	A1	29 April 2021	EP	4049504	A1	31 August 2022
				WO	2021081550	A1	29 April 2021
				CN	114586384	A	03 June 2022
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				KR	20210115470	A	27 September 2021
				CN	115280897	A	01 November 2022
EP	4124089	A1	25 January 2023	WO	2021194324	A1	30 September 2021
				KR	20210120723	A	07 October 2021
				CN	115362705	A	18 November 2022