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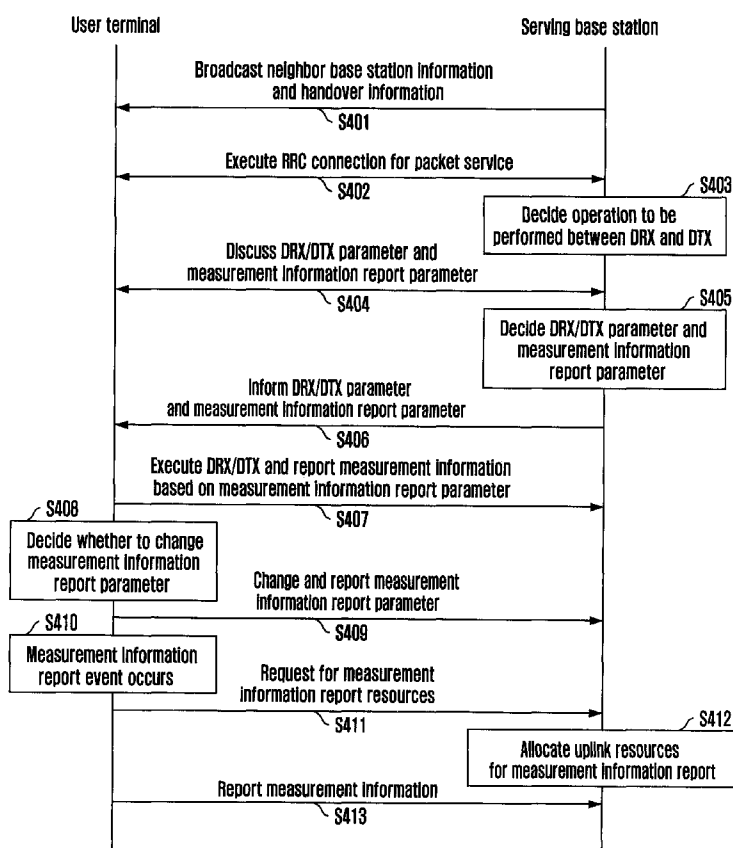
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(54) Title: A METHOD OF REPORTING MEASUREMENT INFORMATION IN PACKET BASED CELLULAR SYSTEM



(57) Abstract: Disclosed is a method for efficiently reporting measurement information required for handover in active- state terminals executing a power-saving operation in a packet-based communication system. The method includes the steps of : (a) receiving a discontinuous reception (DRX) period, a discontinuous transmission (DTX) period, and a measurement information report parameter that are decided by a base station; and (b) measuring channel quality according to a measurement information report period included in the measurement information report parameter, and reporting measurement information formed based on the measurement information report parameter by using radio resources allocated by the base station.

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DESCRIPTION

A METHOD OF REPORTING MEASUREMENT INFORMATION IN PACKET
BASED ON CELLULAR SYSTEM

5 TECHNICAL FIELD

The present invention relates to a measurement
information reporting method in a packet-based
communication system; and, more particularly, to a method
for efficiently reporting measurement information
10 required for an active-state terminal executing a power-
saving operation to perform handover in a packet-based
communication system.

BACKGROUND ART

15 When terminals perform call setup to provide a
service in a Wideband Code Division Multiple Access
(WCDMA) circuit-based cellular system, the terminals
transit into an active state in which they maintain radio
resource control (RRC) connection. The terminals in
20 active state can transmit control information or packets
through a configured dedicated channel whenever they
require the transmission of control information/packet
data according to buffer status or wireless channel
environment. Therefore, the terminals report measurement
25 information on a serving cell and neighbor cells at a
measurement information report period that is set up in
advance in order to execute handover. The transmission
channel between a terminal and a base station is
maintained until the base station and the terminal
30 terminate the service and the terminal releases radio
resources used in the service to transit into an idle
state. Although the terminal is in the idle state, a
network collects measurement information from the
terminal at the measurement information report period to
35 perform network management on the basis of a cell to

which the terminal belongs. Also, the terminal may report measurement information to the network when the terminal decides that handover triggering is needed.

In a packet-based cellular system, however, a
5 transmission channel for transmitting packet information does not provided dedicatedly to a corresponding terminal until the end of a packet service between the terminal and a base station, even though the terminal is in the active state for the service. In other words, although a
10 logical channel for transmitting packet data continues to exist, radio resources, which are physical channels, are shared by a plurality of terminals under the coverage of a base station. Control operation related to radio resource allocation is carried out by the base station.
15 Specifically, an RRC function and a scheduler of the base station take charge of allocating and scheduling radio resources.

For example, a 3rd-Generation Partnership Project (3GPP) Long Term Evolution (LTE) system is a packet-based
20 system providing services. When RRC connection is set up to provide a packet service between a base station and a terminal in a packet-based cellular system, the terminal transits into the active state. When the service is terminated or no packet data to be transmitted are
25 generated for more than a predetermined time, the terminal may transit into the idle state under the control of the base station.

When the terminal is in the active state, the base station allocates radio resources for transmitting packet
30 data to the terminal according to quality of service (QoS) and burst characteristics. The radio resources are allocated semi-statically, persistently, or dynamically according to scheduling performance in an RRC layer and a medium access control (MAC) layer of the base station.

35 Generally, the QoS and such burst characteristics

of the packet service as packet data size and packet generation frequency are different according to whether the packet service is a real-time service or non-real time service. Also, allocation of radio resources for providing a service is affected as well. This factor is called activity level or activity factor. Ultimately, the scheduler of a base station allocates radio resources for transmitting packet data according to the activity factor.

Meanwhile, when a terminal does not transmit or receive packets in a packet-based cellular system, the terminal needs to execute an operation for saving power. An active-state terminal as well executes a power-saving operation in a packet-based cellular system during a discontinuous reception (DRX) period or a discontinuous transmission (DTX) period to save power consumption. Basically, a terminal executes the power-saving operation according to DRX/DTX period that are set up between the terminal and a base station. To take an example, an active-state terminal remains in a sleep mode for the predetermined DRX/DTX period, and wakes up at the end of the periods to decode control signal blocks transmitted from the base station.

Also, in order to support handover, which is one of the most important functions of a cellular system, the terminal measures quality information not only of a serving cell that is currently on service but also neighbor cells as well and reports the quality information to the base station.

The active-state terminal should execute the power-saving operation in a duration when no data burst out according to the predetermined discontinuous DRX/DTX period in the packet-based cellular system, while transmitting/receiving packet data through radio resources allocated by the scheduler of the base station.

Then, the terminal should report the measured quality information of the serving cell and neighbor cells for handover.

Fig. 1 exemplarily shows an operation of an active-state receiving a packet service that is generally performed according to discontinuous DRX/DTX period.

An active-state terminal receiving a service in a packet-based cellular system exchanges packet data with a base station through radio resources addressed by a scheduler of the base station according to scheduling information. The terminal executes a power-saving operation based on DRX/ and/or DTX parameters in a DRX/DTX operation section 12, which is not a packet data exchange section 11, to save power consumed in the terminal. The DRX/DTX parameters basically include DRX/DTX periods 13. The DRX/DTX periods 13 include DRX/DTX duration 14 and monitoring duration 15. In the DRX/DTX duration 14, the terminal does not transmit or receive packets to or from the base station to reduce its power consumption. In the monitoring duration 15, the terminal monitors information transmitted from the base station. The information involves information directing the terminal to receive downlink packets such as paging information.

In order to transmit packet data from the base station to the terminal in the DRX/DTX operation section, the base station transmits to the terminal information directing the terminal to receive data in the monitoring duration. When the terminal receives the data and acknowledges to the base station, the base station transmits downlink packet data.

Also, in order to transmit uplink packet information from the terminal to the base station, the terminal executes one of the following processes after DRX/DTX operation ends. At first, after the terminal

ends the DRX/DTX operation, the terminal tries a random access to the base station to receive radio resources allocated thereto. Secondly, the base station transmits scheduling information to the terminal in a duration
5 where the terminal is awake, which is the monitoring duration 15, following the ends of a DRX/DTX period and allocates uplink radio resources. Thirdly, uplink radio resources are allocated in the duration when the terminal is awake according to a protocol predetermined between
10 the base station and the terminal.

Meanwhile, handover is one of the most important functions of a cellular communication system. Active-state terminals should be able to transmit measurement information on a serving cell and neighbor cell
15 periodically or if necessary in order to smoothly perform handover. In the packet data exchange section 11 where packet data are exchanged between the base station and the terminal, the terminal can transmit the measurement information to the base station through one of the
20 following three methods. A first one is that the base station allocates additional uplink radio resources for the report of the measurement information. A second one is that the terminal transmits the measurement information along with packet data by using the allocated
25 uplink radio resources. The third one is that the terminal requests the base station to allocate radio resources to be used for reporting the measurement information through the allocated uplink radio resources.

As described above, since an active-state terminal,
30 too, operates according to DRX/DTX periods to save power in a packet-based cellular system, it is required to develop a method for the terminal performing power-saving operation to report measurement information on a serving cell and neighbor cells for the sake of handover.

35

DISCLOSURE**TECHNICAL PROBLEM**

An embodiment of the present invention, which is devised to overcome the shortcomings of related art, is directed to providing a measurement information reporting method for efficiently reporting measurement information on a serving cell and neighbor cells which is required for an active-state terminal executing power-saving operation to perform handover in a packet-based communication system.

Other objects and advantages of the present invention can be understood by the following description, and become apparent with reference to the embodiments of the present invention. Also, it is obvious to those skilled in the art of the present invention that the objects and advantages of the present invention can be realized by the means as claimed and combinations thereof.

TECHNICAL SOLUTION

In accordance with an aspect of the present invention, there is provided a method for reporting measurement information about a serving base station and neighbor base stations in a packet-based communication system, the method which includes the steps of: (a) receiving a discontinuous reception (DRX) period, a discontinuous transmission (DTX) period, and a measurement information report parameter that are decided by a base station; and (b) measuring channel quality according to a measurement information report period included in the measurement information report parameter, and reporting measurement information formed based on the measurement information report parameter by using radio resources allocated by the base station.

In accordance with another aspect of the present invention, there is provided a method for reporting measurement information about a serving base station and neighbor base stations in a packet-based communication system, the method which includes the steps of: (a) deciding a discontinuous reception (DRX) period, a discontinuous transmission (DTX) period, and a measurement information report parameter; (b) transmitting the DRX period, the DTX period, and the measurement information report parameter decided above to a terminal; and (c) measuring channel quality according to a measurement information report period included in the measurement information report parameter, and receiving measurement information formed based on the measurement information report parameter by using allocated radio resources.

ADVANTAGEOUS EFFECTS

The measurement information reporting method of the present invention described above can measure and report information on base stations of a serving cell and neighbor cells based on measurement information report parameters that are set up by the respective base stations to support handover at active-state terminals executing a power-saving operation in a packet-based communication system.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 exemplarily shows an operation of an active-state that is generally performed according to DRX/DTX periods.

Fig. 2 illustrates a typical measurement information report period according to a DRX/DTX operation period.

Fig. 3 illustrates a DRX/DTX period for a real-

time service and a measurement information report period.

Fig. 4 is a flowchart describing a measurement information reporting method in accordance with an embodiment of the present invention.

5 Fig. 5 is a flowchart describing a measurement information reporting method in a base station in accordance with an embodiment of the present invention.

Fig. 6 is a flowchart describing a measurement information reporting method in a terminal in accordance
10 with an embodiment of the present invention.

BEST MODE FOR THE INVENTION

The advantages, features and aspects of the invention will become apparent from the following
15 description of the embodiments with reference to the accompanying drawings, which is set forth hereinafter. When it is considered that detailed description on a related art may obscure a point of the present invention, the description will not be provided herein. Hereinafter,
20 specific embodiments of the present invention will be described with reference to the accompanying drawings.

Discontinuous reception (DRX) and discontinuous transmission (DTX) periods may be different according to quality of service (QoS) and attributes of a packet
25 service, capability of a terminal, and aforementioned activity factor. For example, the DRX and DTX periods may be 10 milliseconds or so in case of a real-time service, and it may be even 0 milliseconds in an extreme case. The DRX and DTX periods may range up to about 1
30 second and the maximum time defined by a system, when a service is not sensitive to time delay such as a non-real time service. Therefore, the terminal executing the power-saving operation should report measurement information at a period related to the DRX and DTX
35 periods to efficiently report the measurement information.

Otherwise, the report of measurement information may collide with the power-saving operation.

Fig. 2 illustrates an example where a typical terminal executing a power-saving operation reports
5 measurement information based on a protocol predetermined between a base station and the terminal.

The base station sets up a measurement information report period as well when it sets up DRX and DTX periods for power-saving operation. Also, the base station sets
10 up the measurement information report period according to loading status of the base station, a network environment, e.g., wireless channel environment, and an activity factor of the terminal acquired based on a provided service.

15 It is efficient to set up the measurement information report period to be multiple numbers of the DRX and DTX periods. Consequently, the minimum unit of the measurement information report period is the DRX and DTX periods of a corresponding terminal. The base
20 station can change the measurement information report period at a certain time moment. The terminal may perform measurement for a long time duration 32 to report measurement information in detail in the measurement information report duration 31. However, the measurement
25 should be carried out while the terminal maintains the DRX/DTX periods for power-saving operation. In other words, the measurement operation and the DRX/DTX periods cannot be independent from each other in the terminal, and the terminal should measure quality information of a
30 serving cell and neighbor cells even in a sleep duration of the DRX operation. The monitoring duration for monitoring downlink control information from the base station follows the predetermined DRX/DTX periods.

Uplink physical layers should be synchronized to
35 maintain orthogonality among terminals during uplink data

transmission in a packet-based cellular system based on Orthogonal Frequency Division Multiple Access (OFDMA). Therefore, not only terminals transmitting/receiving packets but also terminals executing the power-saving
5 operation should have their physical layers synchronized at the moment when they transmit uplink packets.

Terminals executing the power-saving operation according to DRX/DTX periods may maintain uplink physical layer synchronization even in the middle of the power-saving operation according to an activity factor of the
10 provided service, or they may not maintain physical layer synchronization in a predetermined time after they transit into DRX/DTX operation mode. Particularly, they need to maintain uplink physical layer synchronization in
15 case of a real-time service where radio resources are periodically allocated according to the DRX/DTX periods.

Fig. 3 illustrates an example of operation according to DRX/DTX periods. In case of a real-time service, a base station and a terminal periodically
20 allocates radio resources for packet transmission for each DRX/DTX period. In this case, the terminal can report measurement information through radio resources allocated thereto for each DRX/DTX period according to a pre-established measurement information report parameter.
25 Also, the base station can direct the terminal to report measurement information along with the transmission of packet data. The terminal, too, can report measurement information through the uplink radio resources allocated thereto or request the base station to allocate uplink
30 radio resources for the transmission of the measurement information, although the measurement information report period has yet come.

The measurement information report parameter may include a measurement information report period, a
35 measurement information report object, and a measurement

information report content. In addition, the measurement information report parameter may further include information defining measurement information report requirements for a case when an event occurs, which will
5 be called an event-driven measurement information report requirements.

The measurement information report period is set up to be a multiple number of the DRX/DTX periods. The measurement information report object includes the range
10 of neighbor cells to be measured. Generally, the base station broadcasts a list of neighbor base stations, or neighbor cells, by using system information. The range of neighbor cells to be measured is decided in the list of neighbor cells to be measured.

15 Meanwhile, when the system information does not include the neighbor cell information, the terminal requests the base station through an additional control signaling and receives the neighbor cell information, or it checks neighbor cells with its cell search function
20 and measures information about the neighbor cells.

The measurement information report content may include radio channel quality report values of the serving cell and neighbor cells, a measurement section value, and the inference level from the neighbor cells.
25 The radio channel quality report value includes a section average value and a standard deviation value of channel quality for a system band and a section average value and a standard deviation value of channel quality for a frequency group in a system band. The measurement
30 section value denotes time taken for the measurement.

Meanwhile, the information on the event-driven measurement information report requirements denotes requirement information for reporting measurement information with no regard to the measurement information
35 report period and the DRX/DTX operation under the

following specific conditions. The specific conditions may include a first case where the quality of the serving cell is deteriorated and thus handover should be requested, a second case where there is a target cell
5 superior to the serving cell by a predetermined level and thus handover should be requested, and a third case where the quality of the provided service does not satisfy requirements.

The control and parameter setup for reporting the
10 measurement information are established through discussion between the base station and the terminal. Of course, the measurement information report parameter may be changed. The change in the measurement information report parameter is carried out through the following two
15 methods.

First, the measurement information report parameter can be changed by exchanging control information. To be specific, the base station decides to change the measurement information report parameter based
20 on measurement information report information, and change the measurement information report parameter by exchanging control information with the terminal.

Secondly, the terminal can change the measurement information report parameter without exchanging control
25 information. To be specific, the base station informs the terminal of a set of available measurement information report parameters, and the terminal changes the measurement information report parameter into a proper parameter among the parameters of the set.

30 Herein, the measurement information report parameter is changed by exchanging control information. Although the measurement information report parameter can be set up properly by exchanging additional information between the base station and the terminal, signaling
35 overhead caused by the transmission of control

information exists. Differently from the method, the method of changing the measurement information report parameter without exchanging control information does not cause signaling overhead but it may report measurement
5 information that does not suitable for an event of the base station. This is because the base station sets up a set of available measurement information report parameters in advance and the terminal changes the measurement information report parameter into a proper
10 parameter among the parameters of the set according to the event without exchanging control information.

Likewise, a change in the measurement information report period should be carried out through definite signaling with the base station when the measurement
15 information report parameter is exchanged without exchanging control information. A change in other parameters may be independently performed by the terminal.

Hereinafter, examples of changeable measurement information parameters will be described. A measurement
20 information report parameter is changed by selecting one among a plurality of measurement information report types according to the standard deviation of a measurement result. For example, when the standard deviation of a measurement result performed for a predetermined time
25 period falls in a predetermined range, a type of a measurement information report message which forms a measurement information report parameter by excluding some of measurement information report objects or reducing a measurement information report content so that
30 report load is decreased. However, when the standard deviation of the measurement result performed for a predetermined time period is out of the predetermined range, a type of a measurement information report message which forms a measurement information report parameter by
35 adding a measurement information report object or

increasing the measurement information report content so that report load is increased. The following Table 1 shows measurement information report objects and measurement information report contents according to the

5 types of measurement information report messages.

Table 1

Type of MI report message	MI report object	MI report content
1	Serving cell	Section average value and standard deviation of channel quality for system band; and section average value and standard deviation of channel quality for a frequency group in system band
	All cells listed on neighbor cell list	Section average value and standard deviation of channel quality for system band
2	Serving cell	Section average value and standard deviation of channel quality for system band
	All cells listed on neighbor cell list	Section average value of channel quality for system band
3	All cells listed on neighbor cell list	Section average value of channel quality for system band

4	Serving cell	Section average value and standard deviation of channel quality for system band
	Some cells listed on neighbor cell list (2-tiered)	Section average value and standard deviation of channel quality for system band
5	Some cells listed on neighbor cell list (2-tiered)	Section average value and standard deviation of channel quality for system band
6	Serving cell	Section average value and standard deviation of channel quality for system band
	Some cells listed on neighbor cell list (1-tiered)	Section average value and standard deviation of channel quality for system band
7	Some cells listed on neighbor cell list (1-tiered)	Section average value and standard deviation of channel quality for system band
8	Serving cell	Section average value and standard deviation of channel quality for system band; and section average value and standard deviation of channel quality for a frequency group in system band

9	Serving cell	Section average value and standard deviation of channel quality for system band
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*MI denotes measurement information.

Fig. 4 is a flowchart describing a measurement information reporting method to support handover in accordance with an embodiment of the present invention.

In step S401, a terminal receives a handover-related threshold value information carried over system information from a base station before a packet service is initiated. In step S402, the base station and the terminal executes radio resource control (RRC) connection to provide the packet service. The RRC connection between the base station and the terminal may be carried out in a known technology. In the step S401, when a serving base station does not broadcast neighbor cell information, the terminal may request the base station to send the neighbor cell information through an additional control signaling process. Also, the terminal checks neighbor cells with its cell search function, measures the downlink channel quality of the neighbor cells, and reports the measurement information to the serving base station.

If necessary, a DRX/DTX parameter for executing a power-saving operation in an active-state terminal may be set up along with the RRC connection according to quality of service (QoS) and attributions of the packet service. Otherwise, the DRX/DTX parameter may be set up through an additional process after the base station decides the DRX/DTX in the middle of the packet service in step S403. Herein, the base station may discuss the DRX/DTX parameter and the measurement information report parameter with the terminal in step S404 so that the base

station can decide related parameters in step S405.

In step S406, the base station informs the terminal of the decided DRX/DTX parameter and the measurement information report parameter. The
5 measurement information report parameter can be set up as the base station transmits an index indicating the type of a measurement information report message to the terminal according to a measurement information report
10 message forming method. In short, the measurement information report parameter can be set up by selecting any one among the types of measurement information report messages shown in the Table 1 in the base station, and informing the terminal of an index corresponding to the selected measurement information report message type.

15 In step S407, the terminal measures information on the serving cell and neighbor cells at every measurement information report period while executing the DRX/DTX operation based on the parameter set up by the base station, and reports the measured information.

20 Meanwhile, in step S408, the terminal decides whether to change the measurement information report parameter when a predetermined condition is satisfied, and if necessary, it changes the measurement information report parameter. When the terminal changes the
25 measurement information report parameter without exchanging any control information, it changes the measurement information report parameter and reports the measurement information based on the changed parameter in step S409. Otherwise, when the terminal changes the
30 measurement information report parameter by exchanging control information, the terminal changes the measurement information report parameter through an additional process without the base station, and reports the measurement information based on the changed parameter in
35 the step S409.

Also, in step S410, the terminal executes an event-driven measurement information report when a predetermined condition is satisfied while the terminal executes measurement information report periodically
5 based on the measurement information report parameter. When there are no uplink radio resources for the measurement information report, the terminal stops the DRX/DTX operation and requests the base station for radio resources to be used to report the measurement
10 information in step S411. In steps S412 and S413, when the base station allocates resources for the measurement information report, the terminal executes the event-driven measurement information report by using the allocated resources.

15 Fig. 5 is a flowchart describing a measurement information reporting method for handover in a base station in accordance with an embodiment of the present invention.

In step S501, a serving base station broadcasts
20 neighbor cell information and handover-related threshold value information through a broadcast channel. Broadcasting the neighbor cell information and handover-related threshold value information through a broadcast channel from the serving base station is optional and the
25 process may be realized in other ways as described above.

In step S502, the serving base station executes radio resource control (RRC) connection with a terminal present in its cell through a typical process. In step S503, the serving base station discusses DRX/DTX periods
30 for power-saving operation and a measurement information report parameter of the serving cell and neighbor cells for the sake of handover with the terminal. In step S504, the base station decides a DRX/DTX parameter and a measurement information report parameter. In step S505,
35 the base station informs the terminal of the decided

DRX/DTX parameter and measurement information by using the allocated radio resources.

In step S506, the base station receives the measured information of the serving cell and/or neighbor
5 cells based on the measurement information report parameter transmitted from the terminal. In step S507, the base station transits into a waiting mode and, in steps S508 and S509, the base station exchanges control information with the terminal, changes the measurement
10 information report parameter, and informs the terminal of the changed measurement information report parameter, when the measurement information report parameter needs to be changed based on the measurement information transmitted from the terminal. This process involves
15 changing the measurement information report parameter through exchange of control information. When the measurement information report parameter is changed without exchanging control information, the process of the steps S508 and S509 is omitted.

20 Meanwhile, when the base station receives a radio resource allocation request for the report of the measurement information from the terminal in step S510, it allocates uplink radio resources for measurement information report in step S511, and transmits the
25 allocated radio resources to the terminal. To sum up, the process where the base station allocates radio resources upon a request from the terminal and informs the terminal of the allocated radio resources may be performed through a typical procedure.

30 Fig. 6 is a flowchart describing a measurement information reporting method for handover in a terminal in accordance with an embodiment of the present invention.

In step S601, a terminal receives neighbor cell information and handover-related threshold value
35 information from a serving base station through a

broadcast channel. When the serving base station does not broadcast the neighbor cell information and handover-related threshold value information, the terminal may request the serving base station for neighbor cell
5 information and receive it through an additional control signaling process. Also, the terminal may check neighbor cells with its cell search function, measure downlink channel quality of the neighbor cells, and reports the measurement information to the serving base station.

10 In step S602, the terminal sets up an RRC connection with the serving base station through a predetermined access procedure. Subsequently, the terminal discusses a DRX/DTX parameter for power-saving operation and a measurement information report parameter
15 for handover with the serving base station through the RRC connection in step S603. In step S604, the terminal receives a DRX/DTX parameter and a measurement information report parameter that are decided by the serving base station. Herein, the terminal may set up a
20 measurement information report parameter by receiving an index indicating the type of a measurement information report message from the serving base station according to a measurement information message forming method. According to another method, the terminal may receive a
25 set of available measurement information report parameters from the serving base station.

In step S606, the terminal measures information about the serving base station and the neighbor cells according to a measurement information report period
30 included in the measurement information report parameter and reports the measurement information to the serving base station by using radio resources allocated by the serving base station. In other words, the terminal executing a power-saving operation wakes up at the
35 measurement information report period included in the

measurement information report parameter, measures channel qualities of the serving cell and neighbor cells, decodes control signal blocks transmitted from the serving base station at the measurement information
5 report period, checks radio resources information allocated for measurement information report, and reports the measurement information by using allocated radio resources.

In step S607, the terminal decides whether to
10 change the measurement information report parameter based on a measurement result acquired after measurement for a predetermined time period. In other words, the terminal decides whether to change the type of a measurement information report message based on whether a standard
15 deviation of the measurement result acquired after measurement for a predetermined time period falls in or out of a predetermined range. When the terminal needs to change the measurement information report parameter in step S608, the terminal changes the measurement
20 information report parameter by exchanging control information, which is described above, or changes it without exchanging any control information in step S609. In step S610, the terminal reports measurement information based on the changed measurement information
25 report parameter.

Meanwhile, when a specific event occurs in step S611, the terminal requests the serving base station to allocate radio resources for measurement information report in step S612 to report measurement information
30 regardless of the DRX/DTX period. In step S613, the terminal reports the measurement information by using the radio resources allocated by the base station.

The method of the present invention described above may be programmed for a computer. Codes and code
35 segments constituting the computer program may be easily

inferred by a computer programmer of ordinary skill in the art to which the present invention pertains. The computer program may be stored in a computer-readable recording medium, i.e., data storage, and it may be read
5 and executed by a computer to realize the method of the present invention. The recording medium includes all types of computer-readable recording media.

While the present invention has been described with respect to certain preferred embodiments, it will be
10 apparent to those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

Industrial Applicability

15 The present invention measures and report information about a serving base station and neighbor base stations based on a measurement information report parameter, which is set up by the serving base station, to support active-state terminals executing a power-
20 saving operation to perform handover in a packet-based communication system.

WHAT IS CLAIMED IS

1. A method for reporting measurement information about a serving base station and neighbor
5 base stations in a packet-based communication system, comprising:

(a) receiving a discontinuous reception (DRX) period, a discontinuous transmission (DTX) period, and a measurement information report parameter that are decided
10 by a base station; and

(b) measuring channel quality according to a measurement information report period included in the measurement information report parameter, and reporting measurement information formed based on the measurement
15 information report parameter by using radio resources allocated by the base station.

2. The method of claim 1, further comprising the step of:

20 (c) changing the measurement information report parameter according to a standard deviation of a measurement result acquired after measurement for a predetermined time.

25 3. The method of claim 1, wherein the measurement information report parameter includes at least any one among the measurement information report period, a target base station whose measurement information is to be reported among the serving base
30 station and the neighbor base stations, and a measurement information report content including radio channel quality information.

4. The method of claim 1, wherein the measurement information report period is a multiple number of the DRX period and the DTX period.

5 5. The method of claim 3, wherein the measurement information report parameter further includes event-driven measurement information report requirement information for reporting measurement information without regard to the DRX period and the DTX period.

10

6. The method of claim 5, further comprising the steps of:

requesting the serving base station to allocate radio resources; and

15 reporting measurement information formed based on the measurement information report parameter by using the radio resources allocated by the serving base station in order to report the measurement information based on the event-driven measurement information report requirement information.

20

7. The method of claim 2, wherein in the step (c),

the serving base station decides to change the measurement information report parameter based on the standard deviation of the measurement result acquired after measurement for a predetermined time, and the measurement information report parameter is changed through exchange of control signals with the serving base station.

25

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8. The method of claim 2, wherein the step (c) includes the steps of:

receiving a set of available measurement information report parameters from the serving base station; and

changing the measurement information report
5 parameter by selecting one from the received measurement information report parameter set based on the standard deviation of the measurement result acquired after measurement for a predetermined time.

10 9. A method for reporting measurement information about a serving base station and neighbor base stations in a packet-based communication system, comprising the steps of:

(a) deciding a discontinuous reception (DRX) period,
15 a discontinuous transmission (DTX) period, and a measurement information report parameter;

(b) transmitting the DRX period, the DTX period, and the measurement information report parameter decided above to a terminal; and

20 (c) measuring channel quality according to a measurement information report period included in the measurement information report parameter, and receiving measurement information formed based on the measurement information report parameter by using allocated radio
25 resources.

10. The method of claim 9, further comprising the step of:

(d) changing the measurement information report
30 parameter.

11. The method of claim 9, wherein the measurement information report parameter includes at least any one among the measurement information report
35 period, a target base station whose measurement

information is to be reported among the serving base station and the neighbor base stations, and a measurement information report content including radio channel quality information.

5

12. The method of claim 9, wherein the measurement information report period is a multiple number of the DRX period and the DTX period.

10

13. The method of claim 11, wherein the measurement information report parameter further includes event-driven measurement information report requirement information for reporting measurement information without regard to the DRX period and the DTX period.

15

14. The method of claim 13, further comprising the steps of:

receiving a radio resource allocation request from the terminal; and

20

allocating radio resources for measurement information report and informing the terminal of the allocated radio resource information; and

receiving measurement information formed based on the measurement information report parameter through the allocated radio resources,

25

in order to report the measurement information based on the event-driven measurement information report requirement information.

30

15. The method of claim 10, wherein in the step (d),

whether to change the measurement information report parameter is decided based on a standard deviation of a measurement result acquired by the terminal after measurement for a predetermined time, and the measurement

35

information report parameter is changed through exchange of control signals with the terminal.

16. The method of claim 10, wherein the step (d)
- 5 includes the steps of transmitting a set of available measurement information report parameters to the terminal, selecting one from the measurement information report parameter set in the terminal, and changing the measurement information report parameter with the
- 10 selected measurement information report parameter in the terminal.

FIG. 1

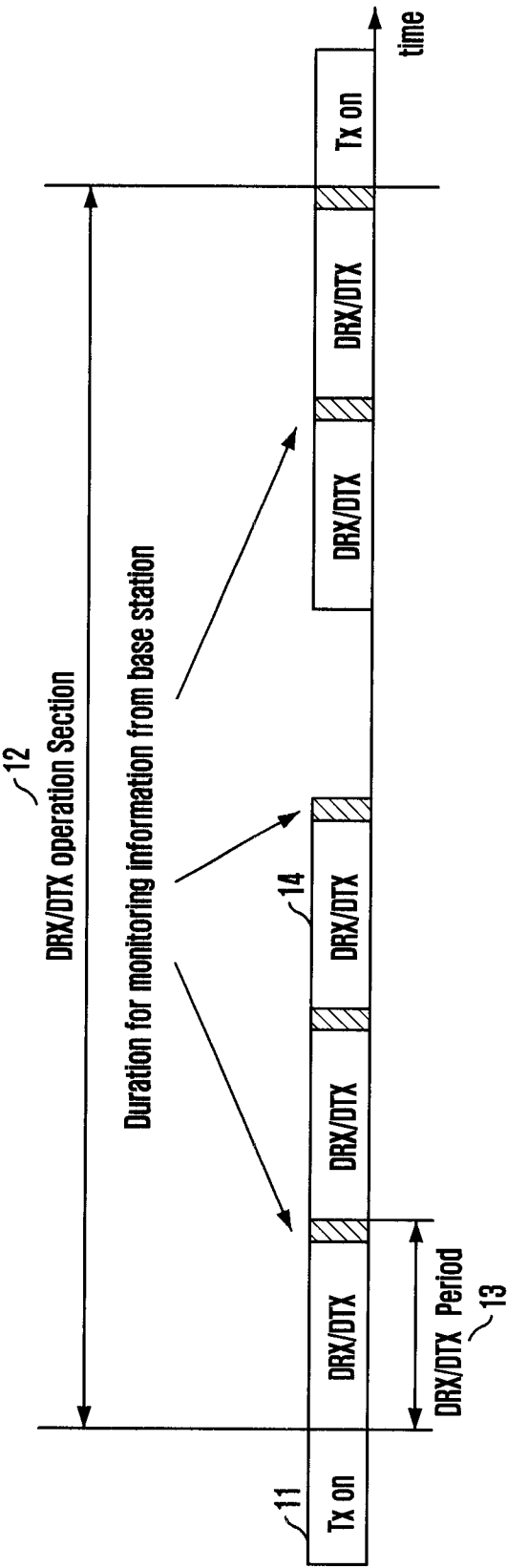


FIG. 2

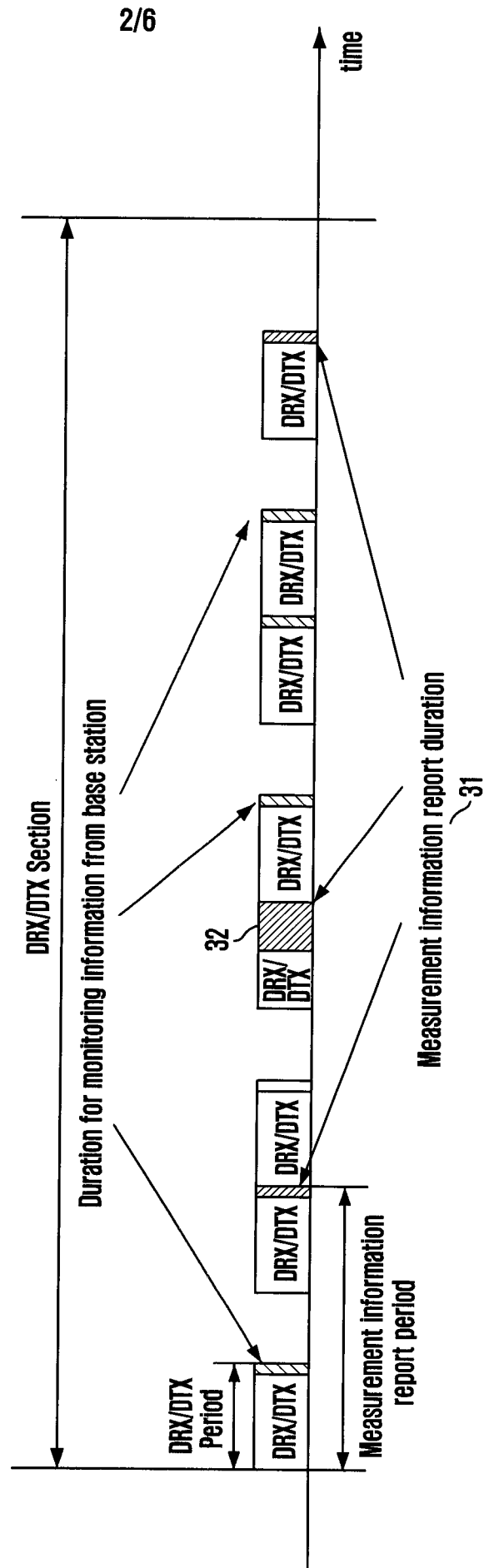
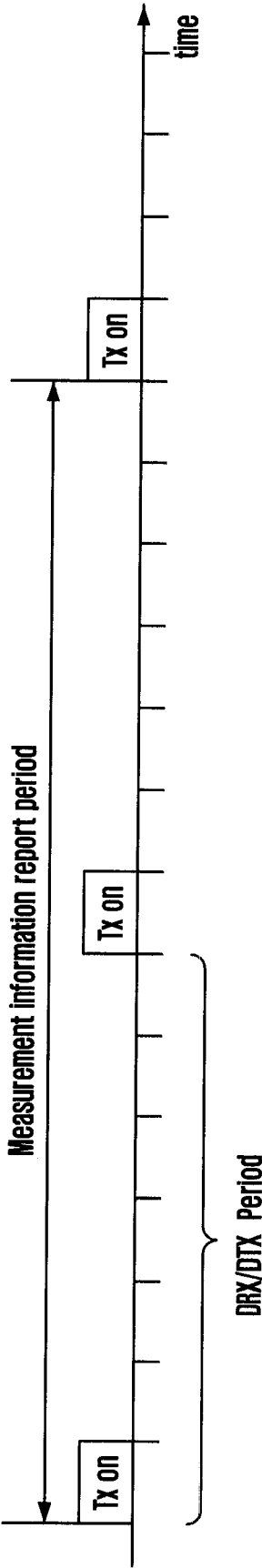
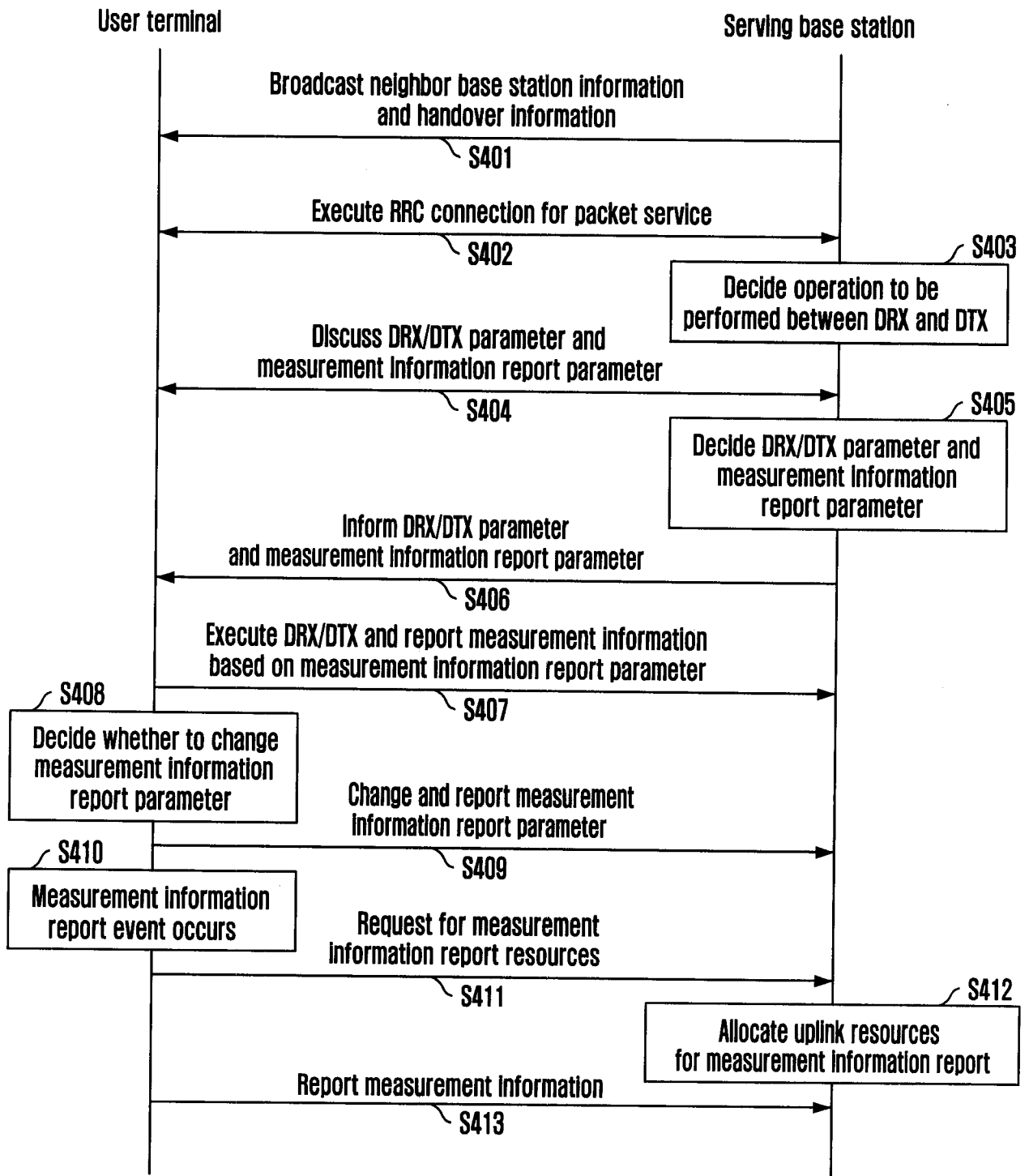


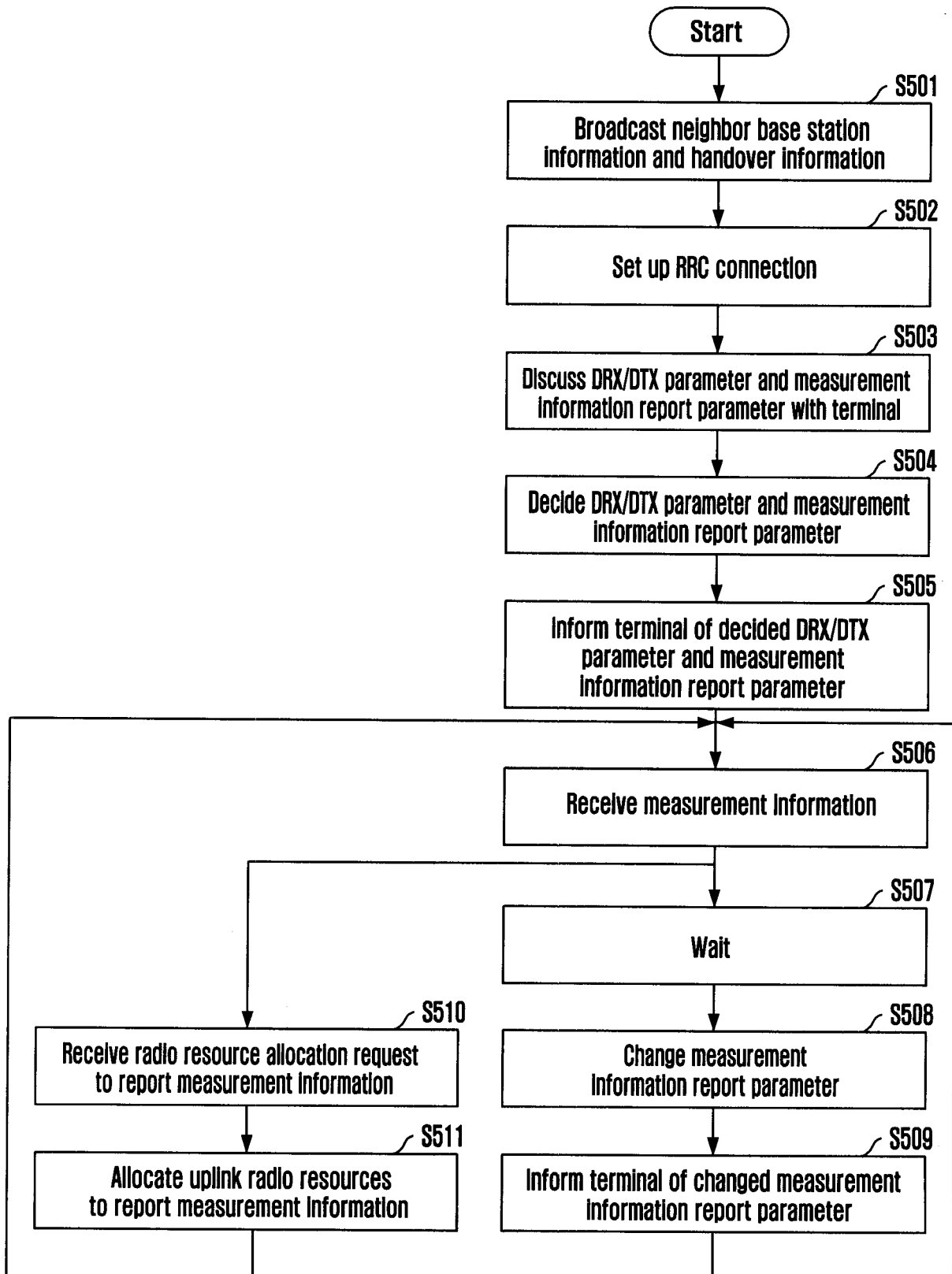
FIG. 3

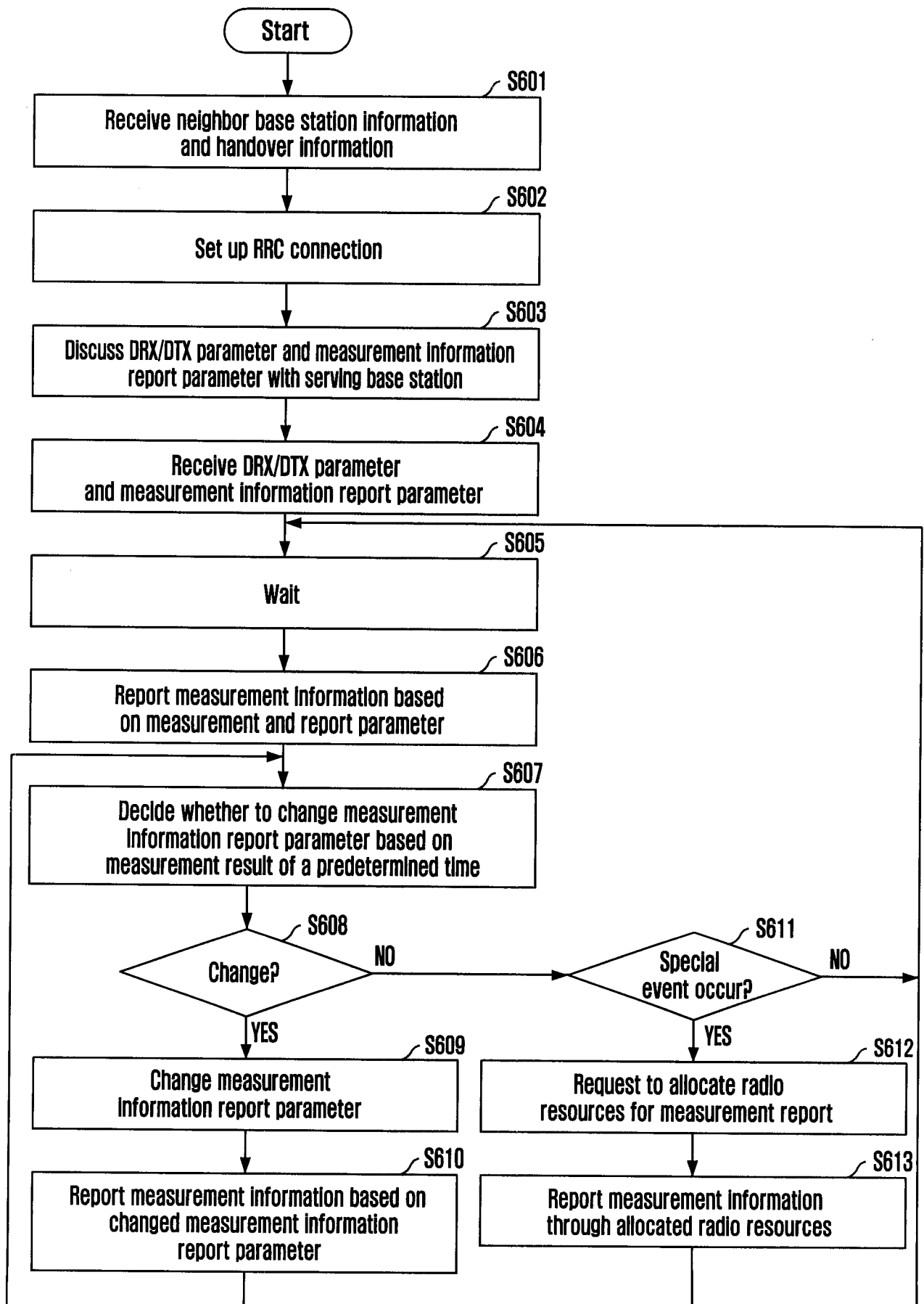


4/6

FIG. 4



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FIG. 5

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FIG. 6

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P07E8046PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/KR2008/000033	International filing date (<i>day/month/year</i>) 03 JANUARY 2008 (03.01.2008)	(Earliest) Priority Date (<i>day/month/year</i>) 12 JANUARY 2007 (12.01.2007)
Applicant ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE et al		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:
A METHOD OF REPORTING MEASUREMENT INFORMATION IN PACKET BASED CELLULAR SYSTEM

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the **drawings** to be published with the abstract is Figure No. 4

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

b. ☐ none of the figure is to be published with the abstract.

A. CLASSIFICATION OF SUBJECT MATTER***H04B 17/00(2006.01)i***

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 H04B

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 since 1975

Japanese Utility models and applications for Utility models since 1975

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

eKIPASS(KIPO internal) : "DRX, DTX, packet, channel quality, measurement, reporting"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2006-083134 A1 (LG ELECTRONICS INC.) 10 Aug. 2006 See Abstract, Fig.6	1-16
A	US 2005-0201296 A1 (VANNITHAMBY et al.) 15 Sep. 2005 See Abstract, Figs. 4,5	1-16
A	US 2005-0191965 A1 (YU et al.) 1 Sep. 2005 See Abstract, Fig.6	1-16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

"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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

22 APRIL 2008 (22.04.2008)

Date of mailing of the international search report

22 APRIL 2008 (22.04.2008)

Name and mailing address of the ISA/KR

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gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, Jin Ick

Telephone No. 82-42-481-5770



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2008/000033

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
W02006083134A1	10.08.2006	AU2006211777A1 CA2583663A1 EP01803237A1 KR1020060089603 KR1020070111473 KR2005100624A KR2005101313A KR2006089603A US2006215609A1	10.08.2006 10.08.2006 04.07.2007 09.08.2006 21.11.2007 19.10.2005 21.10.2005 09.08.2006 28.09.2006
US2005201296AA	15.09.2005	W02005091541A2	29.09.2005
US2005191965AA	01.09.2005	None	