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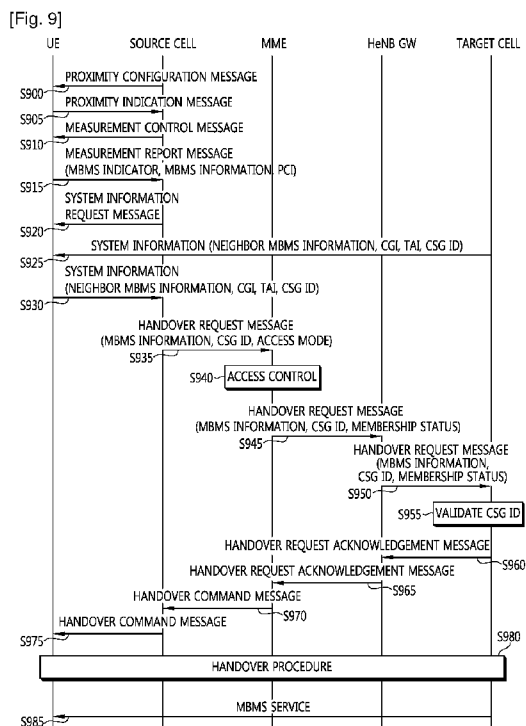
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- (54) **Title:** APPARATUS FOR PERFORMING HANDOVER IN MULTIMEDIA BROADCAST MULTICAST SERVICE AND METHOD THEREOF



- (57) **Abstract:** Method and apparatus for performing handover in Multimedia Broadcast Multicast Service (MBMS) is described. The present invention comprises transmitting a proximity indication message including MBMS indicator which indicates whether the UE is receiving MBMS or is interested in receiving MBMS, to a source Base Station (BS) linked to the UE; transmitting a measurement report message including MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS, to the source BS; performing handover from the source BS to a target BS; and receiving MBMS from the target BS based on the MBMS indicator and the MBMS assistance information.



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Description

Title of Invention: APPARATUS FOR PERFORMING HANDOVER IN MULTIMEDIA BROADCAST MULTICAST SERVICE AND METHOD THEREOF

Technical Field

- [1] The present invention relates to radio communication and, more particularly, to an apparatus for performing handover providing continuity in a multimedia broadcast multicast service (MBMS) and a method thereof.

Background Art

- [2] Cellular is a concept suggested to overcome limitations on a service area and capacity to accommodate frequencies and subscribers. The cellular is a method of providing a single high output base station into a plurality of low output base stations to provide a service area. That is, a mobile communication service area is divided into a number of small cells. Different frequencies are allocated to neighbor cells and the same frequency band is used for two cells that are sufficiently remote from each other so that interference is not generated. Therefore, frequencies may be spatially re-used
- [3] Handover or handoff is a function in which, when a user equipment (UE) deviates from a current communication service area (hereinafter, a source cell) and moves to an adjacent communication service area (hereinafter, a target cell), the UE is automatically tuned to a new traffic channel of the adjacent communication service area to continuously maintain a call status. That is, the UE that communicates with a specific base station (hereinafter, a source base station) is linked to another adjacent base station (hereinafter, a target base station) when the strength of a signal in the specific base station that is serving becomes small. When handover is performed, it is possible to prevent call drop from being generated when the UE moves to a neighbor cell.
- [4] In a multimedia broadcast multicast service (MBMS), like in a conventional cell broadcast service (CBS), the same data packet is simultaneously transmitted to a plurality of users. The CBS is based on a low speed message. However, the MBMS is for transmitting high speed multimedia data. In addition, the CBS is not based on internet protocol (IP), however, the MBMS is based on IP multicast. In the MBMS, when a uniform level of users exist in the same cell and the multimedia data is transmitted to the users, necessary resource (or channel) is shared so that the plurality of users receive the same multimedia data to improve efficiency of radio resource and for the users to cheaply use a multimedia service.
- [5] In the MBMS, a common channel is used so that a plurality of UEs may efficiently receive data on one service. Exclusive channels as many as the number of UEs that

desire to receive the service are not allocated to one cell but only one common channel is allocated to the cell. The plurality of UEs simultaneously receive the common channel to improve efficiency of the radio resource.

- [6] In the case where the target cell of handover is a closed subscriber group (CSG) cell, when the CSG cell does not consider the MBMS, it is not possible to know whether the UE receives the MBMS or is interested in receiving the MBMS and to smoothly support the MBMS. Therefore, a method of transmitting MBMS information of the UE to and receiving the MBMS assistance information of the UE from a network to support continuity of the MBMS is required.

Disclosure of Invention

Technical Problem

- [7] An aspect of the present invention provides an apparatus for performing handover providing service continuity in a multimedia broadcast multicast service (MBMS) and a method thereof.
- [8] Another aspect of the present invention provides an apparatus for providing MBMS assistance information providing continuity of the MBMS when handover is performed to a closed subscriber group (CSG) cell and a method thereof.
- [9] Still another aspect of the present invention provides an apparatus for a UE receiving the MBMS from a source cell for as long as possible when handover is performed to the CSG cell and a method thereof.

Solution to Problem

- [10] According to an aspect of the present invention, a method of performing handover by a User Equipment (UE) receiving Multimedia Broadcast Multicast Service (MBMS) comprises transmitting a proximity indication message including MBMS indicator which indicates whether the UE is receiving MBMS or is interested in receiving MBMS, to a source Base Station (BS) linked to the UE; transmitting a measurement report message including MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS, to the source BS; performing handover from the source BS to a target BS; and receiving MBMS from the target BS based on the MBMS indicator and the MBMS assistance information.
- [11] According to another aspect of the present invention, a method of performing handover by a source Base Station (BS) transmitting Multimedia Broadcast Multicast Service (MBMS) comprises receiving a proximity indication message including MBMS indicator which indicates whether a User Equipment (UE) is receiving MBMS or is interested in receiving MBMS, from the UE; receiving a measurement report message including MBMS assistance information which includes a type of MBMS

which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS, from the UE; transmitting a handover request message including the MBMS indicator and the MBMS assistance information, to a target BS; and performing handover to the target BS when receiving an acknowledgement of the handover request message.

- [12] According to another aspect of the present invention, a method of performing handover by a target Base Station (BS) transmitting Multimedia Broadcast Multicast Service (MBMS) comprises receiving a handover request message including a CSG ID which identifies the CSG of the target BS, a MBMS indicator which indicates whether a UE is receiving MBMS or is interested in receiving MBMS, or MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS; validating whether the target BS is a member of the CSG by comparing the CSG ID of the target BS and the CSG ID included in the handover request message; allocating resource and performing handover when the target BS is confirmed as a member of the CSG; and transmitting MBMS based on the MBMS indicator and the MBMS assistance information, to the UE.

- [13] According to another aspect of the present invention, a User Equipment (UE) performing handover receiving Multimedia Broadcast Multicast Service (MBMS) comprises a transmitting unit transmitting a proximity indication message including MBMS indicator which indicates whether the UE is receiving MBMS or is interested in receiving MBMS to a source Base Station (BS) linked to the UE, and transmitting a measurement report message including MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS to the source BS; and a receiving unit receiving MBMS from the target BS based on the MBMS indicator and the MBMS assistance information.

Advantageous Effects of Invention

- [14] When a user equipment (UE) desires to perform handover in a state of receiving a multimedia broadcast multicast service (MBMS), the MBMS may be continuously received.
- [15] Related information may be obtained so that the UE may receive the MBMS from a cell to be changed before changing a cell.
- [16] The MBMS may be received from a source cell as long as possible before performing handover to a target cell.

Brief Description of Drawings

- [17] FIG. 1 is a block diagram illustrating a radio communication system.

- [18] FIG. 2 is a block diagram illustrating radio protocol architecture for the user plane and a radio protocol architecture for the control plane.
- [19] FIG. 3 illustrates architecture of an LTE MBMS system according to the present invention.
- [20] FIG. 4 illustrates an example in which the architecture of the LTE MBMS system according to the present invention is deployed.
- [21] FIG. 5 illustrates mapping between a downlink logic channel and a downlink transport channel.
- [22] FIG. 6 illustrates mapping between a downlink transport channel and a downlink physical channel.
- [23] FIG. 7 illustrates an example of a scenario of cell based localization according to the present invention.
- [24] FIG. 8 illustrates an example of a method of the UE performing handover from the source cell to the target cell according to the present invention.
- [25] FIG. 9 illustrates another example of a method of the UE performing handover from the source cell to the target cell according to the present invention.
- [26] FIG. 10 illustrates another example of the method of the UE performing handover from the source cell to the target cell according to the present invention.
- [27] FIG. 11 is a flowchart illustrating the operation of the UE performing handover from the macro cell to the CSG cell according to the present invention.
- [28] FIG. 12 is a flowchart illustrating the operation of the source cell performing handover from the macro cell to the CSG cell according to the present invention.
- [29] FIG. 13 is a flowchart illustrating the operation of the target cell (the CSG cell) performing handover from the macro cell to the CSG cell.
- [30] FIG. 14 is a block diagram illustrating a UE, a source BS, and a target BS for performing a handover method providing continuity of the MBMS according to an example of the present invention.

Mode for the Invention

- [31] Hereinafter, in the specification, some embodiments are described in detail through exemplary drawings. In denoting the elements of the drawings by reference numerals, the same elements are denoted by the same reference numerals although the elements are displayed in different drawings. In addition, in describing the embodiments of the specification, when it is determined that detailed description of a related published structure or function may blur the subject matter of the specification, detailed description thereof will be omitted.
- [32] In addition, in the specification, a radio communication network is described and a work may be performed by the radio communication network in a process of a system

(for example, a base station) in charge of the corresponding radio communication network controlling the network and transmitting data or may be performed by a UE combined with the corresponding radio network.

[33] FIG. 1 is a block diagram illustrating a radio communication system. The radio communication system may be a network architecture of an evolved universal mobile telecommunications system (E-UMTS). The E-UMTS system may be referred to as a long term evolution (LTE) or LTE-advanced (LTE-A) system. The radio communication system is widely deployed to provide various communication systems such as voice and packet data.

[34] On the other hand, there are no limitations on a multiple access method applied to the radio communication system. Various multiple access methods such as a code division multiple access (CDMA) method, a time division multiple access (TDMA) method, a frequency division multiple access (FDMA) method, an orthogonal frequency division multiple access (OFDMA) method, a single carrier (SC)-FDMA method, an OFDM-FDMA method, an OFDM-TDMA method, and an OFDM-CDMA method may be used.

[35] Here, in uplink transmission and downlink transmission, a time division duplex (TDD) method in which transmission is performed using different times may be used or a frequency division duplex (FDD) method in which transmission is performed using different frequencies may be used.

[36] Referring to FIG. 1, an evolved-UMTS terrestrial radio access network (E-UTRAN) includes at least one base station (BS) 20 providing a control plane (CP) and a user plane (UP) to the UE. A UE 10 may be fixed or movable and may be referred to as a mobile station (MS), an advanced MS (AMS), a user terminal (UT), a subscriber station (SS), and a wireless device.

[37] The BS 20 commonly refers to a fixed station that communicates with the UE 10 and may be referred to as an evolved-NodeB (eNB), a base transceiver system (BTS), an access point, a femto-eNB, a pico-eNB, a home eNB, and a relay. The BS 20 may provide at least one cell to the UE. The cell may mean a geographical region that provides a communication service and a specific frequency band. The cell may mean downlink frequency resource and uplink frequency resource. The cell may mean a combination of the downlink frequency resource and optional uplink frequency resource. In addition, in general, when carrier aggregation (CA) is not considered, in one cell, the uplink frequency resource and the downlink frequency resource always make a pair.

[38] An interface for transmitting user traffic or control traffic may be used between the BSs 20. In a source BS 21, a radio bearer (RB) is configured with the current UE 10. In a target BS 22, the UE 10 desires to perform handover in order to cut off the RB with

the source BS 21 and to newly configure an RB.

- [39] The BSs 20 may be connected to each other through an X2 interface. The X2 interface is used for transmitting and receiving a message between the BSs 20. The BSs 20 are connected to an evolved packet system (EPS), more particularly, a mobility management entity (MME)/serving gateway (S-GW) 30 through an S1 interface. The S1 interface supports a many-to-many relation between the BS 20 and the MME/S-GW 30. A packet data network (PDN)-GW 40 is used for providing a packet data service to the MME/S-GW 30. The PDN-GW 40 varies with the object or service of communication. The PDN-GW 40 that supports a specific service may be searched using access point name (APN) information.
- [40] Inter E-UTRAN handover as a basic handover mechanism used for handover between E-UTRAN networks includes X2 based handover and S1 based handover. The X2 based handover is used when the UE performs handover from the source S 21 to the target BS 22 using the X2 interface. At this time, the MME/S-GW 30 is not changed.
- [41] A first bearer configured among the PDN-GW 40, the MME/S-GW 30, the source BS 21, and the UE 10 is released by the S1 based handover and a new second bearer is configured among the PDN-GW 40, the MME/S-GW 30, the target BS 22, and the UE 10.
- [42] Hereinafter, the downlink means communication from the BS 20 to the UE 10 and the uplink means communication from the UE 10 to the BS 20. The downlink may be referred to as a forward link and the uplink may be referred to as a reverse link. In the downlink, a transmitter may be a part of the BS 20 and a receiver may be a part of the UE 10. In the uplink, the transmitter may be a part of the UE 10 and the receiver may be a part of the BS 20.
- [43] FIG. 2 is a block diagram illustrating radio protocol architecture for the user plane and a radio protocol architecture for the control plane. The data plane is a protocol stack for transmitting user data and the control plane is a protocol stack for transmitting a control signal.
- [44] Referring to FIG. 2, a physical (PHY) layer provides an information transfer service to an upper layer using a physical channel. The PHY layer is connected to a medium access control (MAC) layer that is an upper layer through a transport channel. Data moves between the MAC layer and the PHY layer through the transport channel. The transport channel is distinguished in accordance with how and with which characteristic data is transmitted through a radio interface. Data moves between different PHY layers, that is, between the PHY layers of the transmitter and the receiver through the physical channel. A number of physical control channels exist.
- [45] A physical downlink control channel (PDCCH) informs the UE of resource allotment

of a paging channel (PCH) and a downlink shared channel (DL-SCH) and hybrid automatic repeat request (HARQ) information on the DL-SCH. The PDCCH may transport uplink scheduling grant that informs the UE of the resource allotment of the uplink transmission. A physical control format indicator channel (PCFICH) informs the UE of the number of OFDM symbols used for the PDCCH and is transmitted every sub-frame. A physical hybrid ARQ indicator channel transports a HARQ ACK/NAK signal in response to the uplink transmission. A physical uplink control channel (PUCCH) transports uplink control information such as HARQ ACK/NAK, a scheduling request, and a channel quality indicator (CQI) for the uplink transmission. A physical uplink shared channel (PUSCH) transports an uplink shared channel (UL-SCH).

- [46] Functions of the MAC layer include mapping between a logic channel and a transport channel and multiplexing/demultiplexing of a MAC service data unit (SDU) that belongs to the logic channel to the transport channel and to a transport block provided to the physical channel. The MAC layer provides a service to a radio link control (RLC) layer through the logic channel. The logic channel may be divided into a control channel for transmitting control region information and a traffic channel for transmitting user region information.
- [47] Functions of the RLC layer include concatenation, segmentation, and reassembly of an RLC SDU. In order to guarantee various qualities of services (QoS) required by the RB, the RLC layer provides three operation modes of a transparent mode (TM), an unacknowledged mode (UM), and an acknowledged mode (AM). AM RLC provides error correction through an automatic repeat request (ARQ).
- [48] Functions of a packet data convergence protocol (PDCP) layer on the user plane include transmission of user data, header compression, and ciphering. Functions of the PDCP layer on the user plane include transmission of control plane data and ciphering/integrity protection.
- [49] A radio resource control (RRC) layer is in charge of control of the logic channel, the transport channel, and the physical channels for configuring, re-configuring, and releasing RBs. The RB means a logic path provided by a first layer (the PHY layer) and second layers (the MAC layer, the RLC layer, and the PDCP layer) for data transmission between the UE and the network. Configuring the RB means regulating the characteristics of a radio protocol layer and a radio protocol channel and configuring the detailed parameters and operation methods of the radio protocol layer and the radio protocol channel. The RB may be divided into a signaling RB (SRB), a data RB (DRB), and an MBMS PTM RB (MRB). The SRB is used as a path for transmitting an RRC message. The DRB is used as a path for transmitting user data on the user plane. The MRB is used as a path for transmitting MBMS data.

- [50] A non-access stratum (NAS) layer that is an upper layer of the RRC layer performs functions of session management and mobility management.
- [51] FIG. 3 illustrates architecture of an LTE MBMS system according to the present invention. An E-UTRAN MBMS is applied to the architecture.
- [52] Referring to FIG. 3, an MBMS GW as an entity to which MBMS data is transmitted is positioned between the BS and a broadcast multicast-service center (BM-SC) and transmits an MBMS packet to the BS or broadcasts the MBMS packet. The BM-CS as a network apparatus capable of starting and managing an MBMS may manage the MBMS.
- [53] A multi-cell/multicast coordination entity (MCE) as an MBMS control entity, that is, a main entity for controlling the MBMS performs radio resource allocation or admission control in a multimedia broadcast/multicast service single frequency network (MBSFN) region. The MCE may be simultaneously realized in the BS or may be independently realized.
- [54] M1 is a user plane interface. The MBMS data is transmitted to the interface between the MBMS GW and the BS. M2 is an E-UTRAN internal control plane interface. MBMS control information is transmitted to the interface between the MCE and the BS. For example, the MCE may be realized in the BS. At this time, the M2 interface may only logically exist. M3 is a control plane interface between the E-UTRAN and an evolved packet core (EPC). MBMS session control information is transmitted to the interface between the MCE and the MME. A Sm interface as an interface between an MBMS control plane (CP) and the MME transmits control information for controlling the MBMS. In the above, the MME as a node for controlling the BS and the UE in the EUTRAN may be defined by 3GPP TS36.300.
- [55] FIG. 4 illustrates an example in which the architecture of the LTE MBMS system according to the present invention is deployed. The MME, the MBMS GW, and the MCE may be used for transmitting the MBMS packet and LTE MBMS control information.
- [56] Referring to FIG. 4, the MCE may be used for session management and resource control of the BS. The MCE may be separated from the BS as illustrated in (a) or may exist in the BS as illustrated in (b). At this time, the MCE may be a block of a logic function in the BS. A session start/stop message is transmitted to the BS through the MME and the MCE for session control signaling such as session start or session stop. The BS that receives the session start/stop message may inform a cell that a corresponding MBMS starts or stops.
- [57] FIG. 5 illustrates mapping between a downlink logic channel and a downlink transport channel.
- [58] Referring to FIG. 5, a paging control channel (PCCH) is mapped to a paging channel

(PCH) and a broadcast control channel (BCCH) is mapped to a broadcast channel (BCH) or a downlink shared channel (DL-SCH). A common control channel (CCCH), a dedicated control channel (DCCH), a dedicated traffic channel (DTCH), a multicast control channel (MCCH), and a multicast traffic channel (MTCH) are mapped to the DL-SCH. The MCCH and the MTCH are mapped to a multicast channel (MCH).

- [59] Logic channel types are defined in accordance with which kind of information is transmitted. There are two types of logic channels of a control channel and a traffic channel.
- [60] The control channel is used for transmitting control plane information. The BCCH is a downlink channel for broadcasting system control information. The PCCH as a downlink channel for transmitting paging information is used when a network does not know the location of the UE. The CCCH as a channel for transmitting control information between the UE and the network is used when there is no RRC connection between the UE and the network. The MCCH as a point-to-multipoint downlink channel used for transmitting MBMS control information is used for UEs that receive the MBMS. The DCCH as a point-to-point unidirectional channel for transmitting exclusive control information between the UE and the network is used by the UE having the RRC connection.
- [61] The traffic channel is used for transmitting user plane information. The DTCH as a point-to-point channel for transmitting user information exists in both the uplink and the downlink. The MTCH as a point-to-multipoint downlink channel for transmitting traffic data is used for the UE that receives the MBMS.
- [62] The transport channel is distinguished in accordance with how and with which characteristic data is transmitted through the radio interface. The BCH has a pre-defined transport format that is broadcasted and fixed in an entire cell region. The DL-SCH is characterized by a support of a hybrid automatic repeat request (HARQ), a support of dynamic link adaptation by a change in modulation, coding, and transmission power, a support of possibility of broadcast, possibility of beamforming, and dynamic/semi-static resource allotment, a discontinuous reception (DRX) support for saving UE power, and an MBMS transmission support. The PCH is characterized by the DRX support for saving the UE power and broadcast to an entire cell region. The MCH is characterized by the broadcast to the entire cell region and an MBSFN support.
- [63] FIG. 6 illustrates mapping between a downlink transport channel and a downlink physical channel.
- [64] Referring to FIG. 6, the BCH is mapped to a physical broadcast channel (PBCH), the MCH is mapped to a physical multicast channel (PMCH), and the PCH and the DL-SCH is mapped to a physical downlink shared channel (PDSCH). The PBCH transports a BCH transport block. The PMCH transports the MCH. The PDSCH

transports the DL-SCH and the PCH.

- [65] The MBMS uses two logic channels, that is, the MCCH as the control channel and the MTCH as the traffic channel. User data such as voice or video is transmitted to the MTCH. Configuration information for receiving the MTCH is transmitted to the MCCH. The MTCH and the MCCH as point-to-multipoint downlink channels for a plurality of UEs may be common channels. Radio resource is not allocated by the number of UEs that receive the MBMSs but only radio resource for the common channels is allocated and the plurality of UEs simultaneously receive the common channels to improve efficiency of the radio resource.
- [66] When the UE changes a cell due to movement while receiving the MBMS, the UE may not continuously receive the MBMS. When the UE performs a decoding operation in order to continuously receive the MBMS in such a state, a battery may be used. An apparatus for the UE that uses the MBMS continuously receiving the MBMS without wasting resource during handover and a method thereof are required.
- [67] In a source cell, the current UE receives a service. The BS that provides the source cell is referred to as the source BS. A neighbor cell is geographically adjacent to the source cell or is adjacent to the source cell in a frequency band. The neighbor cell that uses the same carrier frequency based on the source cell is referred to as an intra-frequency neighbor cell. In addition, the neighbor cell that uses a different carrier frequency based on the source cell is referred to as an inter-frequency neighbor cell. That is, cells that use different frequencies from the frequency of the source cell as well as the same frequency as the frequency of the source cell and that are adjacent to the source cell may be referred to as neighbor cells.
- [68] The UE performing handover from the source cell to the intra-frequency neighbor cell is referred to as intra-frequency handover. On the other hand, the UE performing handover from the source cell to the inter-frequency neighbor cell is referred to as inter-frequency handover. During handover, a neighbor cell to which the UE moves is referred to as a target cell. The BS that provides the target cell is referred to as the target BS.
- [69] The source cell and the target cell may be provided by one BS or by different BSs. Hereinafter, for convenience sake, it is assumed that the source cell and the target cell are provided by different BSs, that is, the source BS and the target BS. Therefore, the source BS, the source cell, the target BS, and the target cell may be mixedly used.
- [70] FIG. 7 illustrates an example of a scenario of cell based localization according to the present invention.
- [71] Referring to FIG. 7, the MBMS may be cell based or location based. An MBMS area refers to an area to which a specific MBMS is provided. For example, when an area in which a specific MBMS A is performed is referred to as a service area A, a network

may be receiving the MBMS A in the MBMS area A. At this time, the UE may receive the MBMS A in accordance with the capability of the UE. The MBMS area may be defined in view of an application and a service with respect to whether a specific service is provided in a uniform area or not.

[72] In addition, the MBMS area may mean an area in which the MBMS is supported. A number of MBMSs may be supported in one MBMS area. For example, MBMSs a, b, and c may be supported in the MBMS area A and may be supported in MBSFN areas. That is, the MBMS a, b, and c may be provided in the MBSFN areas 1, 2, and 3.

[73] Here, the MBSFN area means an area in which a specific MBS is provided in a single frequency band. For example, in the case of the MBSFN area 1, an MBSFN sub-frame is allocated to a frequency f1 to support the specific MBMS A. At this time, the MBSFN sub-frame is allocated to the same frequency f1 to support the MBMS A in the MBSFN area.

[74] For example, the MBMS A may be supported in the MBSFN area 2 using the different frequency f2 from the frequency f1 in the MBSFN area 1. The MBMS may be received in the same MBSFN area based on the same MBMS configuration when the UE moves. That is, the UE may continuously receive the MBMS received by a previous cell in the same MBSFN area without receiving a new MBMS architecture.

[75] When an area is changed, a service may be provided in the same MBSFN area using different frequencies, which may be determined based on an MBMS location range. The MBMS location range is a concept used for performing management so that the MBMS may be received in the same MBSFN area only in a specific area or location range through an MBMS point to multipoint radio bearer or an MBMS radio bearer (MRB) meanwhile the MBMS may be received in all of the cells in the MBSFN area through the MRB in a conventional art.

[76] At this time, the MBMS location range may be managed in units of cells as illustrated in FIG. 7. Meanwhile cells D, F, and G are MBMS location ranges, other cells A, B, C, and E exist in the same MBSFN area, however, are not included in the MBMS location range.

[77] In addition, the MBMS location range may be managed by a geography-based localization method, for example, a positioning method.

[78] A method of providing continuity of the MBMS when handover is performing according to the present invention and an apparatus therefor will be described.

[79] FIG. 8 illustrates an example of a method of the UE performing handover from the source cell to the target cell according to the present invention. At this time, the source cell may be a macro cell and the target cell may be a CSG cell. That is, handover is performed from the macro cell to the CSG cell in a connected mode. At this time, the connected mode may be an RRC connected mode. In addition, inbound mobility in

consideration of MBMS continuity is described. At this time, the inbound mobility means that the UE moves from the macro cell to the CSG cell.

- [80] Hereinafter, the CSG cell refers to a femto cell that provides connection only to the UE that subscribes to the corresponding CSG cell and that is authorized to be used among the UEs to provide a service. A hybrid CSG cell allows access to all of the UE that subscribes to the CSG cell and the UEs that do not subscribe to the CSG cell to provide a service unlike a common CSG cell. However, a high quality service is preferentially provided to the UE that subscribes to the CSG cell and a minimum service is provided to the UEs that do not subscribe to the CSG cell. An open CSG cell means a CSG cell that allows access to all of the UEs regardless of whether the UEs subscribe to the CSG cell. That is, UE may connect to and receive service from the open CSG cell regardless of whether the UE join as a member of the open CSG cell.
- [81] Referring to FIG. 8, the source cell transmits a proximity configuration message to the UE at step S800. The proximity configuration message includes information on whether the UE may perform a proximity indication operation in a specific radio access technology (RAT). For example, when the E-UTRAN of the LTE system or the UTRAN of a wideband code division multiple access (WCDMA) system detects a CSG cell included in a white list of the UE, it is determined whether the state of the parameter "proximityIndicationEUTRA" or "proximityIndicationUTRA" included in the proximity configuration message is "enable" or "disable" to perform the proximity indication operation. That is, the proximity indication operation is performed when one of the parameters is determined as "enable" and is not performed when one of the parameters is not determined as "enable" or is determined as "disable". In addition, the proximity configuration message may be included in the RRC message such as an RRC connection reconfiguration message to be transmitted or may be transmitted together with the RRC message.
- [82] The UE transmits the proximity indication message to the source cell at step S805. The proximity indication message informs the source cell that the UE approaches the CSG cell having a specific frequency and a specific physical cell ID (PCI).
- [83] In general, the handover of the UE is controlled by the macro cell. However, in the case of handover between the macro cell and the CSG cell, it is difficult for the macro cell to perform coordination between the macro cell and the CSG cell. When the frequency of the macro cell is different from the frequency of the CSG cell, measurement configuration for the CSG cell may not be previously performed. Therefore, the UE transmits information on CSG cell to be measured to the source cell through the proximity indication message. The proximity indication message may include frequency information and PCI information. In addition, the proximity indication message may be the RRC message.

- [84] In addition, a method of selecting the CSG cell may follow autonomous search procedures. The autonomous search procedures may be determined by history or fingerprint information on the CSG cell previously visited by the UE.
- [85] According to the present invention, the UE may transmit the proximity indication message including an MBMS indicator (MBMSInd) to the source cell. The MBMS indicator as the MBMS information of the UE, for example, may inform that the UE is receiving the MBMS through an MBMS bearer or is interested in receiving the MBMS. For example, the type of the MBMS indicator is a flag and the MBMS indicator may indicate 0 or 1. When the MBMS indicator is 1, the UE is receiving the MBMS or is interested in receiving the MBMS. When the MBMS indicator is 1, the UE is not receiving the MBMS and is not interested in receiving the MBMS. The reverse is possible. Here, although at least one MBMS is received among a plurality of MBMS, the MBMS indicator may be configured as 1.
- [86] The source cell that receives the MBMS indicator may know whether the UE prefers the MBMS.
- [87] The source cell transmits a measurement control message to the UE at step S810. The measurement control message includes configuration information on an object to be measured by the UE. In the state where the UE detects the CSG cell through the proximity indication message, the source cell requires measurement information on the CSG cell in order to perform handover to the CSG cell. The UE may measure the CSG cell in accordance with configuration of the measurement control information.
- [88] According to the present invention, the measurement control message transmitted by the source cell to the UE may include an MBMS frequency indicator (MBMSFreqInd). The MBMS frequency indicator indicates the MBMS frequency configured by the source cell when a frequency that serves the MBMS is not configured. That is, the UE may not perform a process of measuring a frequency band in which the MBMS may be received although an MBMS desired to be received exists. For example, the UE desires to receive the MBMS A, however, may support only an MBMS B in the currently accessed cell. At this time, the MBMS A may be provided by a different frequency from the frequency of the cell accessed by the UE. The UE may not know the state in which the MBMS is provided in the different frequency and the BS may inform the UE of the state using the MBMS frequency indicator.
- [89] In addition, when measurement for a frequency (or an RAT) in which the UE is interested is not configured, the source cell may configure the measurement for the frequency (or the RAT) in which the UE is interested to indicate the UE to perform the configured measurement. The source cell may transmit the measurement configuration information included in the RRC connection reconfiguration message.
- [90] The UE performs measurement based on the measurement configuration information

included in the measurement control message received from the source cell. At this time, the UE may also configure the MBMS assistance information included in the measurement configuration information. The UE may also monitor the MBMS frequency through the MBMS frequency indicator.

[91] On the other hand, the source cell that receives MBMS indicator information included in the proximity indication message knows that the UE is receiving the MBMS (or is interested in receiving the MBMS). At this time, the UE may receive the MBMS through the source cell as long as possible.

[92] In an example of the present invention, the source cell may further delay timing at which the measurement control message is transmitted to the UE.

[93] In another example of the present invention, the measurement configuration information including a delay offset value may be predetermined so that an event A3 is triggered late when the UE performs measurement. At this time, the event A3 is triggered when the measurement value of the target cell is larger than the measurement value of the source cell by a specific threshold value. At this time, the UE transmits a measurement result to the source cell to report the measurement result.

[94] Measurement report timing of the event A3 may be determined using the following Equation.

[95] [Equation 1]

$$[96] \quad f = (M_n + O_{fn} + O_{cn} - Hys) - (M_p + O_{fp} + O_{cp} + Off)$$

[97] In the above Equation, M_n as the measurement value of the neighbor cell measured by the UE may be a reference signal receive power (RSRP) value. O_{fn} is an offset value specifically allocated to the frequency corresponding to the neighbor cell. O_{cn} is an offset value specifically allocated to the cell corresponding to the neighbor cell. Hys is a threshold value added so that the UE does not frequently make a selection between the neighbor cell and a primary serving cell.

[98] In addition, M_p is the measurement value of the primary serving cell measured by the UE and may be the RSRP value. O_{fp} is an offset value specifically allocated to the frequency corresponding to the primary serving cell. O_{cp} is an offset value specifically allocated to the cell corresponding to the primary serving cell. Off is a value imposed on an E-UTRAN system.

[99] In the Equation 1, the event A3 is triggered based on the event at which "f" is larger than 0. At this time, the measurement report of the UE is performed.

[100] According to the present invention, a delay offset value " Off_m " for delaying timing at which the event A3 is triggered so that the UE may receive the MBMS through the source cell as long as possible may be added, which is illustrated in the following Equation.

[101] [Equation 2]

$$[102] \quad f_2 = (M_n + O_{fn} + O_{cn} - Hys) - (M_p + O_{fp} + O_{cp} + Off + Off_m)$$

[103] When the event A3 is triggered based on the event where " f_2 " is larger than 0, the timing at which the event A3 is triggered may be further delayed than in the case where " f " is used. At this time, the delay offset value " Off_m " may be determined by the system.

[104] As described above, delaying the timing at which the event A3 is triggered according to the present invention is based on the premise that the highest priority of the UE is the MBMS, that is, that the UE prefers receiving the MBMS to performing handover to the CSG cell. The UE does not immediately perform handover to the CSG cell but maximally delays handover timing to determine whether context of the UE is for the MBMS.

[105] The UE transmits a measurement report message to the source cell at step S815. The measurement report message is transmitted at the timing where the event A3 is triggered and informs that the strength of the signal of the CSG cell as the target cell is larger than the strength of the signal of the source cell by no less than a predetermined threshold value so that it is necessary to perform handover. That is, the UE that performs measurement in accordance with the configuration of the received measurement control message triggers the measurement report when the measurement result is larger than the threshold value for handover. The measurement report message includes PCI information on the target cell.

[106] According to the present invention, the measurement report message transmitted by the UE may further include the MBMS information (MBMSInfo). Or, the MBMS information may also be called MBMS assistance information. The MBMS information includes MBMS information that is being received by the UE or MBMS information (or frequency information) in which the UE is interested.

[107] For example, the MBMS information may include information on the type of the MBMS received by the UE, which is because it is necessary to inform that the UE may simultaneously receive the plurality of MBMSs, that MBMS areas or the MBSFN areas for the MBMSs may vary, and which MBMS is performed in the location where the current UE receives the MBMS. The type of the MBMS may be distinguished by a temporary mobile group identity (TMGI) for the MBMS.

[108] For example, when a plurality of MBMS UEs are receiving MBMSs A, B, and C, the MBMS information may be in the form of a list as illustrated in TMGI A, B, and C of the following Table.

[109] Table 1

[Table 1]

Type of MBMS	TMGI	Enable/disable	Frequency
MBMS 1	A	Enable	a
MBMS 2	B	Disable	a
MBMS 3	C	Enable	a
MBMS 4	D	Enable	b

- [110] In accordance with the Table 1, the MBMS information may inform that the MBMS 1 that is being received by the UE or in which the UE is interested is TMGI A, that the MBMS 2 that is being received by the UE or in which the UE is interested is TMGI B, and that the MBMS 3 that is being received by the UE or in which the UE is interested is TMGI C and is transmitted at the frequency a. In addition, the MBMS information may inform that the MBMS 4 in which the UE is interested is TMGI D and is transmitted at the frequency b. In addition, the MBMS information may inform that the MBMS 2 is "disable" and the remaining MBMSs are "enable". The above is only an example. Information on the TMGI by the type of the MBMS, on whether the MBMS is enable/disable, or on the frequency at which the MBMS is transmitted may be differently configured.
- [111] The source cell transmits a system information request message to the UE at step S820. The source cell that receives the measurement report message including the PCI of the target cell determines the PCI to determine whether the target cell corresponds to the CSG cell (or the femto cell) and transmits the system information request message when it is determined that the target cell is the CSG cell to request the UE to receive system information on the target cell.
- [112] The target cell (the CSG cell) broadcasts the system information on the target cell and the UE that receives the system information request message receives the system information broadcasted by the target cell at step S825. The system information includes a cell global identifier (CGI), an E-UTRAN CGI (ECGI), a tracking area identifier (TAI), or a closed subscriber group identifier (CSG ID). The CGI or the ECGI is an identifier for globally distinguishing a cell and may be used as an identifier for distinguishing a cell when the PCI is confused. The TAI is an identifier for the tracking area of the target cell. The CSG ID is an identifier that distinguishes the CSG of the target cell.
- [113] At this time, the target cell may broadcast neighbor MBMS information together with the system information on the target cell. The UE may know that the MBMS information may be received in the neighbor cell through the neighbor MBMS information. The neighbor MBMS information provided by the target cell may be

MBMS performing information in a neighbor cell that is not provided by the source cell. For example, the source cell may provide information on the MBMSs A and B at the frequency "a". The target cell may provide the information on the MBMSs A and B at the frequency "a" and information on the MBMSs A, C, and D at the frequency "b" to the UE. The UE may receive correct information on the MBMS desired to be received from the MBMS information that the source cell and the target cell have. In addition, the UE may determine information on the frequency at which the desired MBMS is provided.

- [114] The UE may receive the MBMS from the frequency at which the desired MBMS is provided in accordance with capability or may measure the frequency at which the MBMS is provided based on the neighbor MBMS information through the system information received from the target cell to perform handover to a neighbor cell, not to the target cell.
- [115] The UE transmits the measurement report message to the source cell at step S830. The measurement report message may include the CGI, the ECGI, the TAI, or the CSG ID. In addition, when the MBMS information (MBMSInfo) is not transmitted in the step S815, the MBMS information may be transmitted through the measurement report message of the step S830.
- [116] The source cell transmits a handover request message to the MME at step S835. The handover request message may include context information on the UE and the access mode of the CSG cell or the CSG ID. The access mode may exist when the CSG cell is a hybrid cell.
- [117] According to the present invention, the handover request message may include the MBMS information. Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the MME. As illustrated in the FIG. 3, since the MBMS information may not be directly transmitted to the target cell due to the network architecture, the UE first transmits the MBMS information to the MME. The MME transmits the MBMS information to the MCE or the BM-SC and the MCE or the BM-SC may transmit the MBMS information to an HeNB GW or the CSG cell. The BM-SC accesses an application server that provides the MBMS to provide the MBMS when the UE point-to-point accesses the corresponding CSG cell.
- [118] The MME performs access control based on the CSG ID included in the handover request message at step S840. When the access control fails, a handover preparation fail message is transmitted to the source cell. When the access control is successful so that the cell access mode exists, the handover request message is transmitted to the target cell (the CSG cell) through the HeNB GW.
- [119] The MME transmits the handover request message to the HeNB GW at step S845. The handover request message may include the CSG ID and membership status in-

formation. In addition, the handover request message may include the MBMS information. Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the HeNB GW.

- [120] The HeNB GW transmits the handover request message to the target cell (the CSG cell) at step S850. In addition, the handover request message may include the CSG ID and the membership status information. In addition, the handover request message may include the MBMS information. Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the target cell.
- [121] The target cell (the CSG cell) compares the CSG ID in the handover request message with the CSG ID broadcasted by the target cell (the CSG cell) to perform validation at step S855. When the target cell is determined as a CSG member through validation, resource is allocated for handover.
- [122] The target cell (the CSG cell) transmits a handover request acknowledgement message to the HeNB GW at step S860 and the HeNB GW transmits the handover request acknowledgement message to the MME at step S865. The handover request acknowledgement message informs that the target cell is prepared for handover so that handover may be performed.
- [123] The MME transmits a handover command message to the source cell at step S870 and the source cell transmits the handover command message to the UE at step S875. The handover command message informs whether the UE may perform handover from the source cell to the target cell.
- [124] The UE starts handover from the source cell to the target cell (the CSG cell) and performs handover at step S880. The UE receives the MBMS through the CSG cell (or neighbor cells) based on handover at step S885.
- [125] FIG. 9 illustrates another example of a method of the UE performing handover from the source cell to the target cell according to the present invention. At this time, the source cell may be the macro cell and the target cell may be the CSG cell.
- [126] Referring to FIG. 9, the UE receives the proximity configuration message from the source cell at step S900. The proximity configuration message includes information on whether the UE may perform the proximity indication operation in a specific RAT. For example, when the CSG cell included in the white list of the UE is detected from the E-UTRAN of the LTE system or the UTRAN of the WCDMA system, it is determined whether the state of the parameter "proximityIndicationEUTRA" or "proximityIndicationUTRA" included in the proximity configuration message is "enable" or "disable" to perform the proximity indication operation. That is, the proximity indication operation is performed when one of the parameters is determined as "enable" and is not performed when one of the parameters is not determined as "enable" or is determined

as "disable". In addition, the proximity configuration message may be included in the RRC message such as an RRC connection reconfiguration message to be transmitted or may be transmitted together with the RRC message.

- [127] The UE transmits the proximity indication message to the source cell at step S905. The proximity indication message informs the source cell that the UE approaches the CSG cell having the specific frequency and the specific PCI. The proximity indication message may include the frequency information and the PCI information. The proximity indication message may be the RRC message. In addition, a method of selecting the CSG cell may follow the autonomous search procedures.
- [128] The source cell transmits the measurement control message to the UE at step S910. The measurement control message includes the configuration information on the object to be measured by the UE. The UE may measure the CSG cell in accordance with the configuration of the measurement control information.
- [129] The UE transmits the measurement report message to the source cell at step S915. The measurement report message is transmitted when the event A3 is triggered and informs that the strength of the signal of the CSG cell as the target cell is larger than the strength of the signal of the source cell by no less than the predetermined threshold value so that it is necessary to perform handover. The measurement report message includes the PCI information on the target cell.
- [130] According to the present invention, the UE may transmit the measurement report message including the MBMS indicator (MBMSInd) to the source cell. The MBMS indicator as the MBMS information of the UE, for example, may inform that the UE is receiving the MBMS through the MBMS bearer or is interested in receiving the MBMS. For example, the type of the MBMS indicator is the flag and the MBMS indicator may indicate 0 or 1. Although the UE receives at least one MBMS among the plurality of MBMSs, the MBMS indicator may be configured as 1. When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.
- [131] According to the present invention, the measurement report message transmitted by the UE may further include the MBMS information (MBMSInfo). The MBMS information includes the MBMS information that is being received by the UE or the MBMS information (or the frequency information) in which the UE is interested.
- [132] For example, the MBMS information may include the information on the type of the MBMS received by the UE, which is because it is necessary to inform that the UE may simultaneously receive the plurality of MBMSs, that the MBMS areas or the MBSFN areas for the MBMSs may vary, and which MBMS is performed in the location where the current UE receives the MBMS. The type of the MBMS may be distinguished by the TMGI for the MBMS.
- [133] For example, when the plurality of MBMS UEs are receiving MBMSs A, B, and C,

the MBMS information may be in the form of the list as illustrated in the TMGI A, B, and C of the Table 1.

- [134] The UE receives the system information request message from the source cell at step S920. The source cell that receives the measurement report message including the PCI of the target cell determines the PCI to determine whether the target cell corresponds to the CSG cell (or the femto cell) and transmits the system information request message when it is determined that the target cell is the CSG cell to request the UE to receive the system information on the target cell.
- [135] The target cell (the CSG cell) broadcasts the system information on the target cell and the UE that receives the system information request message receives the system information broadcasted by the target cell at step S925. The system information includes the CGI, the ECGI, the TAI, or the CSG ID.
- [136] At this time, the target cell may broadcast the neighbor MBMS information together with the system information on the target cell. The UE may know that the MBMS information may be received in the neighbor cell through the neighbor MBMS information. In addition, the UE may determine the information on the frequency at which the desired MBMS is provided.
- [137] The UE may receive the MBMS from the frequency at which the desired MBMS is provided in accordance with capability or may measure the frequency at which the MBMS is provided based on the neighbor MBMS information through the system information received from the target cell to perform handover to the neighbor cell, not to the target cell.
- [138] The UE transmits the measurement report message to the source cell at step S930. The measurement report message may include the CGI, the ECGI, the TAI, or the CSG ID. In addition, the measurement report message may include the MBMS information (MBMSInfo).
- [139] The source cell transmits the handover request message to the MME at step S935. The handover request message may include the context information on the UE and the access mode of the CSG cell or the CSG ID. The access mode may exist when the CSG cell is the hybrid cell.
- [140] According to the present invention, the handover request message may include the MBMS information (MBMSInfo). Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the MME. When the UE point-to-point accesses the corresponding CSG cell, the MBMS may be provided.
- [141] The MME performs access control based on the CSG ID included in the handover request message at step S940. When the access control fails, the handover preparation fail message is transmitted to the source cell. When the access control is successful so

that the cell access mode exists, the handover request message is transmitted to the target cell through the HeNB GW.

- [142] The MME transmits the handover request message to the HeNB GW at step S945. The handover request message may include the CSG ID and the membership status information. In addition, the handover request message may include the MBMS information (MBMSInfo). Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the HeNB GW.
- [143] The HeNB GW transmits the handover request message to the target cell at step S950. In addition, the handover request message may include the CSG ID and the membership status information. In addition, the handover request message may include the MBMS information (MBMSInfo). Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the target cell.
- [144] The target cell compares the CSG ID in the handover request message with the CSG ID broadcasted by the target cell to perform validation at step S955. When the target cell is determined as the CSG member through validation, resource is allocated for handover.
- [145] The target cell transmits the handover request acknowledgement message to the HeNB GW at step S960 and the HeNB GW transmits the handover request acknowledgement message to the MME at step S965. The handover request acknowledgement message informs that the target cell is prepared for handover so that handover may be performed.
- [146] The MME transmits the handover command message to the source cell at step S970 and the source cell transmits the handover command message to the UE at step S975. The handover command message informs that the UE may perform handover from the source cell to the target cell.
- [147] The UE starts handover from the source cell to the target cell and performs handover at step S980. The UE receives the MBMS through the CSG cell (or the neighbor cells) based on handover at step S985.
- [148] FIG. 10 illustrates another example of the method of the UE performing handover from the source cell to the target cell according to the present invention. At this time, the source cell may be the macro cell and the target cell may be the CSG cell.
- [149] Referring to FIG. 10, the UE receives the proximity configuration message from the source cell at step S1000. The proximity configuration message includes information on whether the UE may perform the proximity indication operation in the specific RAT. For example, when the CSG cell included in the white list of the UE is detected from the E-UTRAN of the LTE system or the UTRAN of the WCDMA system, it is determined whether the state of the parameter "proximityIndicationEUTRA" or "prox-

imityIndicationUTRA" included in the proximity configuration message is "enable" or "disable" to perform the proximity indication operation. That is, the proximity indication operation is performed when one of the parameters is determined as "enable" and is not performed when one of the parameters is not determined as "enable" or is determined as "disable". In addition, the proximity configuration message may be included in the RRC message such as the RRC connection reconfiguration message to be transmitted or may be transmitted together with the RRC message.

- [150] The UE transmits the proximity indication message to the source cell at step S1005. The proximity indication message informs the source cell that the UE approaches the CSG cell having the specific frequency and the specific PCI. The proximity indication message may include the frequency information and the PCI information. The proximity indication message may be the RRC message. In addition, the method of selecting the CSG cell may follow the autonomous search procedures.
- [151] The source cell transmits the measurement control message to the UE at step S1010. The measurement control message includes the configuration information on the object to be measured by the UE. The UE may measure the CSG cell in accordance with the configuration of the measurement control information.
- [152] The UE transmits the measurement report message to the source cell at step S1015. The measurement report message is transmitted when the event A3 is triggered and informs that the strength of the signal of the CSG cell as the target cell is larger than the strength of the signal of the source cell by no less than the predetermined threshold value so that it is necessary to perform handover. The measurement report message includes the PCI information on the target cell.
- [153] The UE receives the system information request message from the source cell at step S1020. The source cell that receives the measurement report message including the PCI of the target cell determines the PCI to determine whether the target cell corresponds to the CSG cell or the femto cell and transmits the system information request message when it is determined that the target cell is the CSG cell to request the UE to receive the system information on the target cell.
- [154] The target cell broadcasts the system information on the target cell and the UE that receives the system information request message receives the system information broadcasted by the target cell at step S1025. The system information may include the CGI, the ECGI, the TAI, or the CSG ID.
- [155] At this time, the target cell may broadcast the neighbor MBMS information together with the system information on the target cell. The UE may know that the MBMS information may be received in the neighbor cell through the neighbor MBMS information. In addition, the UE may determine the information on the frequency at which the desired MBMS is provided.

- [156] The UE may receive the MBMS from the frequency at which the desired MBMS is provided in accordance with capability or may measure the frequency at which the MBMS is provided based on the neighbor MBMS information through the system information received from the target cell to perform handover to the neighbor cell, not to the target cell. The BS may stop performing handover to the target cell and may indicate a new cell to be measured, that is, a cell in which the MBMSs preferred by the UE are supported in order to perform handover based on the MBMS information provided by the UE. For example, when the target cell to which the current UE desires to perform handover does not support the MBMSs A and B preferred by the UE, however, the source cell receives information on the neighbor cell and the frequency that support the MBMSs A and B in addition to the neighbor MBMS information that the target cell knows, the UE may newly perform measurement using the information on the neighbor cell and the frequency and may perform handover. At this time, the source cell or the BS may stop performing handover to the target cell.
- [157] The UE transmits the measurement report message to the source cell at step S1030. The measurement report message may include the CGI, the ECGI, the TAI, or the CSG ID.
- [158] According to the present invention, the UE may transmit the measurement report message including the MBMS indicator (MBMSInd) to the source cell. The MBMS indicator as the MBMS information of the UE, for example, may inform that the UE is receiving the MBMS through the MBMS bearer or is interested in receiving the MBMS. For example, the type of the MBMS indicator is the flag and the MBMS indicator may indicate 0 or 1. Although the UE receives at least one MBMS among the plurality of MBMSs, the MBMS indicator may be configured as 1. When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.
- [159] According to the present invention, the measurement report message transmitted by the UE may further include the MBMS information (MBMSInfo). The MBMS information includes the MBMS information that is being received by the UE or the MBMS information (or the frequency information) in which the UE is interested.
- [160] For example, the MBMS information may include the information on the type of the MBMS received by the UE, which is because it is necessary to inform that the UE may simultaneously receive the plurality of MBMSs, that the MBMS areas or the MBSFN areas for the MBMSs may vary, and which MBMS is performed in the location where the current UE receives the MBMS. The type of the MBMS may be distinguished by the TMGI for the MBMS.
- [161] For example, when the plurality of MBMS UEs are receiving MBMSs A, B, and C, the MBMS information may be in the form of the list as illustrated in the TMGI A, B, and C of the Table 1.

- [162] The source cell transmits the handover request message to the MME at step S1035. The handover request message may include the context information on the UE and the access mode of the CSG cell or the CSG ID. The access mode may exist when the CSG cell is the hybrid cell.
- [163] According to the present invention, the handover request message may include the MBMS information (MBMSInfo). Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the MME. When the UE point-to-point accesses the corresponding CSG cell, the MBMS may be provided.
- [164] The MME performs access control based on the CSG ID included in the handover request message at step S1040. When the access control fails, the handover preparation fail message is transmitted to the source cell. When the access control is successful so that the cell access mode exists, the handover request message is transmitted to the target cell through the HeNB GW.
- [165] The MME transmits the handover request message to the HeNB GW at step S1045. The handover request message may include the CSG ID and the membership status information. In addition, the handover request message may include the MBMS information (MBMSInfo). Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the HeNB GW.
- [166] The HeNB GW transmits the handover request message to the target cell at step S1050. In addition, the handover request message may include the CSG ID and the membership status information. In addition, the handover request message may include the MBMS information (MBMSInfo). Therefore, the MBMS information that is being received by the UE or in which the UE is interested may be transmitted to the target cell.
- [167] The target cell compares the CSG ID in the handover request message with the CSG ID broadcasted by the target cell to perform validation at step S955. When the target cell is determined as the CSG member through validation, resource is allocated for handover.
- [168] The target cell transmits the handover request acknowledgement message to the HeNB GW at step S1060 and the HeNB GW transmits the handover request acknowledgement message to the MME at step S1065. The handover request acknowledgement message informs that the target cell is prepared for handover so that handover may be performed.
- [169] The MME transmits the handover command message to the source cell at step S1070 and the source cell transmits the handover command message to the UE at step S1075. The handover command message informs that the UE may perform handover from the source cell to the target cell.

- [170] The UE starts handover from the source cell to the target cell and performs handover at step S1080.
- [171] The UE receives the MBMS through the CSG cell (or the neighbor cells) based on handover at step S1085.
- [172] FIG. 11 is a flowchart illustrating the operation of the UE performing handover from the macro cell to the CSG cell according to the present invention.
- [173] Referring to FIG. 11, the UE receives the proximity configuration message from the source cell at step S1100. The proximity configuration message includes information on whether the UE may perform the proximity indication operation in the specific RAT. In addition, the proximity configuration message may be included in the RRC message such as the RRC connection reconfiguration message to be transmitted or may be transmitted together with the RRC message.
- [174] The UE transmits the proximity indication message to the source cell at step S1105. The proximity indication message informs the source cell that the UE approaches the CSG cell having the specific frequency and the specific PCI. The UE transmits the information on the CSG cell to be measured by the proximity indication message to the source cell. The proximity indication message may include the frequency information and the PCI information. The proximity indication message may be the RRC message.
- [175] According to the present invention, the proximity indication message transmitted by the UE may include the MBMS indicator (MBMSInd). When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.
- [176] The UE receives the measurement control message from the source cell at step S1110. The measurement control message includes the configuration information on the object to be measured by the UE. The UE may measure the CSG cell in accordance with the configuration of the measurement control information.
- [177] According to the present invention, the measurement control message transmitted by the source cell to the UE may include the MBMS frequency indicator (MBMSFreqInd). In addition, when the measurement for the frequency (or the RAT) in which the UE is interested is not configured, the source cell may configure the measurement for the frequency (or the RAT) in which the UE is interested to indicate the UE to perform the configured measurement. The measurement configuration information may be received from the source cell through the RRC connection reconfiguration message.
- [178] The UE performs measurement based on the measurement configuration information included in the measurement control message received from the source cell. At this time, the MBMS information included in the measurement configuration information may be also configured. The MBMS frequency may be monitored through the MBMS frequency indicator.

- [179] According to an example of the present invention, the measurement control message may include the measurement configuration information including the delay offset value of the Equation 2 so that the event A3 is triggered late when the UE performs the measurement.
- [180] The UE transmits the measurement report message to the source cell at step S1115. The measurement report message is transmitted when the event A3 is triggered and informs that the strength of the signal of the CSG cell as the target cell is larger than the strength of the signal of the source cell by no less than the predetermined threshold value so that it is necessary to perform handover. The measurement report message includes the PCI information on the target cell.
- [181] According to the present invention, the measurement report message may include the MBMS indicator (MBMSInd). When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.
- [182] According to the present invention, the measurement report message may further include the MBMS information (MBMSInfo). The MBMS information includes the MBMS information that is being received by the UE or the MBMS information (or the frequency information) in which the UE is interested. For example, the MBMS information may include the information on the type of the MBMS received by the UE as illustrated in the Table 1.
- [183] The UE receives the system information request message from the source cell at step S1120. The source cell that receives the measurement report message including the PCI of the target cell determines the PCI to determine whether the target cell corresponds to the CSG cell or the femto cell and transmits the system information request message when it is determined that the target cell is the CSG cell to request the UE to receive the system information on the target cell.
- [184] The UE receives the system information broadcasted by the target cell at step S1125. The system information includes the CGI, the ECGI, the TAI, or the CSG ID. At this time, the system information may further include the neighbor MBMS information. The UE may know that the MBMS information may be received in the neighbor cell through the neighbor MBMS information. In addition, the UE may determine the information on the frequency at which the desired MBMS is provided. The UE may receive the MBMS from the frequency at which the desired MBMS is provided in accordance with capability or may measure the frequency at which the MBMS is provided based on the neighbor MBMS information through the system information received from the target cell to perform handover to the neighbor cell, not to the target cell.
- [185] The UE transmits the measurement report message to the source cell at step S1130. The measurement report message may include the CGI, the ECGI, the TAI, or the CSG

ID. In addition, the measurement report message may include the MBMS indicator (MBMSInd) and the MBMS information (MBMSInfo). When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.

- [186] The UE receives the handover command message from the source cell at step S1135. The handover command message informs that handover may be performed from the source cell to the target cell. Then, the UE starts handover from the source cell to the target cell (the CSG cell) to perform handover at step S1140 and the UE receives the MBMS through the CSG cell (or the neighbor cells) based on handover at step S1145.
- [187] FIG. 12 is a flowchart illustrating the operation of the source cell performing handover from the macro cell to the CSG cell according to the present invention.
- [188] Referring to FIG. 12, the source cell transmits the proximity configuration message to the UE S1200. The proximity configuration message includes the information on whether the UE may perform the proximity indication operation in the specific RAT. In addition, the proximity configuration message may be included in the RRC connection reconfiguration message to be transmitted or may be transmitted together with the RRC connection reconfiguration message.
- [189] The source cell receives the proximity indication message from the UE at step S1205. The proximity indication message informs the source cell that the UE approaches the CSG cell having the specific frequency and the specific PCI. The proximity indication message may include the frequency information and the PCI information. The proximity indication message may be the RRC message. According to the present invention, the proximity indication message may include the MBMS indicator (MBMSInd). When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.
- [190] The source cell transmits the measurement control message to the UE at step S1210. The measurement control message includes the configuration information on the object to be measured by the UE.
- [191] According to the present invention, the measurement control message transmitted by the source cell to the UE may include the MBMS frequency indicator (MBMSFreqInd). In addition, when the measurement for the frequency (or the RAT) in which the UE is interested is not configured, the source cell may configure the measurement for the frequency (or the RAT) in which the UE is interested to indicate the UE to perform the configured measurement. The measurement configuration information may be transmitted through the RRC connection reconfiguration message.
- [192] In an example of the present invention, the source cell may further delay the timing at which the measurement control message is transmitted to the UE.
- [193] In another example of the present invention, the measurement control message may include the measurement configuration information including the delay offset value of

the Equation 2 so that the event A3 is triggered late when the UE performs the measurement.

- [194] The source cell receives the measurement report message from the UE at step S1215. The measurement report message is transmitted when the event A3 is triggered and includes the PCI information on the target cell. According to the present invention, the measurement report message may include the MBMS indicator (MBMSInd). When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS. According to the present invention, the measurement report message may further include the MBMS information (MBMSInfo). The MBMS information includes the MBMS information that is being received by the UE or the MBMS information (or the frequency information) in which the UE is interested. For example, the MBMS information may include the information on the type of the MBMS received by the UE as illustrated in the Table 1.
- [195] The source cell transmits the system information request message to the UE at step S1220. The source cell that receives the measurement report message including the PCI of the target cell determines the PCI to determine whether the target cell corresponds to the CSG cell or the femto cell and transmits the system information request message when it is determined that the target cell is the CSG cell to request the UE to receive the system information on the target cell.
- [196] The source cell receives the measurement report message from the UE at step S1225. The measurement report message may include the CGI, the ECGI, the TAI, or the CSG ID. In addition, the measurement report message may include the MBMS indicator (MBMSInd) and the MBMS information (MBMSInfo). When the source cell receives the MBMS indicator, it is informed that the UE prefers the MBMS.
- [197] The source cell transmits the handover request message to the MME at step S1230. The handover request message may include the context information on the UE and the access mode of the CSG cell or the CSG ID. The access mode may exist when the CSG cell is the hybrid cell. According to the present invention, the handover request message may include the MBMS information.
- [198] The source cell receives the handover command message from the MME at step S1235. The handover command message informs that the UE may perform handover from the source cell to the target cell. The source cell transmits the handover command message to the UE at step S1240. Then, the UE starts handover from the source cell to the target cell (the CSG cell) and performs handover at step S1245.
- [199] FIG. 13 is a flowchart illustrating the operation of the target cell (the CSG cell) performing handover from the macro cell to the CSG cell.
- [200] Referring to FIG. 13, the target cell broadcasts the system information on the target cell at step S1300. The system information includes the CGI, the ECGI, the TAI, or the

CSG ID. At this time, the target cell may broadcast the neighbor MBMS information together with the system information on the target cell. The UE may know that the MBMS information may be received in the neighbor cell through the neighbor MBMS information. In addition, the UE may determine the information on the frequency at which the MBMS is provided. The UE may receive the MBMS from the frequency at which the desired MBMS is provided in accordance with capability or may measure the frequency at which the MBMS is provided based on the neighbor MBMS information through the system information received from the target cell to perform handover to the neighbor cell, not to the target cell.

- [201] The target cell receives the handover request message from the HeNB GW at step S1305. The handover request message may include the CSG ID and the membership status information. In addition, the handover request message may include the MBMS information. The MBMS information includes the MBMS information that is being received by the UE or in which the UE is interested.
- [202] The target cell (the CSG cell) compares the CSG ID in the handover request message with the CSG ID broadcasted by the target cell (the CSG cell) to perform validation at step S1310. When the target cell is determined as the CSG member through validation, resource is allocated for handover.
- [203] The target cell (the CSG cell) transmits the handover request acknowledgement message to the HeNB GW at step S1315. The handover request acknowledgement message informs that the target cell is prepared for handover so that handover may be performed.
- [204] The UE, the source cell, and the target cell (the CSG cell) start handover and perform handover at step S1320. The CSG cell (or the neighbor cells) as the target cell transmits the MBMS to the UE based on handover at step S1325.
- [205] FIG. 14 is a block diagram illustrating a UE, a source BS, and a target BS for performing a handover method providing continuity of the MBMS according to an example of the present invention. The source BS provides the source cell and the target BS provides the target cell.
- [206] Referring to FIG. 14, a UE 1400 may include a UE transmitting unit 1405 or a UE receiving unit 1410.
- [207] The UE transmitting unit 1405 generates the MBMS indicator to transmit the generated MBMS indicator to the source BS 1430. For example, the MBMS indicator informs whether the UE 1400 is receiving the MBMS or is interested in receiving the MBMS. The MBMS indicator may indicate the type of the MBMS received by the UE 1400. The type of the MBMS may be distinguished by the TMGI for the MBMS, which is illustrated in the Table 1. The MBMS indicator is included in the proximity indication message or the measurement report message to be transmitted to the source

BS 1430.

- [208] The UE transmitting unit 1405 transmits the MBMS information to the source BS 1430. The MBMS information includes the MBMS information that is being received by the UE or the MBMS information (or the frequency information) in which the UE is interested. The type of the MBMS may be distinguished by the TMGI for the MBMS, which is illustrated in the Table 1. The MBMS information is included in the measurement report message to be transmitted to the source BS 1430.
- [209] The UE receiving unit 1410 receives the MBMS frequency indicator from the source BS 1430. When the frequency at which the MBMS is served is not configured, the MBMS frequency indicator indicates the MBMS frequency configured by the source BS. In addition, when measurement for the frequency (or the RAT) in which the UE is interested is not configured, the source BS configures the measurement to indicate the UE to perform the measurement. The MBMS frequency indicator may be received from the source BS through the measurement control message and the measurement configuration information may be included in the RRC connection reconfiguration message to be transmitted. The MBMS frequency may be also monitored through the MBMS frequency indicator.
- [210] The UE receiving unit 1410 may receive the delay offset from the source BS 1430. The delay offset value for delaying the timing at which the event A3 is triggered so that the UE may receive the MBMS through the source cell as long as possible may be determined as illustrated in the Equation 2. The delay offset may be received through the measurement configuration information included in the measurement control message. The UE does not immediately perform handover to the CSG cell but maximally delays the handover timing to determine whether the context of the UE is for the MBMS.
- [211] The UE receiving unit 1410 receives the system information on the target cell from the target BS 1460. The system information includes the CGI, the ECGI, the TAI, or the CSG ID. The system information may include the neighbor MBMS information on the target cell. The UE 1400 may know that the MBMS information may be received in the neighbor cell through the neighbor MBMS information. In addition, the UE 1400 may determine information on the frequency at which the desired MBMS is provided. The UE 1400 may receive the MBMS from the frequency at which the desired MBMS is provided in accordance with capability or may measure the frequency at which the MBMS is provided based on the neighbor MBMS information through the system information to perform handover to a neighbor cell, not to the target cell.
- [212] The UE receiving unit 1410 receives the system information request message or the handover command message from the source BS 1430. In addition, after performing

- handover, the UE receiving unit 1410 receives the MBMS from the target BS 1460.
- [213] The source BS 1430 includes a source receiving unit 1435 and a source transmitting unit 1440.
- [214] The source receiving unit 1435 receives the MBMS indicator from the UE 1400. The MBMS indicator may be included in the proximity indication message or the measurement report message to be received.
- [215] The source receiving unit 1435 receives the MBMS information from the UE 1400. The MBMS information includes the MBMS information that is being received by the UE 1400 or the MBMS information in which the UE 1400 is interested, which is illustrated in the Table 1. The MBMS information may be included in the measurement report message to be received.
- [216] The source receiving unit 1435 may receive the handover command message from the target BS 1460.
- [217] The source transmitting unit 1440 transmits the MBMS frequency indicator to the UE 1400. When the frequency at which the MBMS is served is not configured, the MBMS frequency configured by the source BS is indicated. The MBMS frequency indicator may be transmitted through the measurement control message and the measurement configuration information may be included in the RRC connection reconfiguration message to be transmitted.
- [218] The source transmitting unit 1440 may transmit the proximity configuration message, the system information request message, or the handover command message to the UE 1400. In addition, the source transmitting unit 1440 may transmit the handover request message to the MME. The handover request message may include the MBMS information received from the UE.
- [219] The target BS 1460 may include a target receiving unit 1465, a target controller 1470, or a target transmitting unit 1475.
- [220] The target receiving unit 1465 receives the MBMS information transmitted by the source BS 1430 from the HeNB GW. The MBMS information may be included in the handover request message.
- [221] The target controller 1470 compares the CSG ID in the received handover request message with the CSG ID broadcasted by the target controller to perform validation. When the target controller is determined as a CSG member through validation, resource is allocated for handover.
- [222] The target transmitting unit 1475 transmits the handover request acknowledgement message to the HeNB GW. In addition, after performing handover, the target transmitting unit 1475 transmits the MBMS to the UE 1400.
- [223] The above-described functions may be performed by a processor such as a microprocessor, a controller, a microcontroller, and an application specific integrated circuit

(ASIC) in accordance with software or a program code coded to perform the functions. Designing, developing, and realizing the code is apparent to those skilled in the art based on description of the present invention.

[224] While the present invention has been shown and described in connection with the embodiments, it will be apparent to those skilled in the art that modifications and variations can be made without departing from the spirit and scope of the invention as defined by the appended claims.

Claims

- [Claim 1] A method of performing handover by a User Equipment (UE) receiving Multimedia Broadcast Multicast Service (MBMS), the method comprising of:
transmitting a proximity indication message including MBMS indicator which indicates whether the UE is receiving MBMS or is interested in receiving MBMS, to a source Base Station (BS) linked to the UE;
transmitting a measurement report message including MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS, to the source BS;
performing handover from the source BS to a target BS; and
receiving MBMS from the target BS based on the MBMS indicator and the MBMS assistance information.
- [Claim 2] The method of claim 1, further comprising receiving a measurement control message including a MBMS frequency indicator which configures measurement of the frequency in which the UE is interested, from the source BS; and
wherein the measurement report message includes a result of monitoring of MBMS-related frequency based on the MBMS frequency indicator.
- [Claim 3] The method of claim 1, further comprising receiving system information including neighbor MBMS assistance information which informs whether the UE is able to receive the MBMS assistance information from a neighbor cell, from the target BS; and
wherein the MBMS information is configured based on the neighbor MBMS assistance information.
- [Claim 4] The method of claim 1, further comprising
receiving a measurement control message including measurement configuration information which includes a delay offset for delaying timing the UE triggering a event A3, from the source BS; and
measuring whether the strength of the signal of the target BS is larger than the strength of the signal of the source BS by no less than a predetermined threshold value based on the measurement control message, wherein the measurement report message includes the result of the measurement.
- [Claim 5] The method of claim 1, wherein the type of MBMS included in the

- MBMS assistance information is distinguished by a temporary mobile group identity (TMGI).
- [Claim 6] A method of performing handover by a source Base Station (BS) transmitting Multimedia Broadcast Multicast Service (MBMS), the method comprising of:
- receiving a proximity indication message including MBMS indicator which indicates whether a User Equipment (UE) is receiving MBMS or is interested in receiving MBMS, from the UE;
 - receiving a measurement report message including MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS, from the UE;
 - transmitting a handover request message including the MBMS indicator and the MBMS assistance information, to a target BS; and
 - performing handover to the target BS when receiving an acknowledgement of the handover request message.
- [Claim 7] The method of claim 6, further comprising transmitting a measurement control message including a MBMS frequency indicator which configures measurement of the frequency in which the UE is interested before receiving the measurement report message, to the UE.
- [Claim 8] The method of claim 6, further comprising transmitting a measurement control message including measurement configuration information which includes a delay offset for delaying timing the UE triggering a event A3, to the UE, after receiving the proximity indication message.
- [Claim 9] The method of claim 6, wherein the type of MBMS included in the MBMS assistance information is distinguished by a temporary mobile group identity (TMGI).
- [Claim 10] A method of performing handover by a target Base Station (BS) transmitting Multimedia Broadcast Multicast Service (MBMS), the method comprising of:
- receiving a handover request message including a CSG ID which identifies the CSG of the target BS, a MBMS indicator which indicates whether a UE is receiving MBMS or is interested in receiving MBMS, or MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS;
 - validating whether the target BS is a member of the CSG by comparing the CSG ID of the target BS and the CSG ID included in the handover

request message;

allocating resource and performing handover when the target BS is confirmed as a member of the CSG; and

transmitting MBMS based on the MBMS indicator and the MBMS assistance information, to the UE.

[Claim 11] The method of claim 10, further comprising transmitting system information including neighbor MBMS assistance information which informs whether the UE is able to receive the MBMS assistance information from a neighbor cell, to the UE.

[Claim 12] The method of claim 10, wherein the type of MBMS included in the MBMS assistance information is distinguished by a temporary mobile group identity (TMGI).

[Claim 13] A User Equipment (UE) performing handover receiving Multimedia Broadcast Multicast Service (MBMS), the UE comprising:
a transmitting unit transmitting a proximity indication message including MBMS indicator which indicates whether the UE is receiving MBMS or is interested in receiving MBMS to a source Base Station (BS) linked to the UE, and transmitting a measurement report message including MBMS assistance information which includes a type of MBMS which the UE is receiving or is interested in receiving, availability of the MBMS, or frequency information of the MBMS to the source BS;
a receiving unit receiving MBMS from the target BS based on the MBMS indicator and the MBMS assistance information.

[Claim 14] The UE of claim 13, wherein the receiving unit further receiving a measurement control message including a MBMS frequency indicator which configures measurement of the frequency in which the UE is interested, from the source BS; and
the measurement report message includes a result of monitoring of MBMS related frequency based on the MBMS frequency indicator.

[Claim 15] The UE of claim 13, wherein the receiving unit further receives system information including neighbor MBMS assistance information which informs whether the UE is able to receive the MBMS assistance information from a neighbor cell, from the target BS; and
the MBMS information is configured based on the neighbor MBMS assistance information.

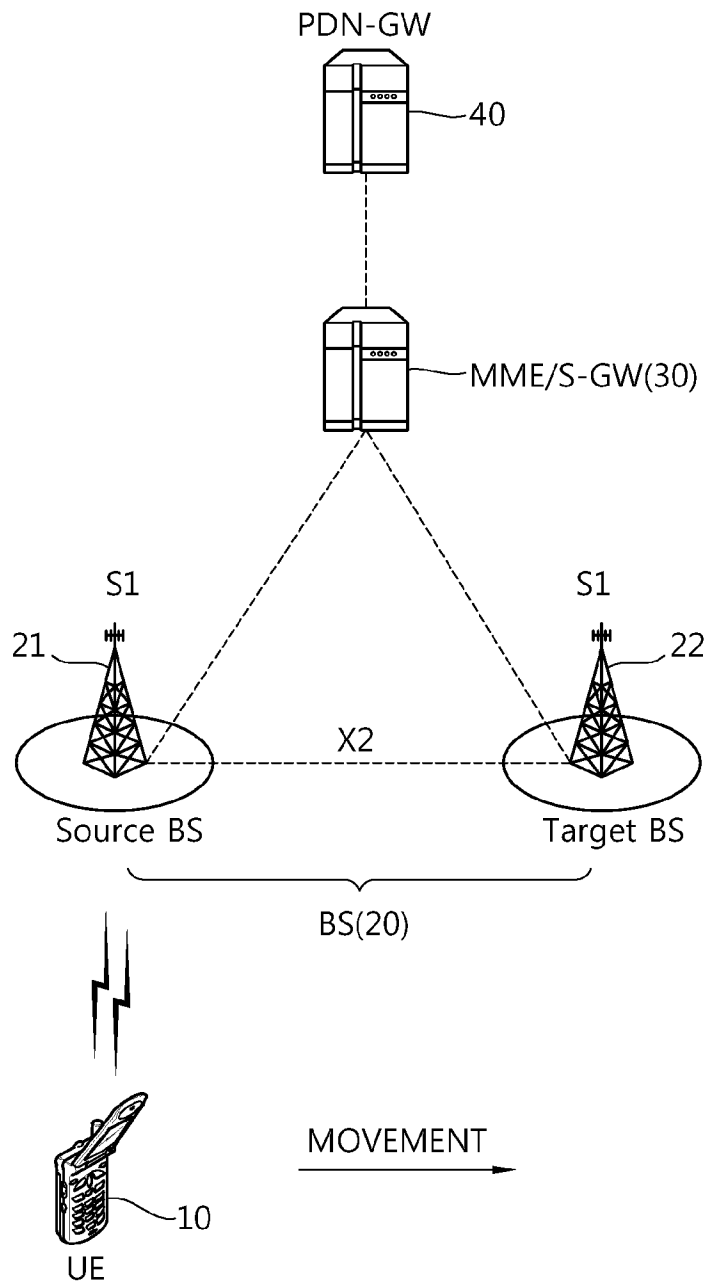
[Claim 16] The UE of claim 13, wherein the receiving unit further receives a measurement control message including measurement configuration in-

formation which includes a delay offset for delaying timing the UE triggering a event A3, from the source BS

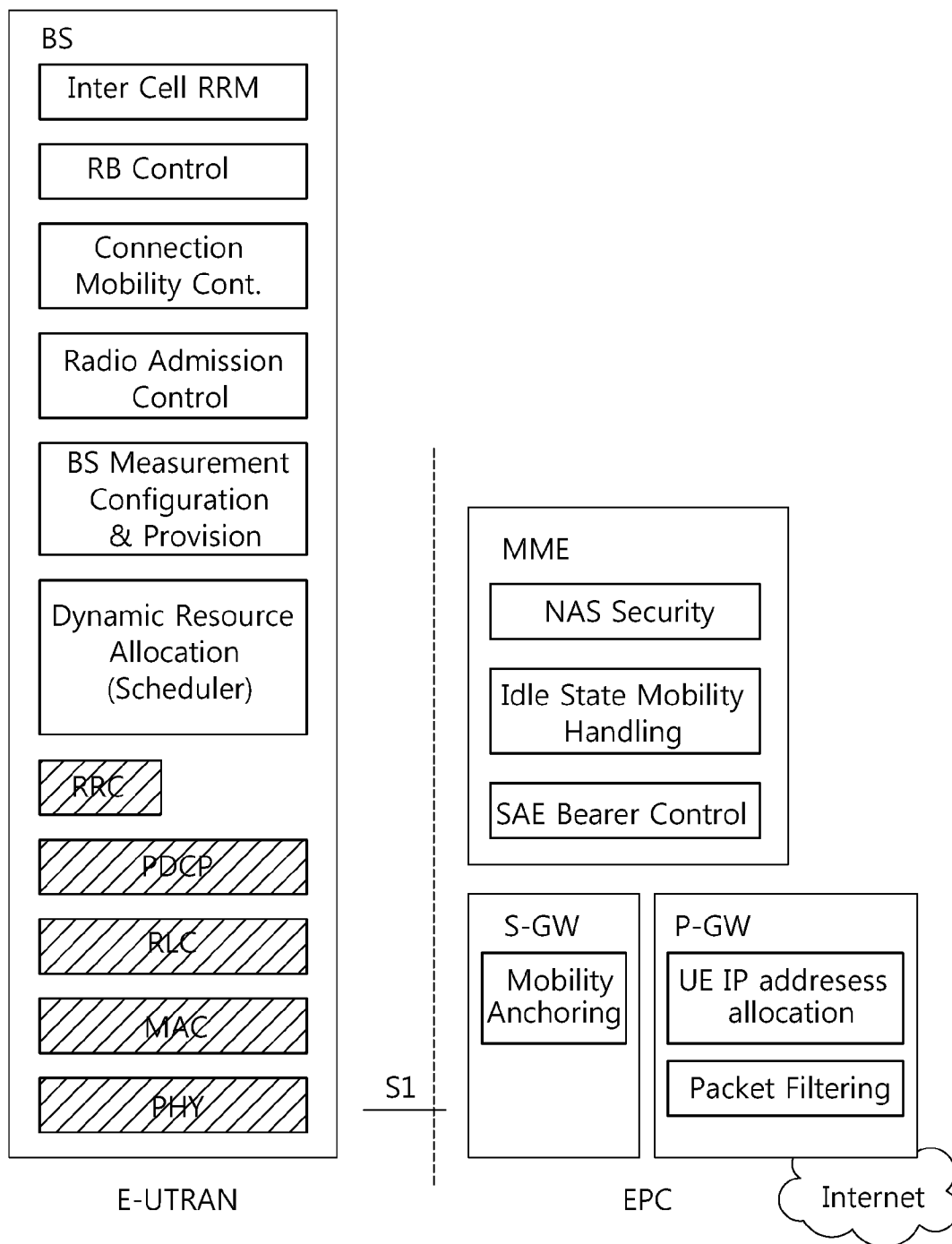
[Claim 17]

The UE of claim 13, wherein the type of MBMS included in the MBMS assistance information is distinguished by a temporary mobile group identity (TMGI).

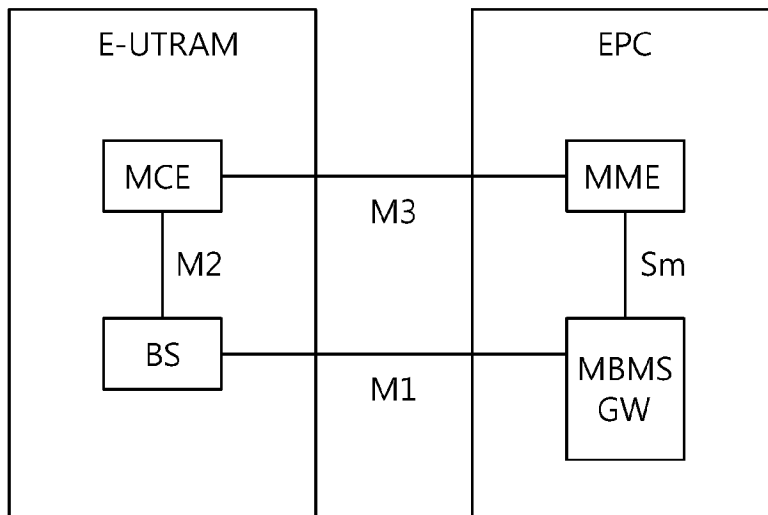
[Fig. 1]



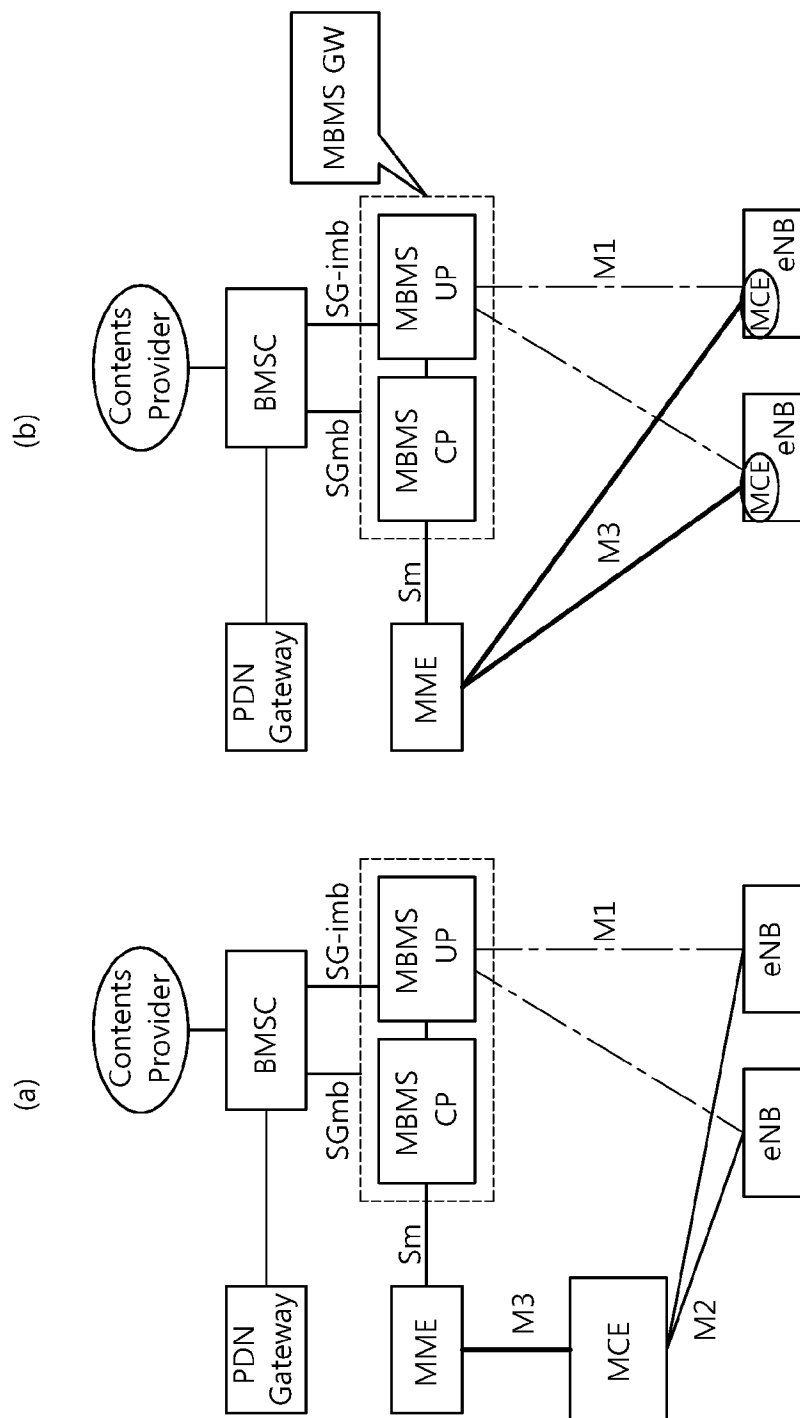
[Fig. 2]



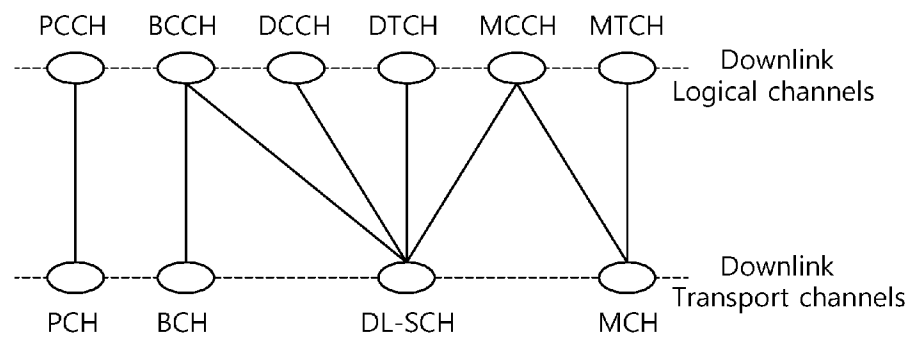
[Fig. 3]



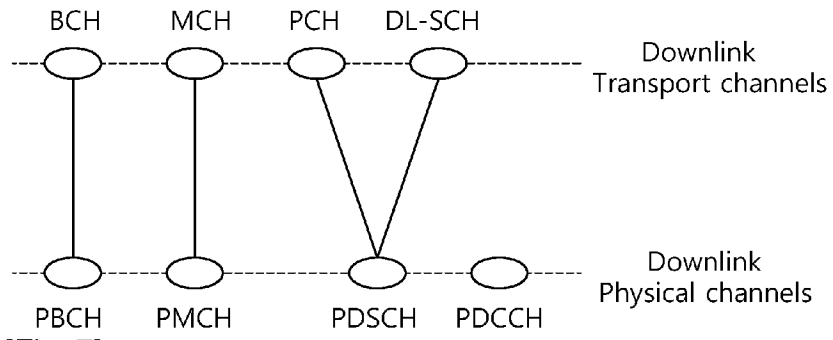
[Fig. 4]



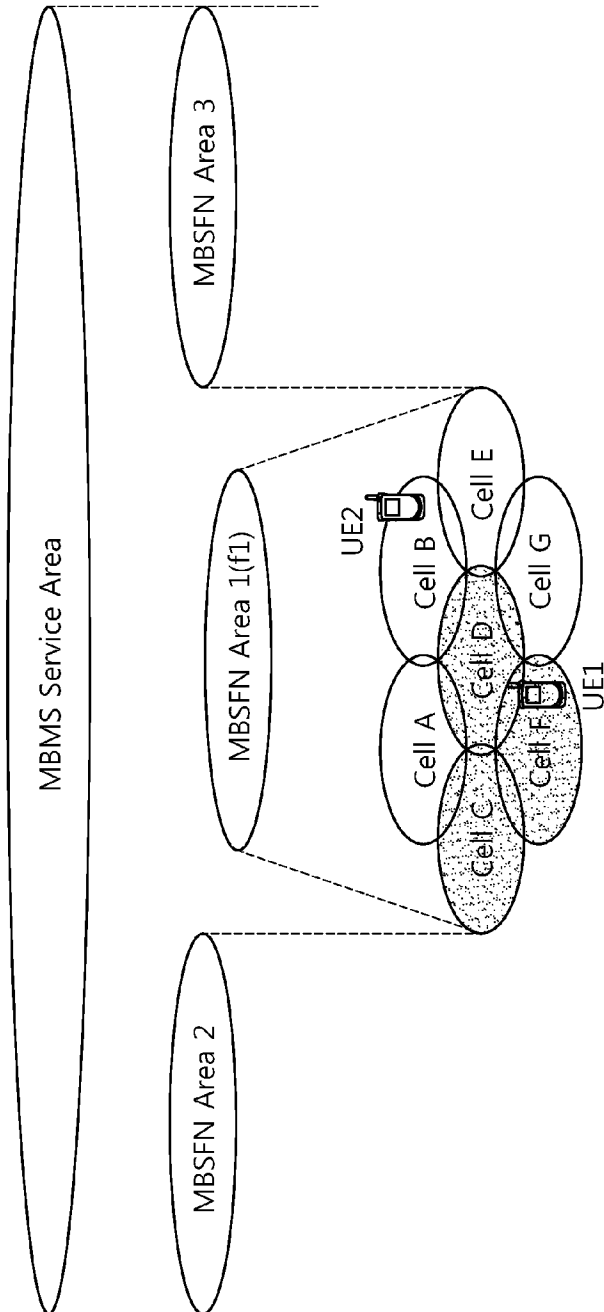
[Fig. 5]



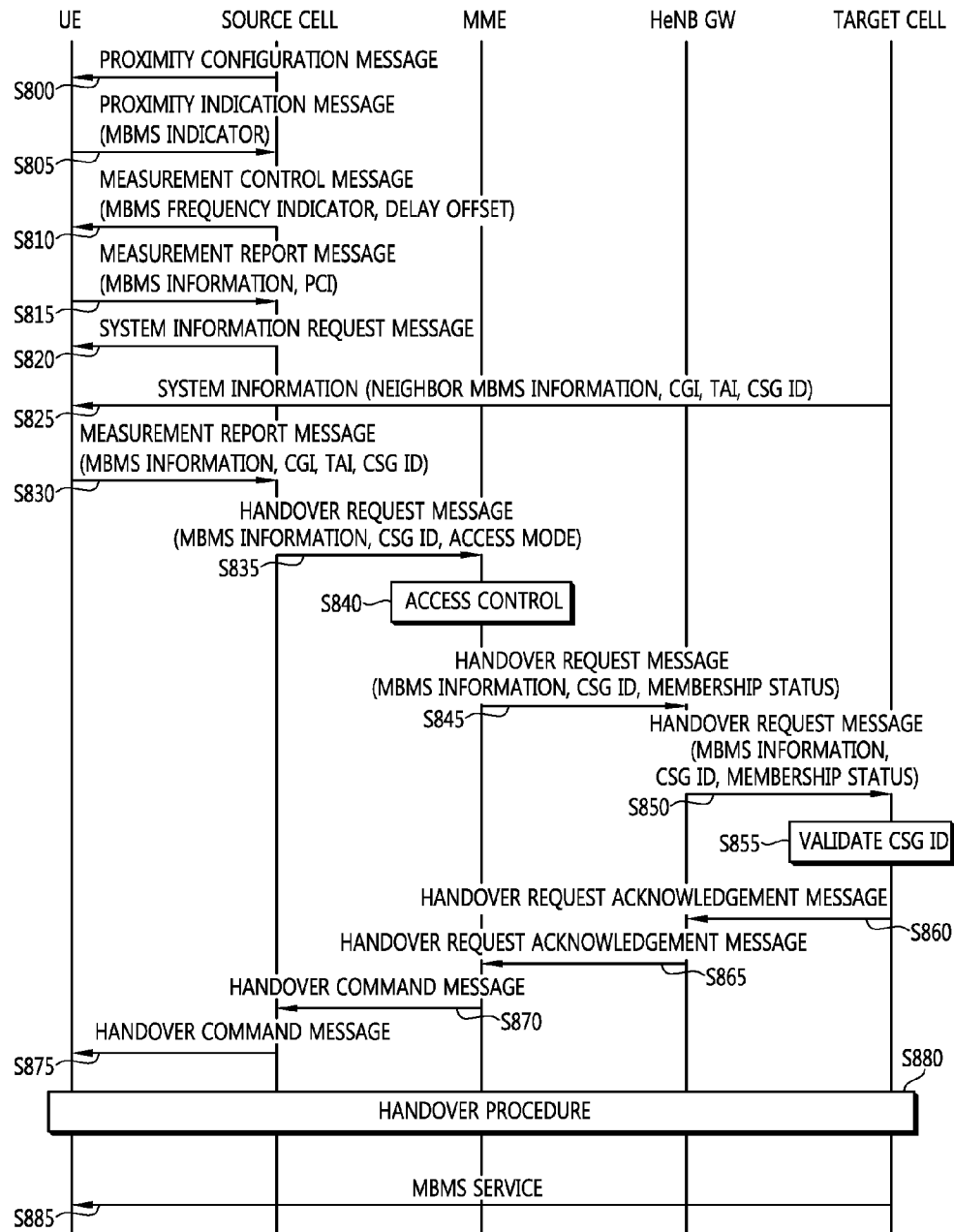
[Fig. 6]



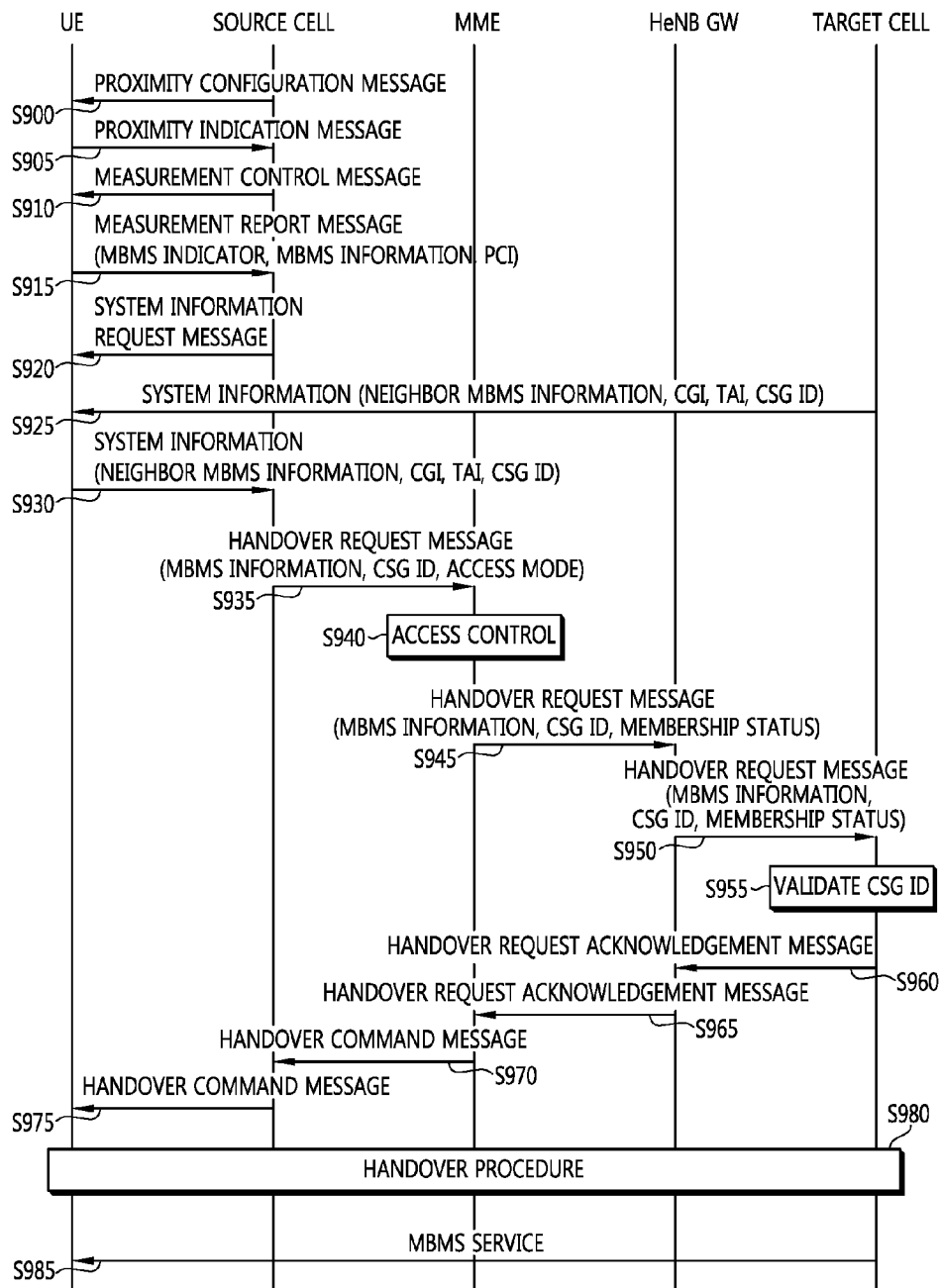
[Fig. 7]



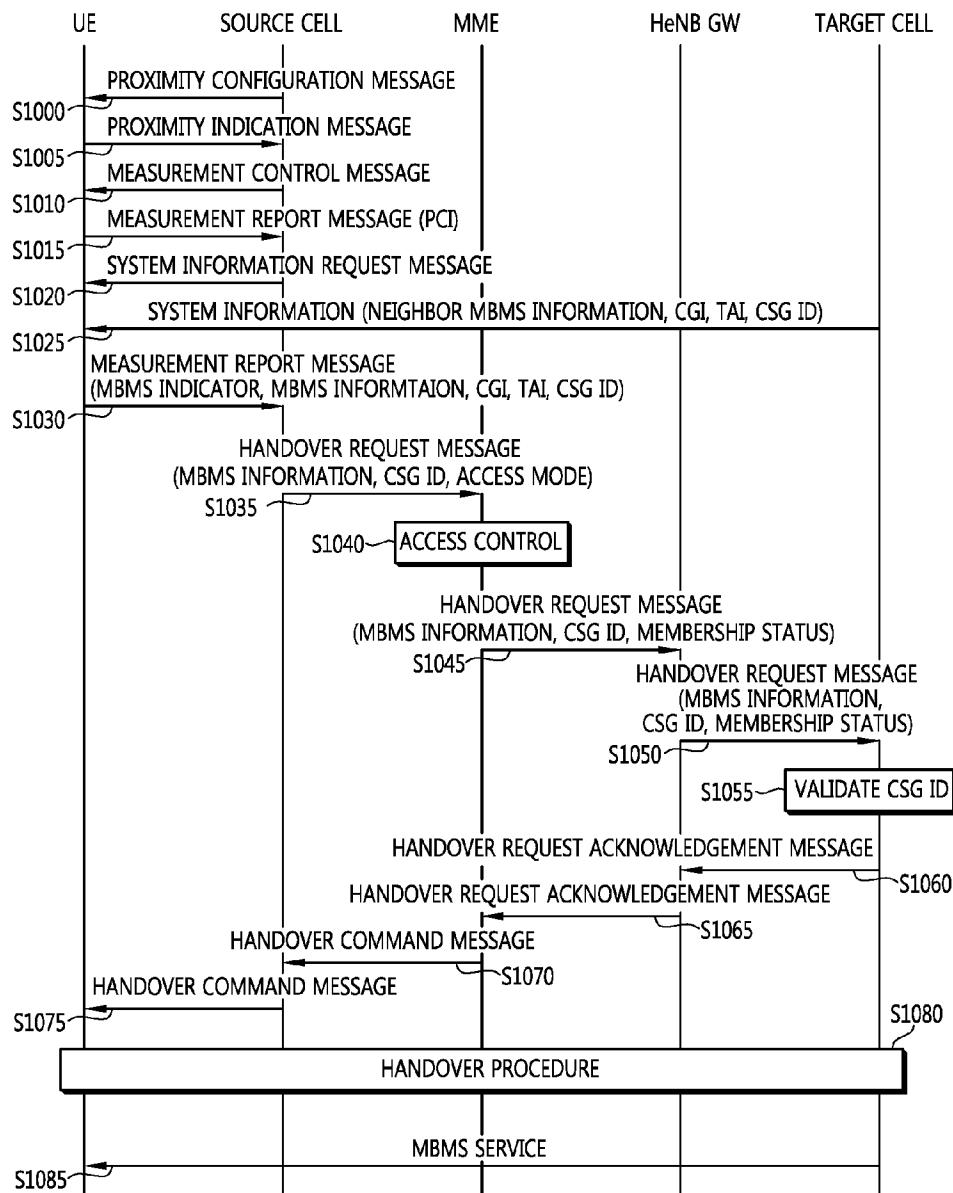
[Fig. 8]



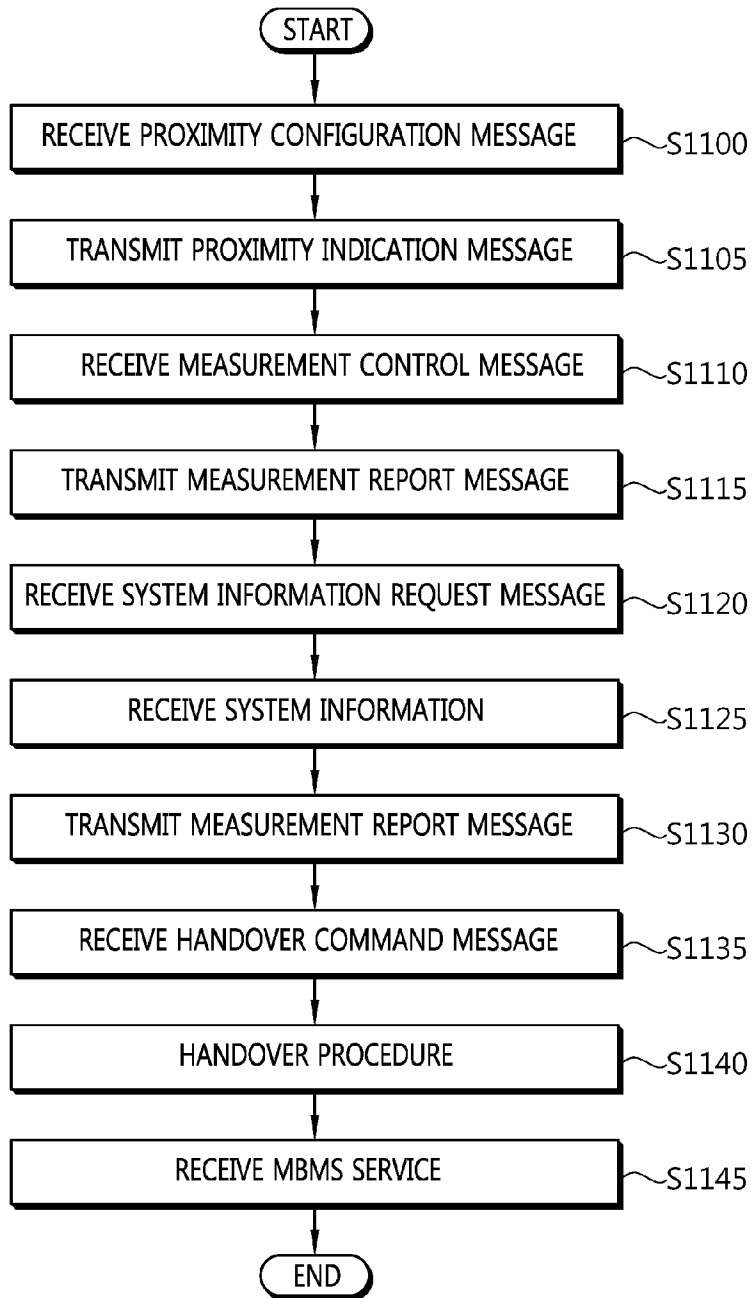
[Fig. 9]



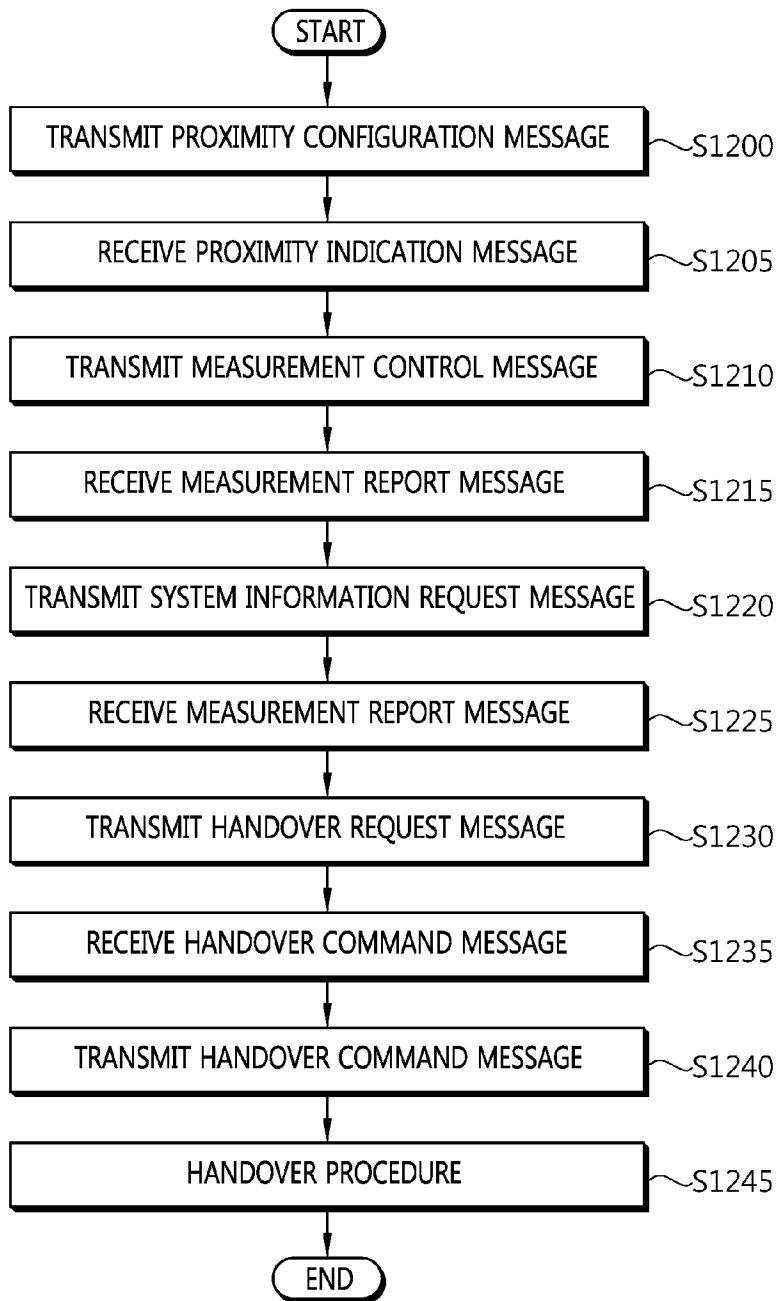
[Fig. 10]



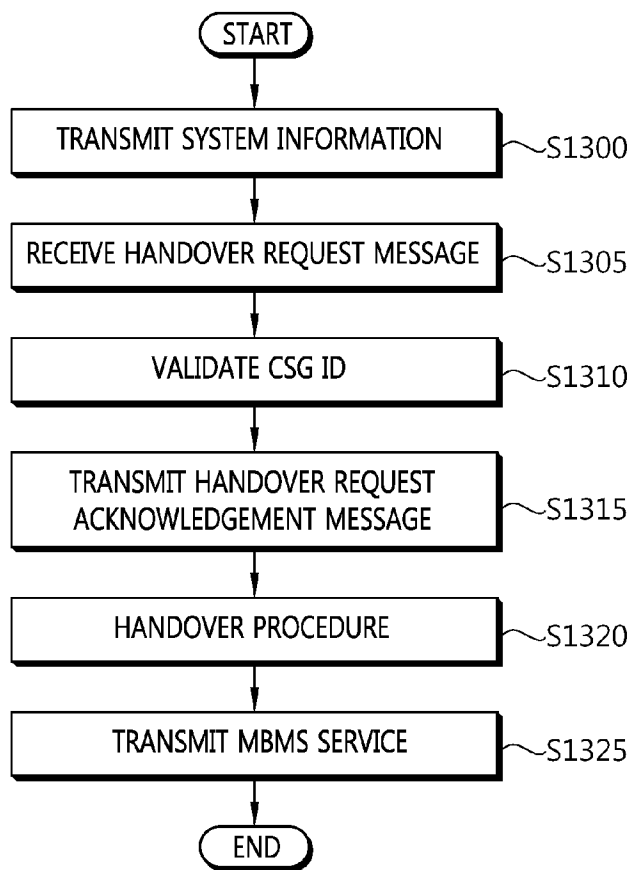
[Fig. 11]



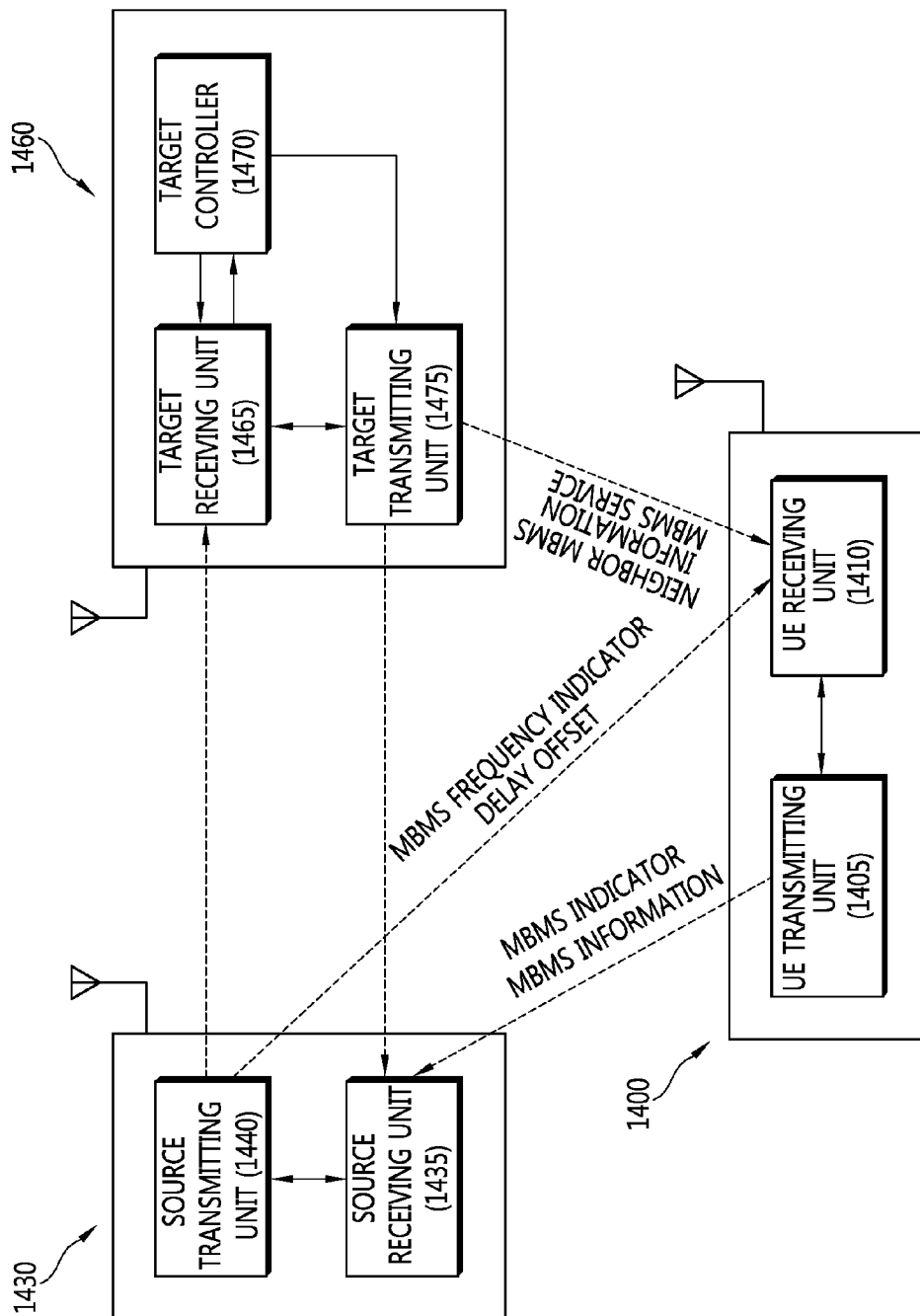
[Fig. 12]



[Fig. 13]



[Fig. 14]



A. CLASSIFICATION OF SUBJECT MATTER***H04W 36/08(2009.01)i, H04B 7/26(2006.01)i, H04W 4/06(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)

H04W 36/08

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: MBMS, measurement report, handover.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KYOCERA. "MBMS service continuity for inbound mobility to non-MBMS capable cells." 3GPP TSG-RAN WG2 #75 R2-114095, 2011.08.12. See pp. 1-3.	1-3, 5-7, 9-15, 17
Y	MEDIATEK. "CCH content." 3GPP TSG-RAN2 #75bis Meeting R2-115220, 2011.10.04. See pp. 1-2.	1-3, 5-7, 9-15, 17
A	ALU. "Service continuity support for RRC connected UE." 3GPP TSG-RAN WG2 Meeting #74 R2-114276, 2011.08.15. See the whole document.	1-17



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"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 citation or other special reason (as specified)

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

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"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

15 MARCH 2013 (15.03.2013)

Date of mailing of the international search report

18 MARCH 2013 (18.03.2013)

Name and mailing address of the ISA/KR

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LEE, Da Na

Telephone No. 82-42-481-3451



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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None