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(71) Applicant *(for all designated States except US)*: **LG ELECTRONICS INC.** [KR/KR]; 20, Yoido-dong, Youngdungpo-gu, Seoul 150-721 (KR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **LEE, Young Dae** [KR/KR]; LG Institute, Hogye 1(il)-dong, Dongan-gu, Anyang-si, Gyeonggi-do 730-070 (KR). **CHUN, Sung Duck** [KR/KR]; LG Institute, Hogye 1(il)-dong, Dongan-gu, Anyang-si, Gyeonggi-do 431-749 (KR). **PARK, Sung Jun** [KR/KR]; LG Institute, Hogye 1(il)-dong, Dongan-gu, Anyang-si, Gyeonggi-do 431-749 (KR).

(74) Agents: **KIM, Yong In** et al.; KBK & Associates, 15th Floor, Yosam-Building, 648-23, Yeoksam-dong, Kangnam-gu, Seoul 135-080 (KR).

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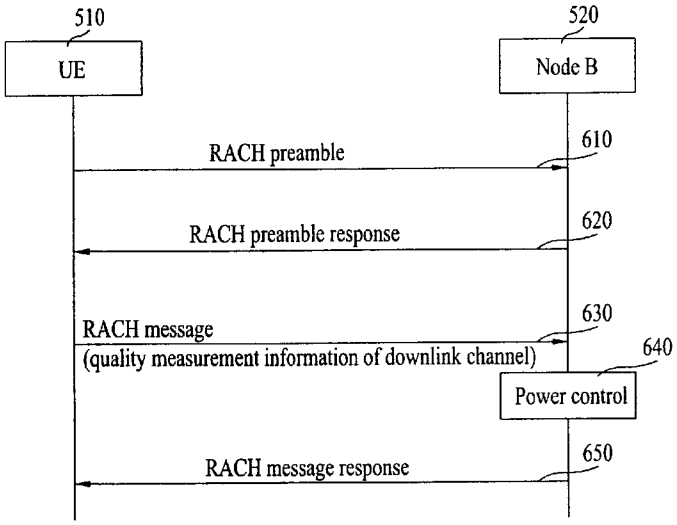

(57) Abstract: A method for responding to a random access channel message, a method for transmitting a random access channel message and a mobile communication terminal for supporting the same are disclosed. The method for responding to a random access channel message includes reading quality measurement information of a downlink channel from a second layer header of a random access channel (RACH) message which is transmitted from a user equipment to an uplink, controlling transmission power of a response message for the RACH message according to the quality measurement information; and transmitting the response message to the user equipment. Since transmission power can be adaptively controlled according to a channel measurement result of the user equipment, a radio resource can be efficiently used. In a method in which information indicating whether or not quality measurement information is included or whether or not upper layer information is included is notified to a base station through a header, compatibility between the existing user equipment and a radio network can be maintained.

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Method for transmitting random access channel message and response message, and Mobile communication terminal

Technical Field

The present invention relates to random access of a mobile communication system, and more particularly to a method for controlling transmission power of a random access channel (RACH) response message according to a channel measurement result of a mobile communication terminal for transmitting data using an uplink channel so as to efficiently use a radio resource, and a terminal for supporting the method.

Background Art

FIG. 1 is a view showing a network structure of a universal mobile telecommunication system (UMTS).

The UMTS largely includes a user equipment (UE), a UMTS terrestrial radio access network (hereinafter, abbreviated to UTRAN), and a core network (hereinafter, abbreviated to CN). The UTRAN includes at least one radio network sub-system (hereinafter, abbreviated to RNS). Each RNS includes a radio network controller (hereinafter, abbreviated to RNC) and at least one base station (hereinafter, referred to as a Node B) managed by the RNC. One Node B includes at least one cell.

FIG. 2 is a view showing the structure of a radio interface protocol between the UTRAN and the UE on the basis of 3GPP radio access network standard.

As shown in Figure 2, the radio access interface protocol includes horizontal layers including a physical layer, a data link layer and a network layer, and vertical planes including a user plane for transmitting data information and a control plane for transmitting control signals. In Figure 2, the protocol layers can be divided into L1 (a first layer), L2 (a second layer), and L3 (a third layer) based on three lower layers of an open system interconnection (OSI) standard model well known in the art of communication systems.

Hereinafter, the layers shown in FIG. 2 will be described. The physical layer which is the first layer provides an information transfer service to an upper layer by using a physical channel. The physical layer is connected to a medium access control layer, which is an upper layer, through a transport channel, and data is transferred between the medium access control layer and the physical layer through the transport channel. In addition, data is transferred between different physical layers, that is, physical layers of a transmission side and a reception side, through a physical channel.

The medium access control (hereinafter, abbreviated to MAC) layer, which is the second layer, provides a service to a radio link control layer, which is an upper layer, through a logic channel. The radio link control (hereinafter, abbreviated to RLC) layer, which is the second layer, provides support for reliable data transmissions, and may perform a function of segmentation and concatenation of an RLC service data unit (SDU) coming from a higher layer.

A radio resource control (hereinafter, abbreviated to RRC) layer located at a lowest portion of the third layer is only defined in the control plane, and controls the logic channels, the transport channels and the physical channels in relation to the configuration, the reconfiguration, and the release of a radio bearer (Hereinafter, abbreviated to RB). At this time, the RB signifies a service provided by the second layer for data transmission between the UE and the UTRAN. In general, the set up of the RB refers to the process of stipulating the characteristics of a protocol layer and a channel required for providing a specific service, and setting the respective detailed parameters and operation methods.

A RACH of a wideband code division multiple access (WCDMA) will be described in more detail as follows. The RACH is used to transfer short length data on an uplink.

In more detail, the RACH is used when the UE acquires initial uplink synchronization. The RACH is used when the UE is first turned on or is switched from a long-time idle mode to an active mode such that the uplink synchronization is set again, and may be used without establishing time synchronization or frequency synchronization. The RACH basically supports multiple users. Each UE transmits a specific preamble sequence when accessing the RACH, the Node B recognizes the preamble sequence and transmits a signal to a downlink, and the UE updates its own time synchronization information using the information. At this time, if frequency synchronization information is transmitted together, the frequency synchronization information may be used in the information of the UE.

The RACH, which is the transport channel, is mapped to the physical random access channel (PRACH).

FIG. 3 is a view showing a conventional PRACH transmission.

As shown in FIG. 3, the PRACH is divided into a preamble part and a message part. The preamble part performs a power ramping function for properly controlling transmission power used for message transmission and a function for avoiding collision among several UEs. The message part performs a function for transmitting an MAC

protocol data unit (hereinafter, abbreviated to PDU) transferred from the MAC to the physical channel.

When the MAC of the UE instructs a PRACH transmission to the physical layer of the UE, the physical layer of the UE first selects one access slot and one signature, and transmits the preamble on the PRACH to an uplink. The preamble is transmitted within an access slot duration having a length of 1.33 ms, and one signature is selected from 16 signatures within a first certain length of the access slot and is transmitted. When the UE transmits the preamble, the Node B transmits a response signal through an acquisition indicator channel (AICH) which is a downlink physical channel. The AICH, in response to the preamble, transmits the signature which was selected by the preamble within the first certain length of the access slot corresponding to the access slot for transmitting the preamble. At this time, the Node B transmits an acknowledge (ACK) response or a non-acknowledge (NACK) response to the UE through the signature transmitted by the AICH.

When the UE receives the ACK response, the UE transmits a message part having a length of 10 ms or 20 ms using an orthogonal variable spreading factor (OVSF) corresponding to the transmitted signature.

When the UE receives the NACK response, the MAC of the UE instructs a PRACH retransmission to the physical layer of the UE after a certain time period. In contrast, if the UE does not receive the AICH corresponding to the transmitted preamble, the UE transmits a new preamble with power higher than that of the previous preamble, after a predetermined access slot.

FIG. 4 is a view showing an exemplary structure of an AICH which is a conventional downlink physical channel.

The AICH, which is the downlink physical channel, transmits 16 symbol signatures (Si, i=0 … 15) for the access slot having a length of 5120 chips. Here, the UE may select any arbitrary signature (Si) from S0 signature to S15 signature, and then transmits the selected signature during the first 4096 chips length. The remaining 1024 chips length is set as a transmission power off period during which no symbol is transmitted. Also, as similar to FIG. 4, the preamble part of the PRACH, which is the uplink physical channel, transmits 16 symbol signatures (Si, i=0 … 15) during the first 4096 chips length.

However, in the conventional RACH transmission, since the downlink message, which is transmitted in response to the uplink RACH message transmission, is transmitted with high power so as to be received even in a cell boundary, a radio resource was inefficiently used.

Disclosure of Invention

Accordingly, the present invention is directed to a method for transmitting a random access channel message and a response message, and a mobile communication terminal that substantially obviate one or more problems due to limitations and disadvantages of the related art.

An object of the present invention devised to solve the problem lies on a method for responding to a random access channel message, which is capable of properly controlling transmission power using measurement information of a user equipment (UE) and transmitting a message to the UE.

Another object of the present invention devised to solve the problem lies on a method for transmitting a random access channel message, which is capable of including measurement information of a UE in an uplink message in order to properly control transmission power of a base station.

Another object of the present invention devised to solve the problem lies on a mobile communication terminal which implements a method for transmitting a random access channel message so as to efficiently use a radio resource.

The object of the present invention can be achieved by providing a method for responding to a random access

channel message, the method including: reading quality measurement information of a downlink channel from a second layer (hereinafter, referred to as L2) header of a random access channel (RACH) message which is transmitted from a user equipment to an uplink; controlling transmission power of a response message for the RACH message according to the quality measurement information; and transmitting the response message to the user equipment.

Preferably, the L2 header may be a medium access control (MAC) header configuring an MAC protocol data unit (PDU).

Preferably, the controlling of the transmission power may include the following processes if upper layer information is included in the MAC PDU of the RACH message. That is, the process of controlling the transmission power may include removing the quality measurement information from the MAC PDU and transmitting the MAC PDU to the MAC of a radio network controller (RNC). At this time, the upper layer information may be a radio resource control (RRC) message transmitted through at least one of a common control channel (CCCH), a dedicated control channel (DCCH) and a dedicated traffic channel (DTCH), all of which are logic channels.

Preferably, the response message may include any one of an acknowledge (ACK) response for notifying that the

RACH message is successfully received and a non-acknowledge (NACK) response for notifying that the RACH message is not successfully received.

In another aspect of the present invention, provided herein is a method for responding to a random access channel message, the method including: reading quality measurement information of a downlink channel included in a payload next to an L2 header from a random access channel (RACH) message which is transmitted from a user equipment to an uplink; controlling transmission power of a response message for the RACH message according to the quality measurement information; and transmitting the response message to the user equipment.

Preferably, the RACH message may store information, which indicates whether or not the quality measurement information is included in the payload, in a target channel type field (TCTF) of the L2 header.

In another aspect of the present invention, provided herein is a method for transmitting a random access channel message, the method including: at a user equipment, measuring quality of a downlink channel and generating quality measurement information of the downlink channel; and including the quality measurement information in an L2 header of a random access channel (RACH) message and transmitting the RACH message to an uplink.

Preferably, the transmitting of the RACH message to the uplink may include transmitting a preamble to the uplink and retransmitting the preamble to the uplink if a response for the preamble is not received or a non-acknowledge response is received. At this time, the RACH message may be transmitted to the uplink if an acknowledge response for the preamble is received.

Preferably, the L2 header may be a medium access control (MAC) header configuring an MAC protocol data unit (PDU).

Preferably, the L2 header may store information, which indicates whether or not the quality measurement information is included in the L2 header, in a target channel type field (TCTF).

In another aspect of the present invention, provided herein is a method for transmitting a random access channel message, the method including: at a user equipment, measuring quality of a downlink channel and generating quality measurement information of the downlink channel; and including the quality measurement information in a payload next to a L2 header of a random access channel (RACH) message and transmitting the RACH message to an uplink.

Preferably, the RACH message may store information, which indicates whether or not the quality measurement

information is included in the payload, in a target channel type field (TCTF) of the L2 header.

In another aspect of the present invention, provided herein is a mobile communication terminal for transmitting data to an uplink through random access in a mobile communication system, the mobile communication terminal including: a downlink channel measurement unit which measures quality of a downlink channel and generates quality measurement information of the downlink channel; and a message transmission unit which includes the quality measurement information in an L2 header of a random access channel (RACH) message and transmitting the RACH message to the uplink.

In another aspect of the present invention, provided herein is a mobile communication terminal for transmitting data to an uplink through random access in a mobile communication system, the mobile communication terminal including: a downlink channel measurement unit which measures quality of a downlink channel and generates quality measurement information of the downlink channel; and a message transmission unit which includes the quality measurement information in payload next to an L2 header of a random access channel (RACH) message and transmitting the RACH message to the uplink.

Advantageous Effects

According to embodiments of the present invention, since transmission power can be adaptively controlled according to a channel measurement result of a user equipment (UE), a radio resource can be efficiently used. In a method in which information indicating whether or not quality measurement information is included or whether or not upper layer information is included is notified to a base station through a header, compatibility between the existing UE and a radio network can be maintained.

Brief Description of Drawings

The accompanying drawings, which are included to provide a further understanding of the invention, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.

In the drawings:

FIG. 1 is a view showing a network structure of a universal mobile telecommunication system (UMTS);

FIG. 2 is a view showing the structure of a radio interface protocol between a UMTS terrestrial radio access network (UTRAN) and a user equipment on the basis of 3GPP radio access network standard;

FIG. 3 is a view showing a conventional physical random access channel (PRACH) transmission;

FIG. 4 is a view showing an exemplary structure of an acquisition indicator channel (AICH) which is a downlink physical channel;

FIG. 5 is a view showing an example of a mobile communication terminal according to the present invention;

FIG. 6 is a view showing an example of a random access process according to the present invention;

FIG. 7 is a view showing an example of the random access process shown in FIG. 6; and

FIG. 8 is a view showing an example of a medium access control (MAC) protocol data unit (PDU) configured according to an embodiment of the present invention.

Best Mode for Carrying Out the Invention

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. However, the range of the present invention is not limited to the below-described embodiments.

FIG. 5 is a view showing an example of a mobile communication terminal 510 according to the present invention.

A downlink channel measurement unit 511 measures the quality of a downlink channel from a downlink signal of a Node B 520 and generates quality measurement information of the downlink channel.

A message transmission unit 512 includes the quality measurement information in a random access message, that is, a RACH message, and transmits the RACH message to the Node B 520 through an uplink signal. The embodiment may vary depending on in which portion of the RACH message the quality measurement information is included. That is, in the mobile communication terminal 510 according to one embodiment of the present invention, the message transmission unit 512 includes the quality measurement information in a header of a second layer L2 of the RACH message. Alternatively, in the mobile communication terminal 510 according to another embodiment of the present invention, the quality measurement information may be included in a payload next to the header of the second layer L2 of the RACH message.

The downlink channel measurement unit 511 and the message transmission unit 512 may be implemented in the form of a program installed in a firmware of the mobile communication terminal 510 or may be implemented by manufacturing respective chips for implementing respective logics. The downlink channel measurement unit 511 and the

message transmission unit 512 may be implemented by a single chip for implementing all logics.

FIG. 6 is a view showing a random access process according to an embodiment of the present invention.

In one embodiment of the present invention, in order to efficiently use a radio resource, a radio user equipment (UE) includes the quality measurement information of the downlink channel in the header of the second layer L2 of the RACH message transmitted to an uplink. A radio network controls transmission power of a response message for the RACH message using the quality measurement information included in the header of the second layer L2 and transmits the response message to the UE.

In another embodiment of the present invention, in order to efficiently use a radio resource, the UE includes the quality measurement information of the downlink channel in the payload next to the header of the second layer L2 of the RACH message transmitted to an uplink. The radio network controls transmission power of a response message for the RACH message using the quality measurement information included in the payload and transmits the response message to the UE. In this case, the radio UE may include the quality measurement information in a L2-PDU in a piggybacking fashion and transmit the RACH message to the radio network.

This embodiment will be described with reference to FIG. 6 as follow.

The UE 510 can transmit the RACH message after a RACH preamble transmission process and a process of responding to the RACH preamble, as shown in FIG. 6.

Accordingly, the UE 510 first transmits the preamble of the RACH to the Node B 520 (610).

Next, when the preamble is accurately received, the Node B 520 transmits an ACK response for the RACH preamble to the UE 510 (620). In contrast, when the preamble is not received or is inaccurately received, the Node B 520 transmits a NACK response for the RACH preamble to the UE 510 (620).

Next, the UE 510 transmits the quality measurement information of the downlink channel of the Node B 520, for example, the RACH message including a channel quality indication (CQI), to the Node B 520 (630). At this time, the RACH message may include at least one L2-PDU. If the L2-PDU includes the quality measurement information, the header of the L2-PDU, that is, the L2 header, can notify whether the quality measurement information is included in the L2 header or the L2-PDU including the header of the L2. For example, the L2 header may be a MAC header configuring the MAC PDU. In more detail, information indicating whether or not the CQI is included in the MAC PDU may be

stored in a target channel type field (TCTF) of the MAC header.

The MAC PDU may include a RRC message transmitted to a common control channel (CCCH), a dedicated control channel (DCCH) or a dedicated traffic channel (DTCH), all of which are the logical channels.

When the UE is turned on and then first accesses a new cell, the UE establishes downlink synchronization and receives system information of the cell to be accessed. After the system information is received, the UE transmits an access request message for RRC connection. However, since the UE does not establish time synchronization with a current network and a uplink radio resource is not ensured, the RACH may be used. That is, the UE requests the radio resource for connection request message transmission to the network using the RACH. The Node B which receives the request for the radio resource allocates a proper radio resource to the UE. Then, the UE can transmit a RRC connection request message to the network through the radio resource.

In a state in which the UE is RRC-connected with the network, the UE which is in the RRC connected mode may use the RACH. In this case, the UE receives the radio resource allocated according to radio resource scheduling of the network and transmits data to the network through the

allocated radio resource. However, if data to be transmitted is no longer left in the buffer of the UE, the network no longer allocates the uplink radio resource to the UE. This is because the allocation of the uplink radio resource to the UE which does not have data to be transmitted is inefficient. If new data occurs in the buffer of the UE which does not have the radio resource, the UE may use the RACH because the uplink radio resource is not allocated to the UE. That is, the UE may make a request for the radio resource necessary for transmission of data to the network using the RACH.

That is, some RRC messages such as a RRC connection request message, a cell update message and a URA update message may be also transmitted through the RACH. At this time, the CCCH, the DCCH and the DTCH, all of which are the logical channels, may be mapped to the RACH which is the transport channel.

The quality measurement information of the downlink channel may be included in the L2 header, for example, the MAC header, or may be included in a front portion of a MAC payload or a rear portion of the MAC payload next to the L2 header in a piggybacking fashion.

Next, the Node B 520 performs adaptive modulation control (AMC) or power control using the quality measurement information of the downlink channel (640). At

this time, the second layer, that is, the MAC layer, of the Node B 520 receives the MAC PDU of the RACH message, checks the MAC header, and checks whether the quality measurement information of the downlink channel is included in the MAC PDU. At this time, if the MAC header notifies that the quality measurement information of the downlink channel is not included, the Node B 520 does not associate the control of the transmission power with the quality measurement information.

Finally, the Node B 520 transmits a RACH response message to the UE 510 using the transmission power controlled according to the quality measurement information of the downlink channel (650).

The UE 510 may include L3 information as well as L2 information in the RACH message, which is transmitted to the uplink, and include the quality measurement information of the downlink channel in the L2 information. At this time, the L3 information may be the RRC message. In addition, the L2 information may notify the Node B 520 that the quality measurement information is included in the L2 information. In particular, the L2 information may be MAC control information which is included in the MAC header or the MAC PDU in the piggybacking fashion, and may be MAC control information included in the payload of the MAC PDU.

In this step 650, three following cases may be realized depending on whether or not the L3 information is included or whether or not the quality measurement information is included in the L2 information.

First, if upper layer information is included in the MAC PDU and the MAC header notifies that the quality measurement information of the downlink channel is included, the Node B 520 removes the quality measurement information from the MAC PDU and reconfigures the MAC PDU. The Node B 520 sends the reconfigured MAC PDU to the MAC of the RNC. In addition, the Node B 520 transmits a response message for the RACH message received from the UE 510 to the UE 510.

Second, if the upper layer information is not included in the MAC PDU and the MAC header notifies that the quality measurement information of the downlink channel is included, the Node B 520 does not send the MAC PDU to the RNC. In this case, the Node B 520 only transmits the response message for the RACH message to the UE 510. At this time, the response message includes the ACK response for notifying that the RACH message is successfully received and the NACK response for notifying that the RACH message is not successfully received. The response message includes information indicating the RACH preamble or information indicating the RACH message. At this time, the indicating information included in the response message may

be code information for transmission of the message or the signature of the preamble.

Third, if the MAC header does not notify that the quality measurement information of the downlink channel is included, the Node B 520 only sends the MAC PDU to the MAC of the RNC and transmits the response message to the UE 510.

The RACH response message of the Node B 520 may be transmitted through the L2-PDU, for example, the MAC PDU or may be transmitted through a physical layer control signal. If the response message is transmitted through the MAC PDU, the header of the MAC PDU including the response message notifies the UE 510 that the response message is included in the MAC PDU. In particular, the UE may be notified that the response message is included in the MAC PDU, using the TCTF of the header of the MAC PDU.

FIG. 7 is a view showing an example of the random access process shown in FIG. 6.

After the transmission (AP) of the RACH preamble and the response (AICH) of the RACH preamble, the UE 510 measures the downlink channel of the Node B 520, includes the quality measurement information in the MAC payload or the MAC header of the MAC PDU, and transmits the RACH message to the uplink.

The response message MSG-ACK/NACK of the Node B 520 for the RACH message is the ACK signal for notifying that

the RACH message is successfully received or the NACK signal for notifying that the RACH message is not successfully received.

Meanwhile, when the UE 510 receives the MAC PDU from the Node B 520 and checks that the response message MSG-ACK/NACK is included in the MAC PDU through the header of the MAC PDU, the UE 520 can retransmit the RACH message to the Node B 520 according to the response message MSG-ACK/NACK. In particular, the UE 510 does not retransmit the RACH message if the response message MSG-ACK/NACK received from the Node B 520 is the ACK response and retransmits the RACH message to the Node B 520 if the response message is the NACK response.

FIG. 8 is a view showing an example of the MAC PDU configured according to an embodiment of the present invention.

In FIG. 8, the TCTF is included in the MAC header. The TCTF may notify whether or not the quality measurement information, that is, the CQI, is included in the MAC PDU, as described above. The MAC PDU may further include other information such as a UE-Id, a C/T, a MAC service data unit (SDU).

In the present invention, the mobile communication terminal includes the quality measurement information of the downlink channel in the L2 header or payload of the

RACH message transmitted to the uplink, and the radio network controls the transmission power of the response message for the RACH message using the quality measurement information included in the L2 header or payload and transmits the response message to the UE. Accordingly, it is possible to efficiently use the radio resource.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Industrial Applicability

According to the present invention, it is possible to provide a method for controlling transmission power of a RACH response message according to a channel measurement result of a mobile communication terminal for transmitting data using an uplink channel. This method is applicable to an algorithm of a random access process of a mobile communication system, and a user equipment and base station for supporting the same.

What is Claimed is:

1. A method for responding to a random access channel message, the method comprising:

reading quality measurement information of a downlink channel from a second layer header of a random access channel (RACH) message which is transmitted from a user equipment to an uplink;

controlling transmission power of a response message for the RACH message according to the quality measurement information; and

transmitting the response message to the user equipment.

2. The method according to claim 1, wherein the second layer header is a medium access control (MAC) header configuring an MAC protocol data unit (PDU).

3. The method according to claim 2, wherein the controlling of the transmission power comprises removing the quality measurement information from the MAC PDU and transmitting the MAC PDU to the MAC of a radio network controller (RNC), if upper layer information is included in the MAC PDU of the RACH message.

4. The method according to claim 3, wherein the upper layer information is a radio resource control (RRC) message transmitted through at least one of a common control channel (CCCH), a dedicated control channel (DCCH) and a dedicated traffic channel (DTCH), all of which are logic channels.

5. The method according to claim 1, wherein the response message includes any one of an acknowledge (ACK) response for notifying that the RACH message is successfully received and a non-acknowledge (NACK) response for notifying that the RACH message is not successfully received.

6. A method for responding to a random access channel message, the method comprising:

reading quality measurement information of a downlink channel included in a payload next to a second layer header from a random access channel (RACH) message which is transmitted from a user equipment to an uplink;

controlling transmission power of a response message for the RACH message according to the quality measurement information; and

transmitting the response message to the user equipment.

7. The method according to claim 6, wherein the RACH message stores information, which indicates whether or not the quality measurement information is included in the payload, in a target channel type field (TCTF) of the second layer header.

8. A method for transmitting a random access channel message, the method comprising:

at a user equipment, measuring quality of a downlink channel and generating quality measurement information of the downlink channel; and

including the quality measurement information in a second layer header of a random access channel (RACH) message and transmitting the RACH message to an uplink.

9. The method according to claim 8, wherein the transmitting of the RACH message to the uplink comprises transmitting a preamble to the uplink, retransmitting the preamble to the uplink if a response for the preamble is not received or a non-acknowledge response is received, and transmitting the RACH message to the uplink if an acknowledge response for the preamble is received.

10. The method according to claim 8, wherein the

second layer header is a medium access control (MAC) header configuring an MAC protocol data unit (PDU).

11. The method according to claim 8, wherein the second layer header stores information, which indicates whether or not the quality measurement information is included in the second layer header, in a target channel type field (TCTF).

12. The method according to claim 8, further comprising retransmitting the RACH message to the uplink if the response message for the RACH message is a non-acknowledge response.

13. A method for transmitting a random access channel message, the method comprising:

at a user equipment, measuring quality of a downlink channel and generating quality measurement information of the downlink channel; and

including the quality measurement information in a payload next to a second layer header of a random access channel (RACH) message and transmitting the RACH message to an uplink.

14. The method according to claim 13, further

comprising retransmitting the RACH message to the uplink if the response message for the RACH message is a non-acknowledge response.

15. A mobile communication terminal for transmitting data to an uplink through random access in a mobile communication system, the mobile communication terminal comprising:

a downlink channel measurement unit which measures quality of a downlink channel and generates quality measurement information of the downlink channel; and

a message transmission unit which includes the quality measurement information in a second layer header of a random access channel (RACH) message and transmitting the RACH message to the uplink.

16. A mobile communication terminal for transmitting data to an uplink through random access in a mobile communication system, the mobile communication terminal comprising:

a downlink channel measurement unit which measures quality of a downlink channel and generates quality measurement information of the downlink channel; and

a message transmission unit which includes the quality measurement information in payload next to a second

layer header of a random access channel (RACH) message and transmitting the RACH message to the uplink.

FIG. 1

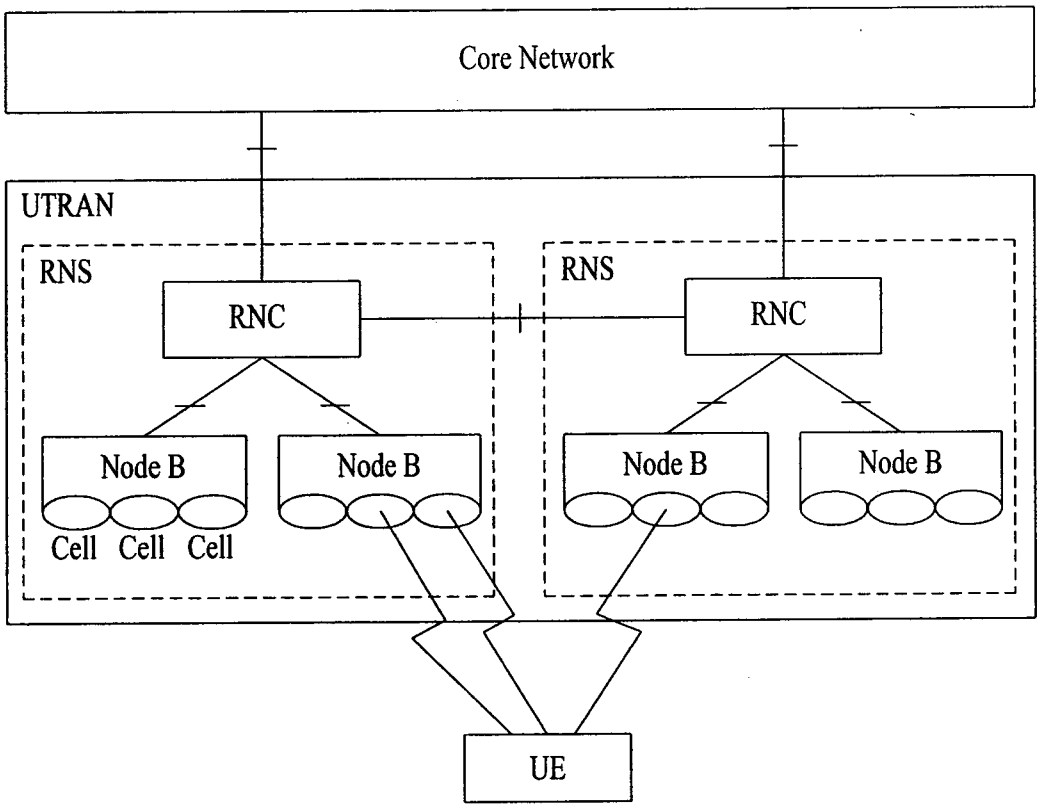
Core Network
UTRAN
RNS
RNC
Node B
Node B
Cell
Cell
Cell
RNS
RNC
Node B
Node B
UE

FIG. 2

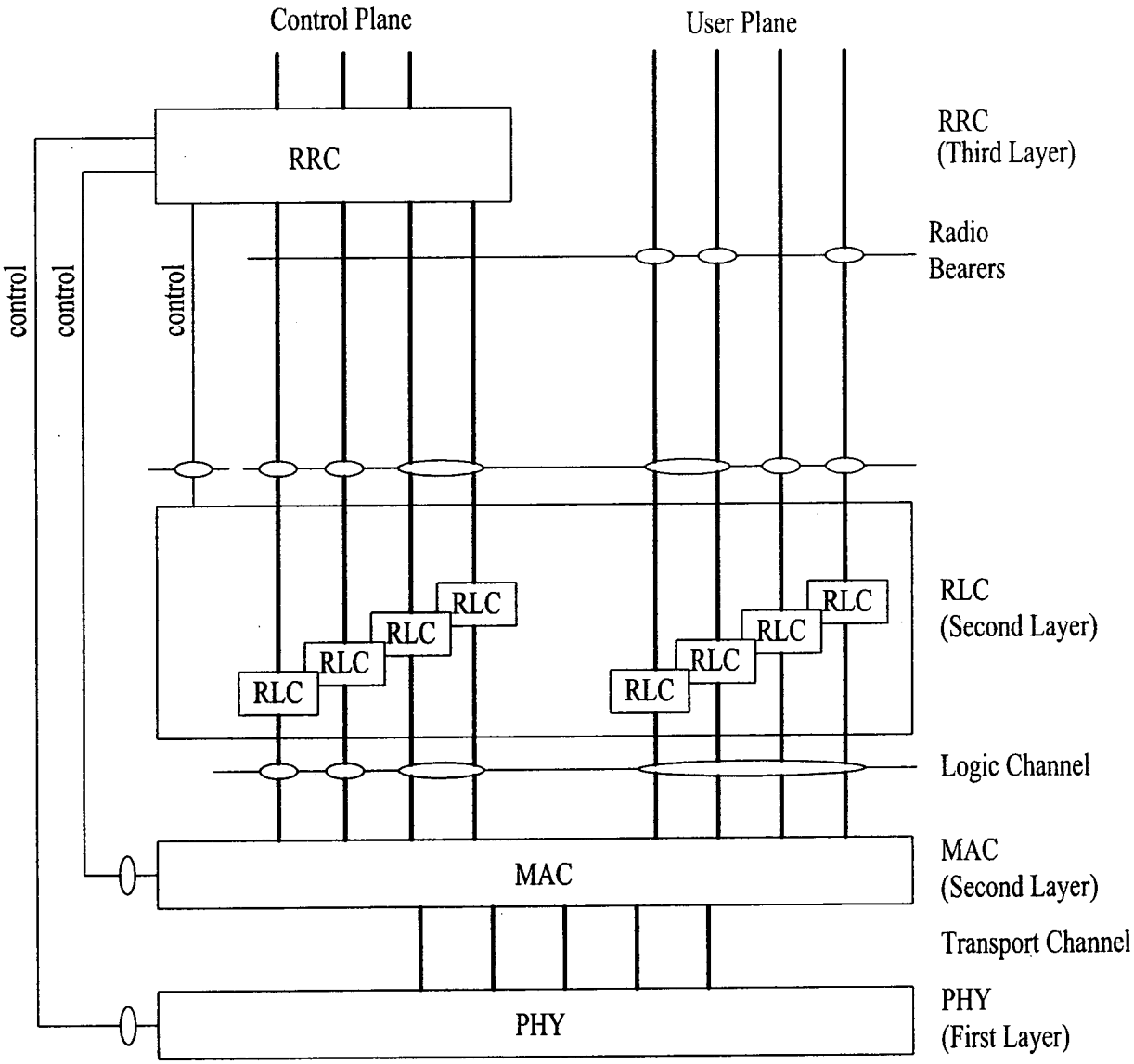
Control Plane
User Plane
RRC
RRC
(Third Layer)
Radio
Bearers
control
control
control
RLC
RLC
RLC
RLC
RLC
RLC
RLC
RLC
RLC
(Second Layer)
Logic Channel
MAC
MAC
(Second Layer)
Transport Channel
PHY
PHY
(First Layer)

FIG. 3

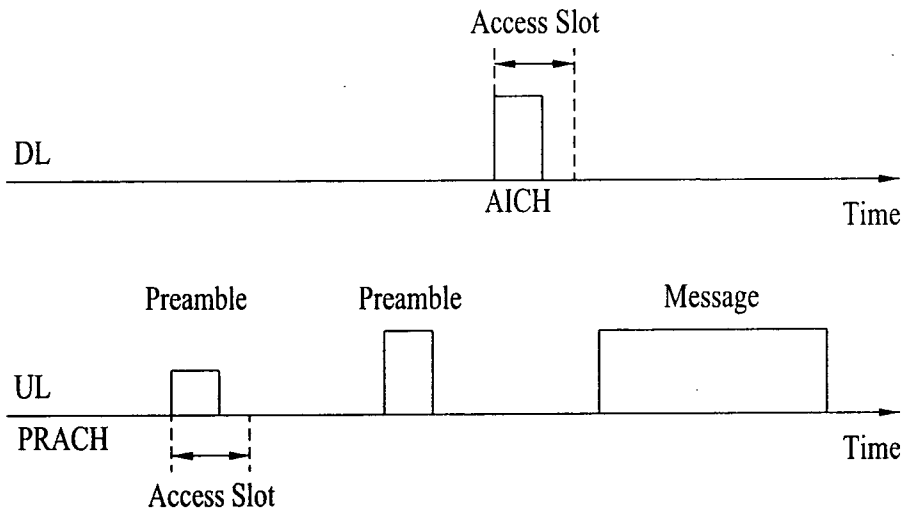
Access Slot
DL
AICH
Time
Preamble
Preamble
Message
UL
PRACH
Time
Access Slot

FIG. 4

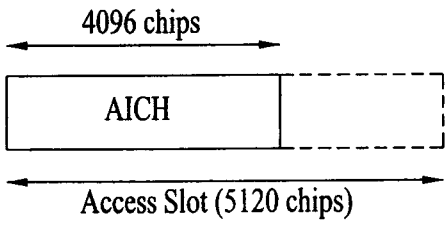
4096 chips
AICH
Access Slot (5120 chips)

FIG. 5

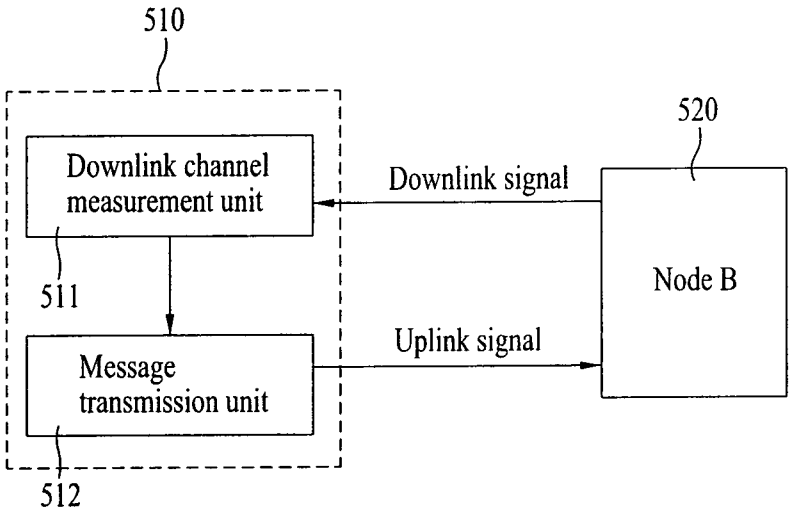
510
520
Downlink channel measurement unit
Downlink signal
Node B
511
Uplink signal
Message transmission unit
512

FIG. 6

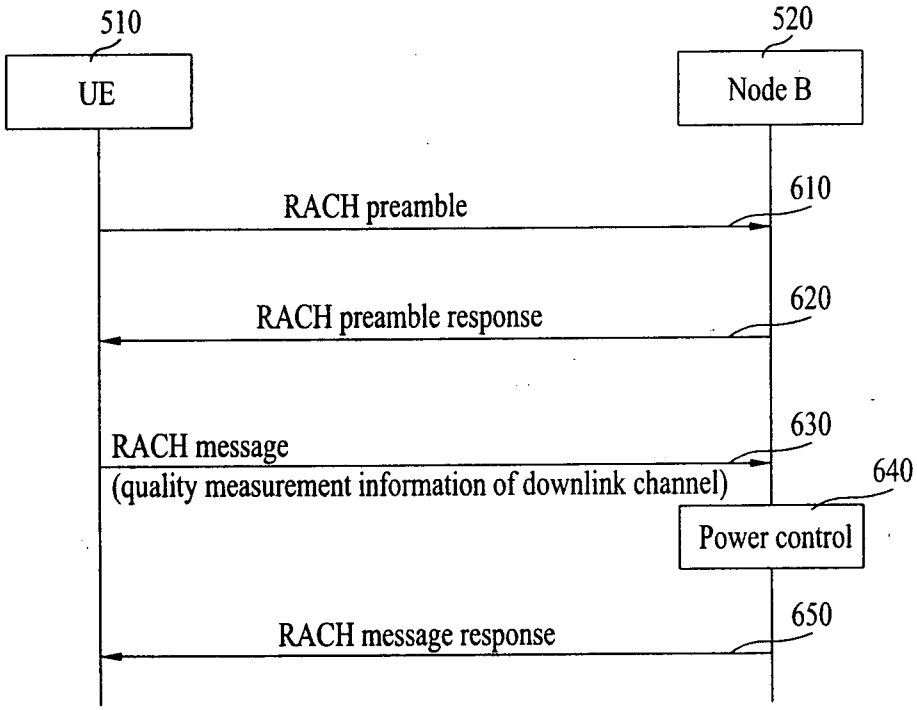
510
UE
520
Node B
610
RACH preamble
620
RACH preamble response
630
RACH message
(quality measurement information of downlink channel)
640
Power control
650
RACH message response

FIG. 7

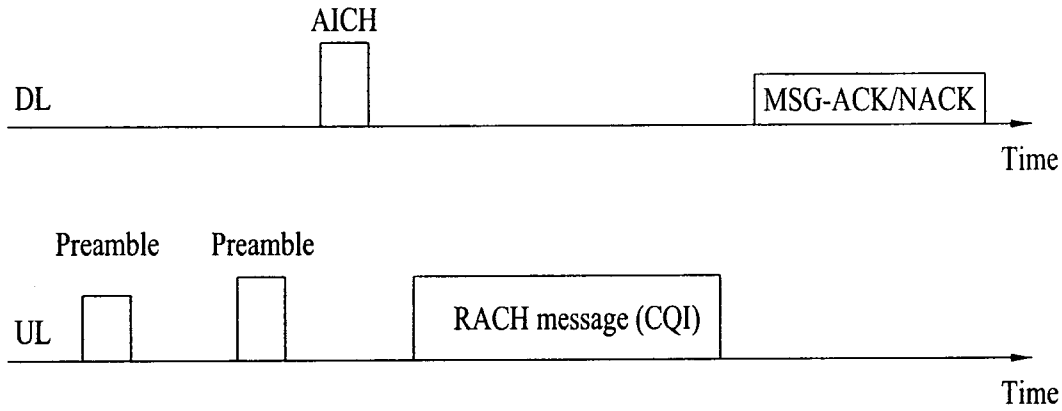

FIG. 8

TCTF	UE-Id	CQI	C/T	MAC SDU