(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 July 2008 (10.07.2008)

PCT

(10) International Publication Number
WO 2008/082207 A1

(51) International Patent Classification:
H04L 29/02 (2006.01) *H04B 7/26* (2006.01)
H04L 1/00 (2006.01)

(21) International Application Number:
PCT/KR2007/006973

(22) International Filing Date:
28 December 2007 (28.12.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2469/CHE/2006 29 December 2006 (29.12.2006) IN

(71) Applicant *(for all designated States except US)*: **SAMSUNG ELECTRONICS CO., LTD.** [KR/KR]; 416, Maetan-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do 442-742 (KR).

(72) Inventor: **DWARAKANATH, Pradeep**; Bagmane Lakeview, Block 'B', No. 66/1, Bagmane Tech park, C V Raman Nagar, Byrasandra, Bangalore 560093 (IN).

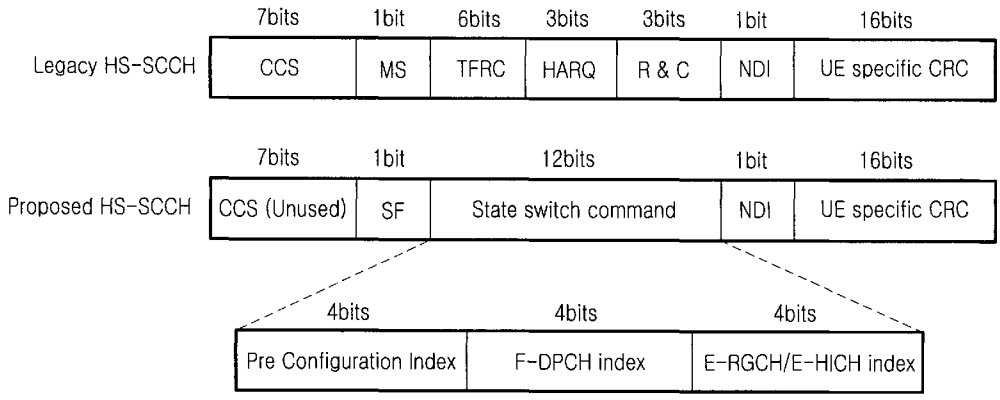
(74) Agent: **LEE, Keon-Joo**; Mihwa Bldg. 110-2, Myon-gryun-dong 4-ga, Chongro-gu, Seoul 110-524 (KR).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(54) Title: METHOD OF EFFICIENT STATE TRANSITION IN ENHANCED CELL FACH



(57) Abstract: A method of efficient state transition between CELL_DCH and CELL_FACH states is provided. According to the method, the transmission of configuration data through a physical data channel is reduced by using pre-configuration information or previously received/stored information for state transition. The indication regarding the use of pre-configuration information or previously received/stored information for state transition is conveyed through a high speed shared control channel (HS-SCCH), thus reducing the information sent through a high speed physical data shared channel (HS_PDSCH).

WO 2008/082207 A1

METHOD OF EFFICIENT STATE TRANSITION IN ENHANCED CELL FACH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention in general relates to mobile wireless communication for 3rd Generation Partnership Project (3GPP) Release 7 (R7) High Speed Packet Access (HSPA) mobile equipment, where a user equipment (UE) quickly switches between CELL_DCH and CELL_FACH states with very small overhead. Particularly, this invention relates to a method of efficient state transitioning in Enhanced CELL_FACH.

2. Description of the Related Art

As per 3GPP TS 25.212, the High Speed Shared Control Channel (HS-SCCH) carries Layer 1 (L1) control signaling to user equipments (UE). HS-SCCH is sent to the UEs to schedule them on a certain code and time resource. The contents of HS-SCCH are shown in Fig. 1 and described as follows: the channelization codes on which a UE will be scheduled and the modulation scheme that will be used on the data being sent to the UE are sent through the CCS and MS fields ; the packet data unit size and format is sent through the TFRC field; the Hybrid Automatic Transmission Request (HARQ) process information is sent through the HARQ field; redundancy and constellation version (R & C Ver) for the support of HARQ is sent through the R & C Ver field; and an indication whether the UE is new data or a retransmission is indicated in HS-SCCH.

As per 3GPP TS 25.331, Radio Resource Control (RRC) control signaling is sent to lower layers in an acknowledged mode; segmentation is done at the Radio Link Control (RLC) level; RLC and Medium Access Control (MAC) will add corresponding headers and L1 will append a 24-bit Cyclic Redundancy Check (CRC) and then CRC will be transmitted through one or more code/time resources. Pre-configurations of such RRC messages are also possible as explained in the technical specification below.In all Enhanced Cell_FACH discussions in the 3GPP forum, a UE is supposed to read the HS-SCCH and then look for a corresponding message in the High Speed Physical Data Shared Channel (HS-PDSCH) for its specific messages. On the uplink, the UE will

communicate to a Node B through a Random Access Channel (RACH). It is observed in a 3GPP RAN1 contribution R1-063043 entitled "State Transition Delay Reduction via Enhanced CELL_FACH", that in the absence of initial link adaptation, for Node B HS-FACH power consumption to be maintained at a reasonable level, 3 to 4 "quick repeat" transmissions are needed to ensure 95% coverage of a message.

All messages that may cause a state transition are listed in Table 1. Here, the Node B communicates more than 360 bits of control data to effect a state transition from CELL_FACH to CELL_DCH. As per 3GPP RAN1 contribution R1-063043, 3 to 4 retransmissions are needed for ensuring users at the cell edges to receive the message with 1% Frame Error Rate (FER) in the absence of link adaptation and Acknowledge/Negative-Acknowledge (ACK/NACK) feedback. This will lead to 360 * 3 = 1080 bits of information, which will reduce the achievable throughput.

Table 1:Messages that may cause a state transition

RRC Message causing CELL_FACH ←→CELL_DCH with HS-DSCH/E-DCH	RRC Message Size*
CELL Update confirm	300 - 360
Radio bearer reconfiguration	552
Transport channel reconfiguration	552
Physical channel reconfiguration	< 552

*Note: Only RRC message size is mentioned in the table. Depending on the number of PDUs used in sending the RRC message, a total header of RLC header (2 bytes * no. of PDUs + 1) + MAC header (3 or 5 bytes of UE ID * no. of PDUs) + L1 (24 bit CRC * no. of PDUs) and 1/3 rate channel coding is added.

For example, considering CELL UPDATE CONFIRM message size of 300 bits and assuming 336 bits RLC PDU size, a total header of 384 bits (3 bytes of MAC header + 24 bits CRC) is required for each transmission. Three quick repetitions will lead to 384 * 3 = 1152 bits. Considering 1/3 rate coding, 1152 * 3 = 3456 bits are required for transmitting a control message. The present

invention provides a method to reduce the number of bits needed to effect such a state transition.

SUMMARY OF THE INVENTION

In the prior art, RRC CELL UPDATE CONFIRM/ RADIO BEARER RECONFIGURATION messages were transmitted using the HS-PDSCH with big overhead. It is an object of the present invention to reduce the message size used to communicate a state transition command to UEs by using pre-configuration data derived from one of the previously received and stored RRC messages and pre-configuration of RRC signaling messages. Such pre-configuration data is then communicated through HS-SCCH, using a pre-configuration index. Thus, HS-PDSCH need not be used for this purpose. Some of the redundant fields in HS-SCCH in the context of Enhanced CELL_FACH are reinterpreted. A method of communicating dedicated channelization codes such as Fractional Dedicated Physical Channel (F-DPCH) and Enhanced Relative Grant Channel (E-RGCH)/ Enhanced HARQ Indicator Channel (E-HICH) is provided, where a set of 16 channelization codes are pre-sent to the UE and the network would communicate the index to be used in CELL_DCH. Under this invention, a large RRC signaling message is sent within the small field previously used for L1 control signaling in HS-SCCH.

The present invention needs no link adaptation and Modulation and Coding Scheme (MCS) selection to communicate the state transition command on HS-SCCH, because HS-SCCH is not power controlled to any particular UE.

The present invention provides an initial Measurement/ Channel Quality Indicator (CQI) report on RACH is not required to aid the MCS selection for transmission of state transition command.

The present invention provides better cell edge detection and performance due to improved channel coding.

The present invention provides reduced latency in communication of state transmission command due to fewer bits transmitted and also fewer retransmissions.

The present invention provides that the HS-PDSCH is not used, leading to a higher utilization of code space and increased cell throughput. 12 bits in HS-SCCH are encoded with 1/3 rate coding as existing and are sufficient to communicate a state transition command within HS-SCCH itself.

The present invention provides efficient utilization of Node B power resources, as the Node B need not transmit a big message with multiple repetitions.

The present invention further provides an option for the network to solicit a Measurement/ CQI report or to communicate a traffic volume measurement control message with very small overhead.

The present invention further provides that the control signaling on Iub interface between Radio Network Controller (RNC) and the Node B is reduced.

Instead of using pre-configurations, if a previously received and stored configuration is used for state transition, an RLC level acknowledgement can be supported with integrity protection to achieve virtually 0% error probability.

Accordingly, an aspect of the present invention is to provide a method for efficient state transition in Enhanced CELL_FACH, wherein the transition is made between CELL_DCH and CELL_FACH states, and the transmission of configuration data through a physical data channel is reduced by using pre-configuration information or previously received/stored information for state transition, where the indication regarding the use of the pre-configuration information or previously received/stored information for state transition is conveyed through a high speed shared control channel (HS-SCCH).

When using pre-configuration for state transition CELL UPDATE CONFIRM/ RADIO BEARER RECONFIGURATION messages are sent to a UE at the beginning of connection establishment or the first time when the UE moves

from CELL_FACH to CELL_DCH. The method further includes an associated network ordering the state to which the UE has to switch to and the index to the pre-defined configuration to be used in the new state. Prior F-DPCH and E-RGCH/E-HICH codes are stored by the UE and in case the codes are not reallocated, the codes are reused while entering CELL_DCH. If the codes are reassigned to other UEs, they have to be communicated to UEs for every transition to CELL_DCH.

A UE is sent 16 F-DPCH and 16 E-HICH/E-RGCH codes in advance at the time the UE first enters CELL_DCH. If there is a change in F-DPCH and E-RGCH codes, a UE is signaled the index to these pre-sent codes which the UE uses on transition to CELL_DCH. With UE specific Hybrid-Radio Network Temporary Identity (H-RNTI), when the UE detects a CRC corresponding to its H-RNTI, an unused combination of CCS fields indicate that there is no data carried on the HS-PDSCH and only a state transition command is being communicated to the UE on the HS-SCCH.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a diagram illustrating the HS-SCCH frame format;

Fig. 2 is a diagram illustrating HS-SCCH fields with the use of pre-configuration of RRC messages according to an embodiment of the present invention;

Fig. 3 is a diagram illustrating the HS-SCCH fields when previously received RRC messages are used for state transition according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT

The preferred embodiments of the present invention will now be explained with reference to the drawings. It should be understood however that the disclosed embodiments are merely exemplary of the invention, which may be

embodied in various forms. The following description and drawings are not to be construed as limiting the invention and numerous specific details are described to provide a thorough understanding of the present invention as the basis for the claims and as a basis for teaching one skilled in the art of how to make and/or use the invention. However in certain instances, well-known or conventional details are not described in order not to unnecessarily obscure the present invention in detail.

The present invention provides for CELL UPDATE_CONFIRM/ RADIO BEARER RECONFIGURATION messages that were previously received when the UE was in CELL_DCH to be used again for switching back to CELL_DCH. Alternatively, according to 3GPP TS 25.331, RRC control signaling messages can be configured through pre-configuration.

The number of bytes used for control signaling can be reduced by using one of the pre-configuration and the previously received configuration. Depending on whether a pre-configured message or a previously received and stored message is used for the state transition, two options are listed below.

Option 1: Using pre-configuration for state transition

The CELL UPDATE CONFIRM/ RADIO BEARERRECONFIGURATION messages pre-configured for the purpose of switching between CELL_FACH and CELL_DCH are sent to the UE at the beginning of the connection establishment or at the first time the UE moves from CELL_FACH to CELL_DCH.

When a UE using the pre-configured messages is ordered by a network to switch between the CELL_FACH state and the CELL_DCH state, the network only needs to specify the new state the UE is to switch to, together with the index to the pre-defined configuration to be used in the new state. It acts just like a CELL_FACH ←→ CELL_DCH switch command.

In the physical layer Information Element (IE), the F-DPCH and E-RGCH/E-HICH codes can be changed based on a network reallocation. The

previous F-DPCH and E-RGCH/E-HICH codes can be stored in the UE and in case these codes are not reallocated, they can be used again while entering CELL_DCH. However, when these codes are reassigned to other UEs, they have to be communicated to the other UEs for every transition to CELL_DCHA UE can be sent 16 F-DPCH and 16 E-HICH/ E-RGCH codes in advance. Every time when the UE enters into CELL_DCH, it is allocated code within those 16 codes. Thus, a code index of 4 bits is needed to communicate the codes to be used in the CELL_DCH state of a UE. Therefore, with the pre-defined configuration and pre-communicated F-DPCH and E-HICH/E-RGCH codes (when moving to CELL_DCH), a UE can obtain all information needed to switch between CELL_FACH and CELL_DCH.

Option 2: Using previously received and stored configuration for state transition

If a previously received and stored configuration is used, the 4-bit field of the pre-configuration index illustrated in Option 1 above is not needed. Thus, the 4-bit field can be used to communicate a random ID, which could be used as a sequence number for sending an RLC level acknowledgement. Alternatively, the content of the 4-bit field can be generated based on an integrity algorithm, thereby providing integrity protection to the state transition command. The rest of the 8-bit field can be used as set forth in Option 1 above.

Both Options 1 and 2 can be used on a same network, with the Slot Format (SF) field used for distinguishing the option being used. The use of both Options 1 and 2 in the same network should be known to the UE and the network by standardization or through explicit system information broadcast. If only one of the options is used, the SF field can have a different meaning as will be explained below. For both Options 1 and 2, with a UE specific H-RNTI, when the UE detects a CRC corresponding to its H-RNTI, an unused combination of CCS fields may indicate that there is no data carried on the HS-PDSCH and only a state transition command is being communicated to the UE on HS-SCCH. Under this scheme, many HS-SCCH fields become redundant and are reinterpreted to communicate the state switch command for the following reasons:

TFRC (6-bit) field is redundant because there is no data /control message carried on the HS-PDSCH;

HARQ process (3-bit) is redundant assuming that no ACK/NACK is sent by the UE in support of HARQ operation;

Modulation Scheme (1-bit) is redundant, because in the absence of the UE's CQI, the network cannot use higher modulation schemes. Hence the modulation scheme can be fixed to Quadrature Phase Shift Keying (QPSK) for UEs in Enhanced CELL_FACH and make this field redundant;

Redundancy and Constellation Version (R & C Ver) (3-bit) is redundant, because only "quick repeats" as specified in R1-062884 "Analysis of HSDPA in CELL_FACH State" are done, thus making this field redundant.

Based on the fields that become redundant in HS-SCCH described above, a new HS-SCCH type for Enhanced CELL FACH for Option 1 is shown in Fig. 2; and a new HS-SCCH type for Enhanced CELL_FACH for Option 2 is shown in Fig. 3. When a UE is in Enhanced CELL_FACH state, the MS field is re-interpreted as HS-SCCH Slot Format field (SF), which indicates the usage of alternate HS-SCCH slot format. If SF equals 1, an alternate slot format is used and HS-SCCH contains a state transition command; If SF equals 0, the network can either use this option to solicit a Measurement/ CQI report from the UE on RACH or to communicate a traffic volume measurement control message; If both Options 1 and 2 are used in the same network, the SF field may be used to indicate whether reconfiguration is being done through pre-configuration (Option 1) or through a previously stored RRC message (Option 2).

The F-DPCH index indicates which of the pre-configured codes are used for receiving F-DPCH. A set of 16 codes was pre-sent to the UE and this field indicates which of the 16 will be used for F-DPCH reception.

The E-RGCH/ E-HICH index indicates which of the pre-configured codes are used for receiving relative grants and HARQ indications. A set of 16 codes is also pre-sent to the UE and this field indicates which of the 16 will be used for E-RGCH/ E-HICH reception.

The 8unused combinations in the CCS field can be used to indicate the state to which the UE is to switch to. The usage of this field is optional when UE only switches between CELL_FACH and CELL_DCH states.

The Pre Configuration Index field in r Option 1 or the Reserved/Random Number/State transition order field of Option 2 indicates the configuration to be used in the new state. Up to 16 configurations can be indicated using this field (Release 6 also uses 16 pre-configurations). Alternatively, the network may send a 4-bit random number if the previously received configuration is to be used for state transition.

When a UE in the Enhanced CELL_FACH identifies that the CCS field has an "unused combination" and SF equals 1, it decodes the state transition command, the F-DPCH index and the E-RGCH index according to the new HS-SCCH format and acts thereafter accordingly. There is no need for the UE to decode HS-PDSCH as no information is carried on it for the UE. The UE can identify the new command or retransmission by a New Data Indicator (NDI). For quick repetitions, the same HS-SCCH contents are repeated with NDI indicating whether it is a repeated command or a new transmission.

The reinterpretation of these HS-SCCH fields does not affect the existing HSDPA UEs because the UE specific CRC will not match the slot format for Release 5 UEs.

When only one of the two options is used, a combination of the CCS field having an "unused combination" and SF equaling 0 can be used by the network to solicit the Measurement/ CQI report, which is responded to by the UE on RACH accordingly. This option enables the network to request the Measurement/ CQI report, and support CQI based MCS selection with very small overhead. Alternatively, the network may communicate a reduced traffic volume measurement control message to the UE. The whole scheme is summarized in Table 2 below.

When a full control message or data plane packets are to be transmitted, a UE decodes the 16-bit UE specific CRC on each HS-SCCH to check if the CRC matches its H-RNTI. Channelization Code Set (CCS) indicates channelization codes where the data packets or the control message is carried for the UE. TFRC and logical channel ID assist the UE to decode the payload on HS-PDSCH(s) as in the current specification.

Table 2: Summary of HS-SCCH fields reinterpreted

CCS Field	MS/ SF field	Interpretation
Valid combination	MS = QPSK or 16 QAM	UE reads HS-PDSCH as indicated by the CCS field and performs the regular HS-FACH operation
Unused combination	SF = 1	If Options 1 and 2 as described above are not used in the same network, the rest of HS-SCCH fields are reinterpreted as per Figure 2 if option 1 is used, or as per Figure 3 if option 2 is used
Unused combination	SF = 0	If Options 1 2 are not used in the same network, it can either use this option to solicit the Measurement/ CQI report or to communicate a reduced Traffic volume measurement control message
Unused combination	SF	If Options 1 and 2 are used in the same network, this field indicates the option being used on the fly.

A pseudo code for distinguishing HS-SCCH is listed below:

IF (CRC of HS-SCCH is OK):

IF (UE is in Enhanced CELL_FACH and CCS field has unused combination):

=> Re-interpret MS field as per Table 2 and rest of fields are interpreted as per Figure 2 for option 1 and as per Figure 3 for option 2.

ELSE IF (UE is in Enhanced CELL_FACH and CCS field has valid combination):

=> receive HS-PDSCH as per CCS field and rest operation is as existing

ELSE

=> Discard HS-SCCH

END

END

The advantages for reducing the size of message communicating the state transition include: The current HS-SCCH 1/3 rate code rate can be used to provide good link reliability and fewer retransmissions. Current HS-SCCH is transmitted with high power to ensure reliable coverage over the entire cell. Using this method of present invention for communication of state transition command ensures good detection probability. Because link adaptation and MCS selection need not be communicated on HS-SCCH, the initial Measurement/ CQI report on RACH is not needed to send a state transition command to UE. Better cell edge detection and performance are achieved with improved channel coding and reduced latency in communication due to fewer bits transmitted and fewer retransmissions.

Also, HS-PDSCH need not be used, leading to higher utilization of code space and increased cell throughput. Only12 bits in HS-SCCH are encoded with 1/3 rate coding and are sufficient to communicate a state transition command. Node B power resources are more efficiently utilized. There is an option for the network to solicit Measurement/ CQI report or to communicate Traffic volume measurement control message with very small overhead.There is reduced control signaling on the Iub interface between the RNC and the Node B.

When a previously received and stored configuration is used for state transition, an RLC level acknowledgement can be supported with integrity protection to achieve virtually 0% error probability.

It will also be obvious to those skilled in the art that other control methods and apparatuses can be derived from the method of the present invention as taught by the description and the accompanying drawings and these shall also be considered within the scope of the present invention. It should also be noted that the host for storing the applications includes but is not limited to a microchip, microprocessor, handheld communication device, computer, rendering device and multi-function device.

Although a preferred embodiment of the present invention has been described for illustrative purposes, it is noted that various changes and modifications are possible and are apparent to those skilled in the art. Such changes and modifications are to be understood as included within the scope of the present invention as defined by the claims without departing from the scope and spirit of the present invention.

WHAT IS CLAIMED IS:

1. A method for efficient state transition between a CELL_DCH state and CELL_FACH state in Enhanced CELL_FACH, the method comprising the steps of:

a) conveying through a high speed shared control channel (HS-SCCH) one of pre-configuration information and previously received and stored information for state transition; and

b) transitioning the state between the CELL_DCH state and the CELL_FACH state in accordance with the conveyed information.

2. The method as claimed in Claim 1, wherein the pre-configuration information is sent using one of CELL UPDATE CONFIRM and RADIO BEARER RECONFIGURATION messages at the beginning of connection establishment

3. The method in Claim 1, wherein the pre-configuration information is sent using one of CELL UPDATE CONFIRM and RADIO BEARER RECONFIGURATION messages at the first time when a user equipment (UE) moves from the CELL_FACH state to the CELL_DCH state.

4. The method as claimed in Claim 2, further comprising ordering which state the UE has to switch to and an index to the pre-defined configuration to be used in the new state.

5. The method as claimed in Claim 1, further comprising:

storing prior F-DPCH and E-RGCH/E-HICH codes in a UE ; and

entering the CELL_DCH state using the stored prior F-DPCH and E-RGCH/E-HICH codes which are not reassigned.

6. The method as claimed in Claim 1, further comprising:

storing prior F-DPCH and E-RGCH/E-HICH codes stored in a UE;

re-transmitting the F-DPCH and E-RGCH/E-HICH codes when the prior F-DPCH and E-RGCH/E-HICH codes are reassigned; and

entering the CELL_DCH state using the re-transmitted F-DPCH and E-RGCH/E-HICH codes

7. The method as claimed in Claim 1, further comprising:

sending 16 F-DPCH and 16 E-HICH/ E-RGCH codes to a UE; and

signaling an index of the codes when there is a change in the F-DPCH and E-HICH/ E-RGCH codes.

8. The method as claimed in Claim 1, further comprising:

detecting a corresponding Cyclic Redundancy Check (CRC) code of a UE, specified by H-RNTI; and

indicating that there is no data carried on HS-PDSCH and a state transition command is communicated in HS-SCCH.

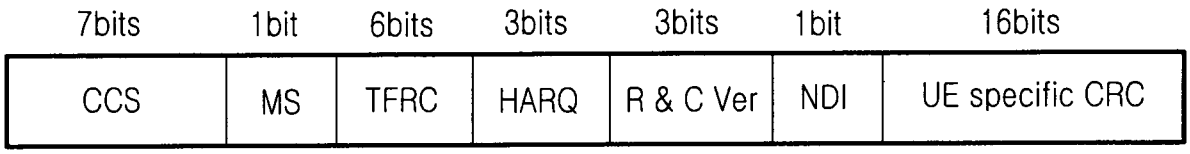

7bits
1bit
6bits
3bits
3bits
1bit
16bits
CCS
MS
TFRC
HARQ
R & C Ver
NDI
UE specific CRC

FIG.1

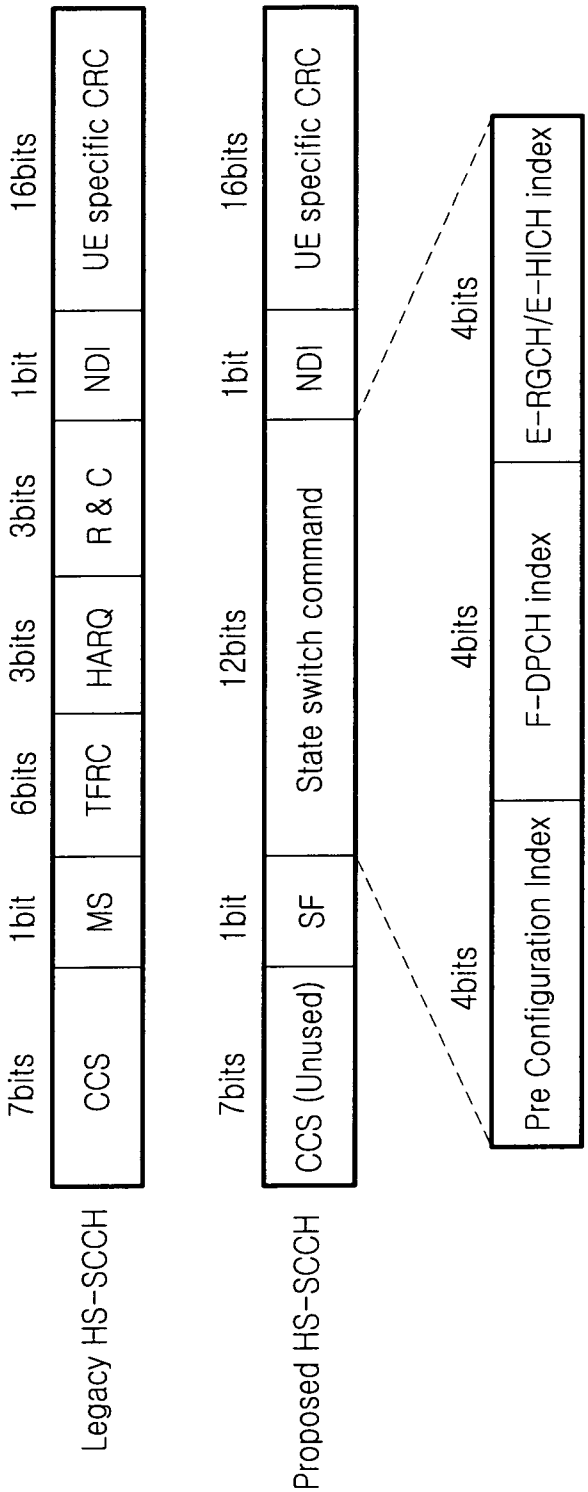

Legacy HS-SCCH
7bits
CCS
1bit
MS
6bits
TFRC
3bits
HARQ
3bits
R & C
1bit
NDI
16bits
UE specific CRC
Proposed HS-SCCH
7bits
CCS (Unused)
1bit
SF
12bits
State switch command
1bit
NDI
16bits
UE specific CRC
4bits
Pre Configuration Index
4bits
F-DPCH index
4bits
E-RGCH/E-HICH index

FIG.2

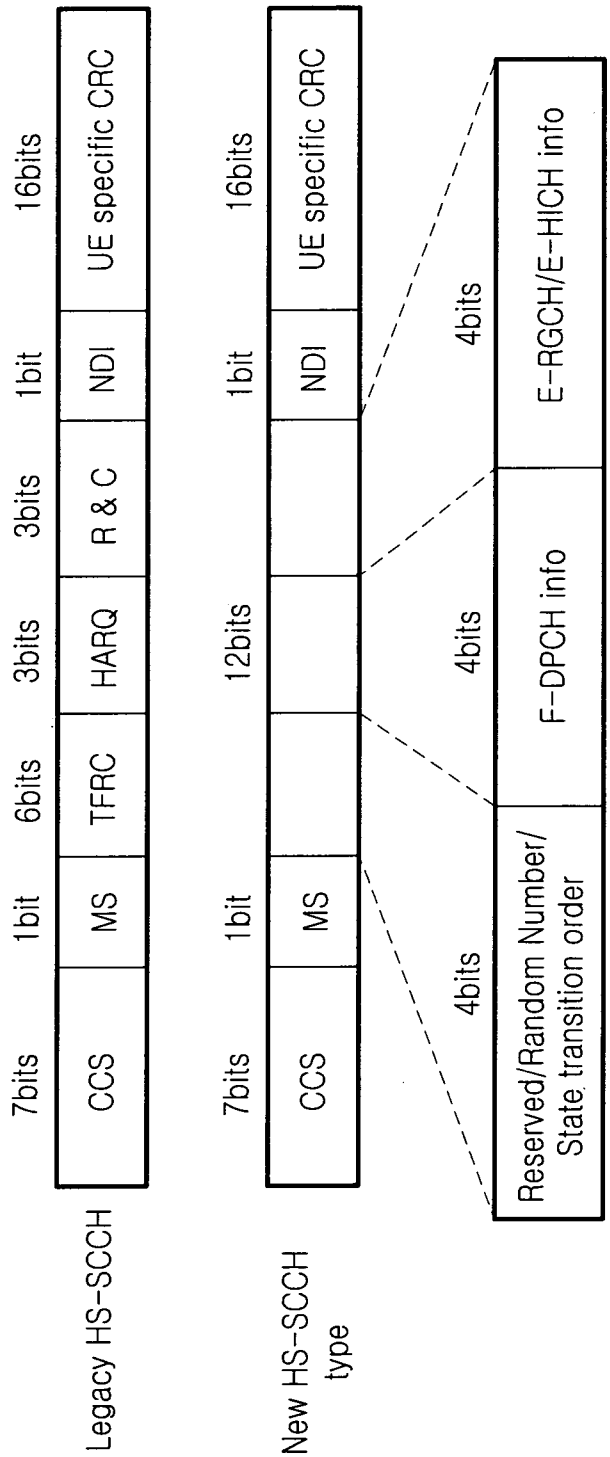

Legacy HS-SCCH
7bits
CCS
1bit
MS
6bits
TFRC
3bits
HARQ
3bits
R & C
1bit
NDI
16bits
UE specific CRC
New HS-SCCH type
7bits
CCS
1bit
MS
12bits
1bit
NDI
16bits
UE specific CRC
4bits
Reserved/Random Number/ State transition order
4bits
F-DPCH info
4bits
E-RGCH/E-HICH info

FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/006973

A. CLASSIFICATION OF SUBJECT MATTER

H04L 29/02(2006.01)i, H04L 1/00(2006.01)i, H04B 7/26(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: H04L

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1408658 A2 (ASUSTEK COMPUTER INC.) 14 Apr. 2004 See Paragraph [0025] - Paragraph [0036].	1-8
A	US 2005/0020260 A1 (JEONG et al.) 27 Jan. 2005 See Paragraph [0031] - Paragraph [0082].	1-8
A	US 2004/0253955 A1 (LOVE et al.) 16 Dec. 2004 See Paragraph [0017] - Paragraph [0049].	1-8

☐ 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	Date of mailing of the international search report
18 APRIL 2008 (18.04.2008)	**21 APRIL 2008 (21.04.2008)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer JEON, Yong Hai Telephone No. 82-42-481-5657

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2007/006973

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1408658 A2	14.04.2004	CN 1251528 C	12.04.2006
		CN 1494334 A	05.05.2004
		JP 2004166233 A2	10.06.2004
		KR 1020040015674 A	19.02.2004
		TW 233285 A	21.05.2005
		US 20030164190 A1	04.09.2003
		US 6899125 B	31.05.2005
US 20050020260 A1	27.01.2005	DE 6004006344 C0	21.06.2007
		EP 1501328 A3	12.04.2006
		EP 1501328 A2	26.01.2005
		EP 1501328 B1	09.05.2007
		KR 1020050012190 A	31.01.2005
US 20040253955 A1	16.12.2004	BR 200411307 A	11.07.2006
		CN 1795687 A	28.06.2006
		EP 1627464 A2	22.02.2006
		EP 1632096 A2	08.03.2006
		JP 2007515850 A	14.06.2007
		KR 1020060021882 A	08.03.2006
		US 2004189228 A1	30.09.2004
		US 2006175998 A	10.08.2006
		US 7132811B	07.11.2006
		WO 2004087482 A2	14.10.2004
		WO 2004087482 A3	15.09.2005
		WO 2005002111 A2	06.01.2005
		WO 2005002111 A3	16.06.2005