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(54) METHOD AND USER EQUIPMENT FOR DETERMINING SCHEDULING GRANT

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(57) **ABSTRACT**

The disclosure discloses a method and User Equipment (UE) for determining Scheduling Grant (SG). The method includes: a non-quantization power gain factor of an Enhanced Dedicated Channel (E-DCH) Dedicated Physical Data Channel (E-DPDCH) required by an E-DCH Transport Format Combination Indicator (E-TFCI) is determined; when a ratio of the non-quantization power gain factor of the E-DPDCH to a power gain factor of a Dedicated Physical Control Channel (DPCCH) is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, the non-quantization power gain factor of the E-DPDCH required by the E-TFCI is set as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$; otherwise, power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$ are determined, and a maximum value selected from the power gain factors of the E-DPDCHs is set as the power gain factor of the E-DPDCH required by the E-TFCI; and a sum of squares is performed on non-quantization power gain factors of various E-DPDCHs required by the E-TFCI, and obtaining SG required by the E-TFCI. By means of the disclosure, the drawback that a UE cannot achieve a maximum rate under an existing method for determining SG in the related art can be solved.

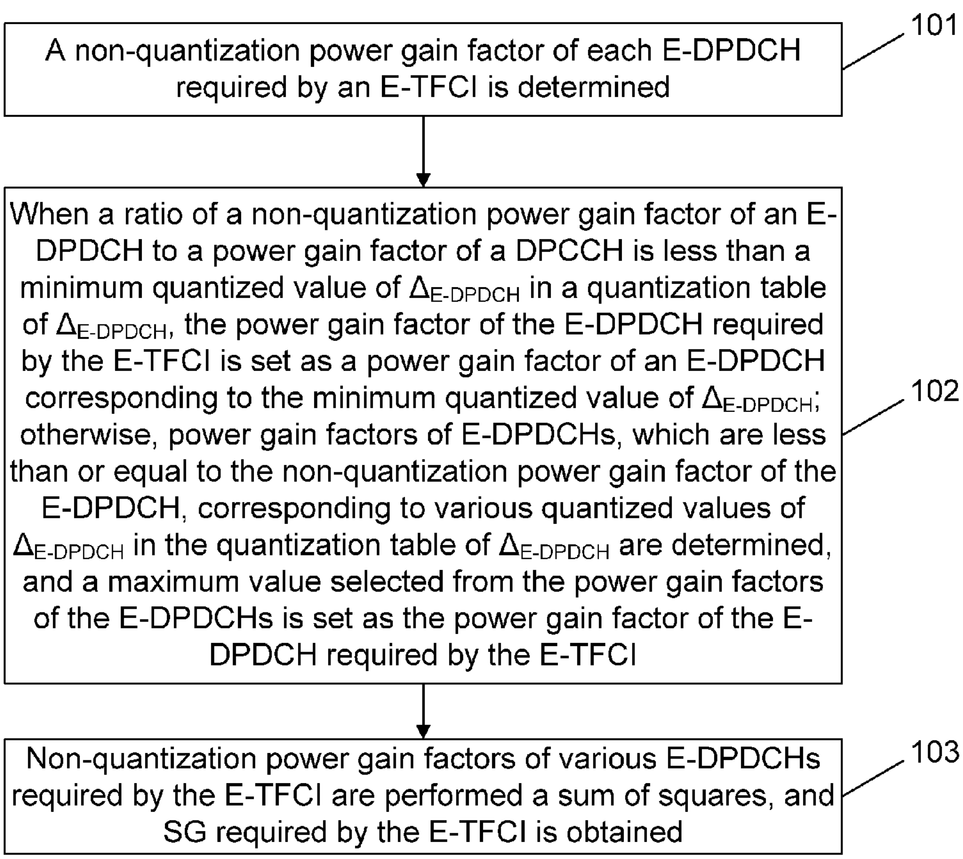
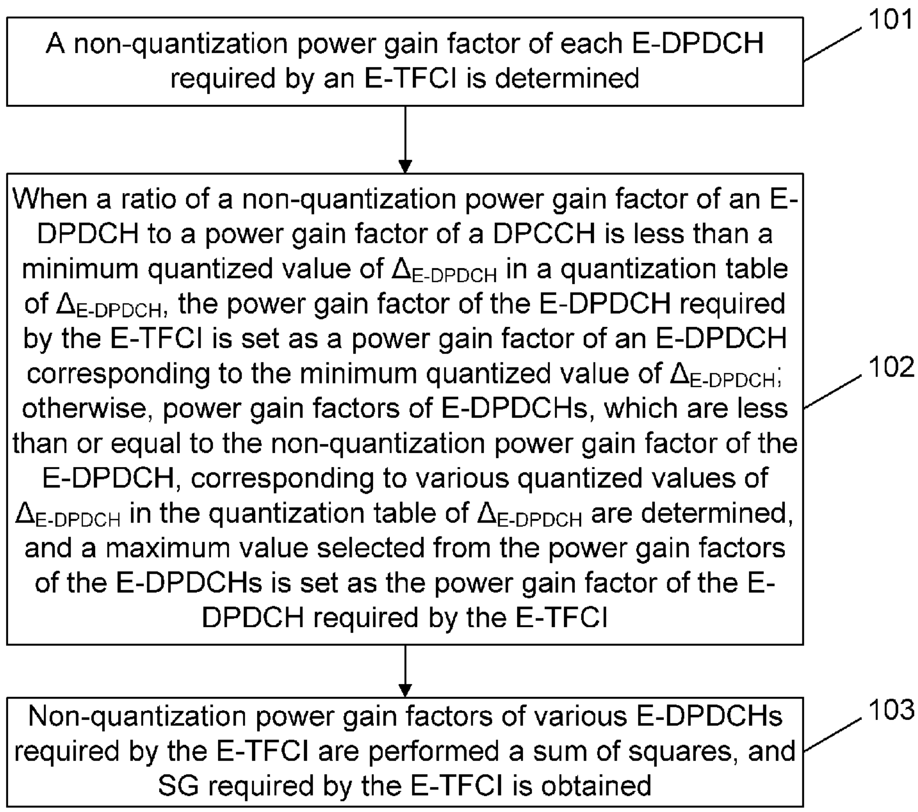


Fig. 1


A non-quantization power gain factor of each E-DPDCH required by an E-TFCI is determined
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When a ratio of a non-quantization power gain factor of an E-DPDCH to a power gain factor of a DPCCH is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, the power gain factor of the E-DPDCH required by the E-TFCI is set as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$; otherwise, power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$ are determined, and a maximum value selected from the power gain factors of the E-DPDCHs is set as the power gain factor of the E-DPDCH required by the E-TFCI
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Non-quantization power gain factors of various E-DPDCHs required by the E-TFCI are performed a sum of squares, and SG required by the E-TFCI is obtained
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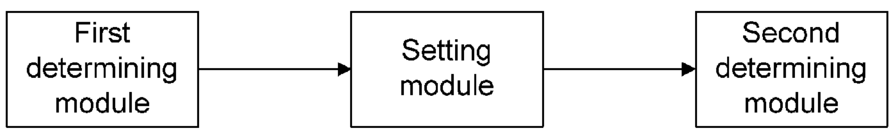
Fig. 2


First determining module
Setting module
Second determining module

METHOD AND USER EQUIPMENT FOR DETERMINING SCHEDULING GRANT

TECHNICAL FIELD

[0001] The disclosure relates to a High Speed Uplink Packet Access (HSUPA) system, and in particular to a User Equipment (UE) and method for determining Scheduling Grant (SG).

BACKGROUND

[0002] In order to improve an uplink capacity and coverage of a system and satisfy a high speed uplink service requirement of a user, a 3GPP introduces, in R6, an Enhanced Dedicated Channel (E-DCH) in an uplink direction. Compared with an uplink Dedicated Channel (DCH) in R99/4/5, the E-DCH shifts a scheduling function from a Radio Network Controller (RNC) to a Node B (NodeB) so as to implement quick packet scheduling, and uses a Hybrid Automatic Repeat Request (HARQ) technique to implement quick re-transmission in a physical layer.

[0003] When scheduling, a NodeB allocates, according to available resources and an interference threshold of a cell, a scheduling request of a UE, a Quality of Service (QoS) demand and scheduling priority of a service and other factors, uplink resources to the UE by means of a certain scheduling algorithm. In the R6, a Binary Phase Shift Keying (BPSK) modulation mode is merely supported, and a maximum rate can reach 5.76 Mbps. In R7, a 16 Quadrature Amplitude Modulation (QAM) (i.e., 4PAM) modulation mode is introduced, and a maximum rate can reach 11.52 Mbps. After a dual carrier technique is introduced into R9, a maximum rate can reach 23.04 Mbps.

[0004] An E-DCH is borne by an E-DCH Dedicated Physical Data Channel (E-DPDCH), and zero, one or more E-DPDCHs may exist simultaneously. Accompanying control information of the E-DCH borne by an E-DCH Dedicated Physical Control Channel (E-DPCCH), the E-DPCCH will exist only when the E-DPDCH exists, and at most one E-DPCCH can merely exist.

[0005] The E-DCH may use multiple transmission format sets, wherein each transmission format set includes multiple transmission formats. A protocol gives a Transmission Block Index (TB Index) in each transmission format set and the bit number of corresponding Transmission Block Size (TB Size). A network may, when establishing an E-DCH channel, configure a used transmission format set to a UE, and the UE sends a transmission format selected from the transmission format set to a network side when sending data in each E-DCH Transport Time Interval (TTI), wherein the transmission format is identified by an E-DCH Transport Format Combination Indicator (E-TFCI).

[0006] A NodeB determines scheduling according to a scheduling request, and sends SG. A UE determines, according to SG information sent by the NodeB, the size of a data block that can be sent and a transmitting power thereof. At present, in a conventional method for determining SG (which is one adopted in a protocol), Table 1 or Table 2 (selected from TS25.213) is adopted to quantize a power gain factor β_{ed} of a respective E-DPDCH. Finally, the SG of the ith E-TFCI (marked as E-TFCI$_i$) is obtained to be $SG_i=\Sigma(\beta_{ed,i,k})^2$, i.e., the sum of squares of the power gain factors β_{ed} of various E-DPDCHs, and k is a serial number of the E-DPDCH.

TABLE 1

Signaling value of $\Delta_{E\text{-}DPDCH}$	Quantized value of an amplitude ratio $A_{ed} = \beta_{ed}/\beta_c$	E-DPDCH modulation mode(s) used in identical sub-frames
29	168/15	BPSK
28	150/15	BPSK
27	134/15	BPSK
26	119/15	BPSK
25	106/15	BPSK
24	95/15	BPSK
23	84/15	BPSK
22	75/15	BPSK
21	67/15	BPSK
20	60/15	BPSK
19	53/15	BPSK, 4PAM
18	47/15	BPSK, 4PAM
17	42/15	BPSK, 4PAM
16	38/15	BPSK, 4PAM
15	34/15	BPSK, 4PAM
14	30/15	BPSK, 4PAM
13	37/15	BPSK, 4PAM
12	24/15	BPSK, 4PAM
11	21/15	BPSK, 4PAM
10	19/15	BPSK, 4PAM
9	17/15	BPSK
8	15/15	BPSK
7	13/15	BPSK
6	12/15	BPSK
5	11/15	BPSK
4	9/15	BPSK
3	8/15	BPSK
2	7/15	BPSK
1	6/15	BPSK
0	5/15	BPSK

TABLE 2

Signaling value of $\Delta_{E\text{-}DPDCH}$	Quantized value of an amplitude ratio $A_{ed} = \beta_{ed}/\beta_c$	E-DPDCH modulation mode(s) used in identical sub-frames
31	377/15	4PAM (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4)
30	336/15	4PAM (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4)
29	299/15	4PAM
28	267/15	BPSK (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4), 4PAM
27	237/15	BPSK (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4), 4PAM
26	212/15	BPSK, 4PAM
25	189/15	BPSK, 4PAM
24	168/15	BPSK, 4PAM
23	150/15	BPSK, 4PAM
22	134/15	BPSK, 4PAM
21	119/15	BPSK, 4PAM
20	106/15	BPSK, 4PAM
19	95/15	BPSK, 4PAM
18	84/15	BPSK, 4PAM
17	75/15	BPSK, 4PAM
16	67/15	BPSK, 4PAM
15	60/15	BPSK, 4PAM
14	53/15	BPSK, 4PAM
13	47/15	BPSK, 4PAM
12	42/15	BPSK, 4PAM
11	38/15	BPSK
10	34/15	BPSK
9	30/15	BPSK
8	27/15	BPSK
7	24/15	BPSK

TABLE 2-continued

Signaling value of $\Delta_{E\text{-}DPDCH}$	Quantized value of an amplitude ratio $A_{ed} = \beta_{ed}/\beta_c$	E-DPDCH modulation mode(s) used in identical sub-frames
6	21/15	BPSK
5	19/15	BPSK
4	17/15	BPSK
3	15/15	BPSK
2	13/15	BPSK
1	11/15	BPSK
0	8/15	BPSK

[0007] Table 1 gives quantized values of $\Delta_{E\text{-}DPDCH}$ (i.e., A_{ed}) when E-TFCI≤E-TFCI boost. Table 2 gives quantized values of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost, wherein β_c, is a power gain factor of a DPCCH.

[0008] In order to send a larger E-TFCI, the E-TFCI boost is introduced to provide an enhanced phase reference for an E-DPCCH. The E-TFCI boost is configured to a NodeB and a UE by a RNC, and the NodeB and the UE are optional cells. Moreover, a protocol stipulates that an E-TFCI boost capability of a UE is optional, a UE with a 16QAM capability does not always have the E-TFCI boost capability, and a UE without the 16QAM capability may also have the E-TFCI boost capability.

[0009] Configuration combinations of the 16QAM capability and the E-TFCI boost capability of a UE are shown in Table 3.

TABLE 3

Serial number of combination	Whether the UE is configured to use the 16QAM	Whether the UE is configured to use the E-TFCI boost	Maximum value of A_{ed}
1	Yes	Yes	377/15
2	Yes	No	168/15
3	No	Yes	267/15
4	No	No	168/15

[0010] A power gain factor $\beta_{ed,i,k}$ of an E-DPDCH is obtained by means of computation according to the number of physical channels and the size of a transmission block used by an E-TFCI$_i$, the number of physical channels and the size of a transmission block used by a reference E-TFCI, a gain factor of the reference E-TFCI, a biasing Δ_{harq} of a Hybrid Automatic Repeat Request (HARQ) and other information. Computation of the unquantized value of the entire E-DPDCH is unrelated to the E-TFCI boost, only when a quantization table is used to perform quantization in the end, different quantization tables (i.e., the above-mentioned Table 1 and Table 2) are used respectively according to two cases that E-TFCI is greater than or less than E-TFCI boost.

[0011] Therefore, when a UE is configured to use the 16QAM, whether the E-TFCI boost is used, ranges of unquantized values of a power gain factors $\beta_{ed,i,k}$ of E-DPDCHs should be same. However, according to an existing technique, ranges in quantization have a great difference: when the E-TFCI boost is not used, a maximum quantized value can only reach 168/15, whereas when the E-TFCI boost is used, a maximum quantized value can reach 377/15, so that a possibly reached maximum value of A_{ed} corresponding to the combination 2 in Table 3 is limited.

[0012] Similarly, when the 16QAM is not used, whether the E-TFCI boost is used, ranges of unquantized values of power gain factors $\beta_{ed,i,k}$ of E-DPDCHs should be same. However, according to an existing technique, ranges in quantization have a great difference. For example, when the E-TFCI boost is not used, a maximum quantized value can only reach 168/15, whereas when the E-TFCI boost is used, a maximum quantized value can reach 267/15, so that a possibly reached maximum value of A_{ed} corresponding to the combination 4 in Table 3 is limited.

[0013] To sum up, an existing SG determination method cannot achieve a maximum rate of HSUPA in the modulation mode under the combinations 2 and 4, therefore a high speed characteristic of the HSUPA cannot be given full play.

SUMMARY

[0014] In view of this, the disclosure is desired to provide a method and UE for determining SG, to solve the drawback that a UE cannot achieve a maximum rate under an existing method for determining SG in the related art.

[0015] To this end, a technical solution of the disclosure is implemented as follows.

[0016] A method for determining SG includes:

[0017] a non-quantization power gain factor of an E-DPDCH required by an E-TFCI is determined;

[0018] when a ratio of the non-quantization power gain factor of the E-DPDCH to a power gain factor of a DPCCH is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, the non-quantization power gain factor of the E-DPDCH required by the E-TFCI is set as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$; otherwise, power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$ are determined, and a maximum value selected from the power gain factors of the E-DPDCHs is set as the power gain factor of the E-DPDCH required by the E-TFCI; and

[0019] a sum of squares is performed on non-quantization power gain factors of various E-DPDCHs required by the E-TFCI, and SG required by the E-TFCI is obtained.

[0020] Wherein the quantization table of $\Delta_{E\text{-}DPDCH}$ may be:

[0021] when it is decided that a UE does not use a new quantization table of $\Delta_{E\text{-}DPDCH}$, a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI≤E-TFCI boost or a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost is selected; otherwise, the new quantization table of $\Delta_{E\text{-}DPDCH}$ is selected to use.

[0022] The quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost may be expanded as adaptation to a case that a UE uses or does not use the E-TFCI boost, and generating the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0023] The step that it is decided that the UE uses or does not use a new quantization table of $\Delta_{E\text{-}DPDCH}$ may include:

[0024] a Radio Network Controller (RNC) notifies, according to a capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$, the UE and a Node B (NodeB) of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0025] The step that the RNC determines the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ may include:

[0026] the UE reports its own version information to the RNC, and the RNC learns the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ according to the version information; or

[0027] a cell is newly added into a Radio Resource Control (RRC) connection request message, and the UE notifies the RNC of the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ via the cell.

[0028] The step that the UE and a NodeB are notified of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$ may include:

[0029] the RNC notifies, via a newly-added dedicated cell on a Uu interface, the UE of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$; and

[0030] the RNC notifies, via a newly-added dedicated cell on an Iub interface, the NodeB of the decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0031] The disclosure further provides a UE for determining SG, which includes:

[0032] a first determining module configured to determine a non-quantization power gain factor of an E-DPDCH required by an E-TFCI;

[0033] a setting module configured, when a ratio of the non-quantization power gain factor of the E-DPDCH to a power gain factor of a DPCCH is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, to set the non-quantization power gain factor of the E-DPDCH required by the E-TFCI as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$, otherwise, to determine power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$, and to set a maximum value selected from the power gain factors of the E-DPDCHs as the power gain factor of the E-DPDCH required by the E-TFCI; and

[0034] a second determining module configured to perform a sum of squares on non-quantization power gain factors of various E-DPDCHs required by the E-TFCI, and to obtain SG required by the E-TFCI.

[0035] The setting module may be further configured, when deciding a UE not to use a new quantization table of $\Delta_{E\text{-}DPDCH}$, to select a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI≤E-TFCI boost or a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost; otherwise, to select the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0036] The setting module may be further configured to expand the quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost as adaptation to a case that a UE uses or does not use E-TFCI boost, and to generate the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0037] In the method and UE for determining SG of the disclosure, by means of improving Table 2 in the related art, Table 2 is modified to adapt to a case that a UE uses or does not use E-TFCI boost, and a new quantization table of $\Delta_{E\text{-}DPDCH}$ is generated. In this way, when a power gain factor of an E-DPDCH required by an E-TFCI is performed quantization, adoption of the new quantization table of $\Delta_{E\text{-}DPDCH}$ can make a maximum rate possibly achieved by a UE to be increased, so that a high-speed characteristic of HSUPA can be given more full play.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] FIG. **1** is a schematic flowchart of a method for determining SG according to the disclosure; and

[0039] FIG. **2** is a schematic diagram of a structure of a UE for determining SG provided by the disclosure.

DETAILED DESCRIPTION

[0040] A method for determining SG according to the disclosure is shown in FIG. **1**, and includes:

[0041] Step 101: a Non-Quantization Power Gain Factor of Each E-DPDCH Required by an E-TFCI is Determined.

[0042] A non-quantization power gain factor of an E-DPDCH required by a ith E-TFCI (i.e., E-TFCI$_i$) is obtained by means of computation according to the number of physical channels and the size of a transmission block used by the E-TFCI$_i$, the number of physical channels and the size of a transmission block used by a reference E-TFCI, a gain factor of the reference E-TFCI, a biasing Δ_{harq} (the Δ_{harq} is an HARQ offset configured by an MAC-d flow bearing the data) of an HARQ and other information. The computation is the conventional art, and is not repeated here.

[0043] In the disclosure, a non-quantization power gain factor of a single E-DPDCH is recorded as B wherein $\beta_{ed,k,i,uq}$, represents a power gain factor of an E-DPDCH, i represents the ith E-TFCI, k is a serial number of an E-DPDCH, and uq represents unquantized.

[0044] Step 102: When a ratio of a non-quantization power gain factor of an E-DPDCH to a power gain factor of a DPCCH is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, the power gain factor of the E-DPDCH required by the E-TFCI is set as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$, otherwise, power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$ are determined, and a maximum value selected from the power gain factors of the E-DPDCHs is set as the power gain factor of the E-DPDCH required by the E-TFCI.

[0045] Namely, when $\beta_{ed,k,i,uq}/\beta_c<A_{ed,min}$, β_{ed} corresponding to $A_{ed,min}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$ is set as $\beta_{ed,k}$ required by the E-TFCI; and

[0046] when $\beta_{ed,k,i,uq}/\beta_c\geq A_{ed,min}$, β_{ed} corresponding to each A_{ed} in the quantization table of $\Delta_{E\text{-}DPDCH}$ is determined, and a maximum β_{ed} that satisfies $\beta_{ed}\leq\beta_{ed,k,i,uq}$ is set as $\beta^3{}_{ed,k}$ required by the E-TFCI.

[0047] In the step, for selection of the quantization table of $\Delta_{E\text{-}DPDCH}$, the following principle is followed:

[0048] a RNC notifies, according to a capability of a UE in supporting a new quantization table of $\Delta_{E\text{-}DPDCH}$, the UE and a NodeB of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$. If the decision result is that the UE does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$, then Table 1 or Table 2 is selected to use (that is, Table 1 is used when E-TFCI≤E-TFCI boost, and Table 2 is used when E-TFCI>E-TFCI boost). If the decision result is that the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$, then the new quantization table of $\Delta_{E\text{-}DPDCH}$ (Table 4 as shown below) is selected to use.

[0049] Wherein, the new quantization table of $\Delta_{E\text{-}DPDCH}$ (Table 4) is an extension to Table 2, and the quantized values of $\Delta_{E\text{-}DPDCH}$ provided by Table 2 are modified as a case adapted to regardless of whether a UE uses the E-TFCI boost.

[0050] Step 103: Non-quantization power gain factors of various E-DPDCHs required by the E-TFCI are performed a sum of squares, and SG required by the E-TFCI is obtained.

[0051] Namely, $SG=\Sigma(\beta_{ed,k})^2$.

TABLE 4

Signaling value of $\Delta_{E\text{-}DPDCH}$	Quantized value of an amplitude ratio Aed = βed/βc	E-DPDCH modulation mode(s) used in identical sub-frames
31	377/15	4PAM (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4)
30	336/15	4PAM (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4)
29	299/15	4PAM
28	267/15	BPSK (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4), 4PAM
27	237/15	BPSK (only adapted to configuration of an SF2 code in 2 × SF2 + 2 × SF4), 4PAM
26	212/15	BPSK, 4PAM
25	189/15	BPSK, 4PAM
24	168/15	BPSK, 4PAM
23	150/15	BPSK, 4PAM
22	134/15	BPSK, 4PAM
21	119/15	BPSK, 4PAM
20	106/15	BPSK, 4PAM
19	95/15	BPSK, 4PAM
18	84/15	BPSK, 4PAM
17	75/15	BPSK, 4PAM
16	67/15	BPSK, 4PAM
15	60/15	BPSK, 4PAM
14	53/15	BPSK, 4PAM
13	47/15	BPSK, 4PAM
12	42/15	BPSK, 4PAM
11	38/15	BPSK
10	34/15	BPSK
9	30/15	BPSK
8	27/15	BPSK
7	24/15	BPSK
6	21/15	BPSK
5	19/15	BPSK
4	17/15	BPSK
3	15/15	BPSK
2	13/15	BPSK
1	11/15	BPSK
0	8/15	BPSK

[0052] Table 4 gives quantized values of $\Delta_{E\text{-}DPDCH}$ when a UE uses or does not use the E-TFCI boost.

[0053] The solution of the disclosure is illustrated below by means of specific embodiments.

Embodiment 1

[0054] Step 1: The method for determining SG of the disclosure is introduced into 3GPP Rel 10, that is, when a version of a UE is Rel 10, it is indicated that the UE supports the new quantization table of $\Delta_{E\text{-}DPDCH}$. Of course, the method for determining SG of the disclosure may also be introduced into other versions as needed, but is not limited to the 3GPP Rel 10.

[0055] A UE reports its own version information to a RNC, and the RNC can learn a capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ according to the version information.

[0056] Step 2: The RNC decides that the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$, decides that the UE uses 16QAM instead of using E-TFCI boost, and notifies a NodeB of the configuration information. More preferably, the RNC notifies, via a newly-added cell on an Iub interface, the NodeB of a decision result that the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$, and notifies, via a newly-added dedicated cell on a Uu interface, the UE of the decision result that the UE use the new quantization table of $\Delta_{E\text{-}DPDCH}$. The above newly-added cells are optional cells, when the optional cells are not included, it is indicated that the UE does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$, otherwise, it is indicated that the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$. A corresponding decision result of using or no using the new quantization table of $\Delta_{E\text{-}DPDCH}$ by the UE is notified to the UE and the NodeB by means of values of the newly-added cells.

[0057] Step 3: The UE sends uplink scheduling information to the NodeB.

[0058] Step 4: After receiving the uplink scheduling information from the UE, the NodeB performs scheduling on the UE according to services requirements of various UEs in a cell, unlink interference degree of the cell, a load threshold allowed by a network, a load processed by the NodeB and other factors, and obtains a power offset $PO_{m,ed}$ of an E-DPDCH of the UE with respect to a DPCCH by means of computation, wherein the letter m is a serial number of the UE; and converts SG of the UE into a corresponding serial number (i.e., Absolute Grant (AG)) in a SG table or Relative Grant (RG) with respect to "UP", "DOWN" or "HOLD" of SG during the previous scheduling according to the SG table. The implementation of converting the SG into the AG or the RG is the conventional art, and is not repeated here.

[0059] Step 5: The NodeB sends the AG or the RG converted by the SG to the UE.

[0060] Step 6: The UE converts the received AG or RG into a corresponding quantized value of SG.

[0061] Specifically, Table 5 and Table 6 correspond to quantization tables of SG when Table 1 and Table 2 are used respectively. When the new quantization table of $\Delta_{E\text{-}DPDCH}$ is used, Table 6 serves as a corresponding quantization table of SG.

[0062] After the UE receives the AG (a value range of the AG is 0 to 37), the UE finds a corresponding physical value such as AG=37 in the quantization table of SG. In the embodiment, the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$, a corresponding quantization table of SG when Table 6 is used is $(377/15)^2\times4$.

[0063] After the UE receives the RG, the UE finds and stores, according to a power offset $PO_{m,ed}$ (a value range of the $PO_{m,ed}$AG is 0 to 37) of the E-DPDCH used when selecting an E-TFC within a previous TTI with respect to a DPCCH, a corresponding quantized value of SG in the quantization table of SG, and takes the corresponding quantization value as a reference such as $PO_{m,ed}=36$. In the embodiment, the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$, and then a corresponding quantization table of SG when Table 6 is used is $(336/15)^2\times4$. The UE finds a quantized value of SG corresponding to "UP", "DOWN" or "HOLD" in the quantization table of SG respectively on the basis of the reference according to an "UP", "DOWN" or "HOLD" command in RG, for example, the "UP" command exists in the RG, and then the quantized value of SG corresponding to the "UP" is $(377/15)^2\times4$.

TABLE 5

Index	Scheduled Grant
37	$(168/15)^2 \times 6$
36	$(150/15)^2 \times 6$
35	$(168/15)^2 \times 4$
34	$(150/15)^2 \times 4$
33	$(134/15)^2 \times 4$
32	$(119/15)^2 \times 4$
31	$(150/15)^2 \times 2$
30	$(95/15)^2 \times 4$
29	$(168/15)^2$
28	$(150/15)^2$
27	$(134/15)^2$
26	$(119/15)^2$
25	$(106/15)^2$
24	$(95/15)^2$
23	$(84/15)^2$
22	$(75/15)^2$
21	$(67/15)^2$
20	$(60/15)^2$
19	$(53/15)^2$
18	$(47/15)^2$
17	$(42/15)^2$
16	$(38/15)^2$
15	$(34/15)^2$
14	$(30/15)^2$
13	$(27/15)^2$
12	$(24/15)^2$
11	$(21/15)^2$
10	$(19/15)^2$
9	$(17/15)^2$
8	$(15/15)^2$
7	$(13/15)^2$
6	$(12/15)^2$
5	$(11/15)^2$
4	$(9/15)^2$
3	$(8/15)^2$
2	$(7/15)^2$
1	$(6/15)^2$
0	$(5/15)^2$

TABLE 6

Index	Scheduled Grant
37	$(377/15)^2 \times 4$
36	$(336/15)^2 \times 4$
35	$(237/15)^2 \times 6$
34	$(212/15)^2 \times 6$
33	$(237/15)^2 \times 4$
32	$(168/15)^2 \times 6$
31	$(150/15)^2 \times 6$
30	$(168/15)^2 \times 4$
29	$(150/15)^2 \times 4$
28	$(134/15)^2 \times 4$
27	$(119/15)^2 \times 4$
26	$(150/15)^2 \times 2$
25	$(95/15)^2 \times 4$
24	$(168/15)^2$
23	$(150/15)^2$
22	$(134/15)^2$
21	$(119/15)^2$
20	$(106/15)^2$
19	$(95/15)^2$
18	$(84/15)^2$
17	$(75/15)^2$
16	$(67/15)^2$
15	$(60/15)^2$
14	$(53/15)^2$
13	$(47/15)^2$
12	$(42/15)^2$
11	$(38/15)^2$
10	$(34/15)^2$
9	$(30/15)^2$
8	$(27/15)^2$
7	$(24/15)^2$
6	$(21/15)^2$
5	$(19/15)^2$
4	$(17/15)^2$
3	$(15/15)^2$
2	$(13/15)^2$
1	$(12/15)^2$
0	$(11/15)^2$

[0064] The quantized value of SG is SG allocated by the NodeB to the UE. When sending a data block actually, the UE must satisfy that SG required by the sent transmission block cannot exceed the SG allocated by the NodeB.

[0065] Step 7: Determining the required SG for the transmission block sent by the UE is specifically:

[0066] assuming that an E-TFCI corresponding to a size of the transmission block is an E-$TFCI_i$,

[0067] firstly, a non-quantization power gain factor $\beta_{ed,k,i,uq}$ of the kth E-DPDCH required by the E-$TFCI_i$ is determined (specific implementation thereof is the conventional art, and is not repeated here);

[0068] next, the $\beta_{ed,k,i,uq}$ is performed the following quantization: when $\beta_{ed,k,i,uq}/\beta_c<A_{ed,min}$, wherein $A_{ed,min}$ in Table 4 is 8/15, then $\beta_{ed,k}$ required by the E-$TFCI_i$ is 8;

[0069] when $\beta_{ed,k,i,uq}/\beta_c\geq A_{ed,min}$, β_{ed} corresponding to each A_{ed} in Table 4 is determined, and a maximum value β_{ed} satisfying $\beta_{ed}\leq\beta_{ed,k,i,uq}$ is set as the $\Delta_{ed,k}$ required by the E-TFCI. Assuming that $\beta_{ed,k,i,uq}$=20, the value of β_{ed} satisfying $\beta_{ed}<\beta_{ed,k,i,uq}$ in Table 4 is 19, 17, 15, 13, 11 and 8, in which the maximum value is 19, therefore $\beta_{ed,k}$=19.

[0070] By analogy, power gain factors of all E-DPDCHs required by the E-$TFCI_i$ are obtained, and then all $\beta_{ed,k}$ are performed the sum of squares to obtain SG required by the E-$TFCI_i$, i.e., $SG=\Sigma(\beta_{ed,k})^2$.

[0071] It needs to be indicated that if SG determined by the UE exceeds SG allocated by a NodeB, then a transmission block is sent by means of the SG allocated by the NodeB; otherwise, the UE sends a transmission block by means of the SG determined by the UE itself.

[0072] In the embodiment, since the UE is configured to use the 16QAM instead of using the E-TFCI boost, it can seen from Table 4 that a maximum quantized value of $\Delta_{E\text{-}DPDCH}$ can reach 377/15, whereas the conventional art can only reach 168/15, so that a maximum rate possibly achieved by the UE is increased and a high-speed characteristic of HSUPA can be given more full play.

Embodiment 2

[0073] The embodiment is basically the same as Embodiment 1, and differs from Embodiment 1 in that: in Step 2, the RNC decides that the UE uses the new quantization table of $\Delta_{E\text{-}DPDCH}$, and decides that the UE doses not use the 16QAM or E-TFCI boost.

[0074] In the embodiment, since the UE is configured to not use the 16QAM or the E-TFCI boost, it can seen from Table 4 that a maximum quantized value of $\Delta_{E\text{-}DPDCH}$ can reach 267/15, whereas the conventional art can only reach 168/15, so that a maximum rate possibly achieved by the UE is increased and a high-speed characteristic of HSUPA can be given more full play.

Embodiment 3

[0075] The embodiment is basically the same as Embodiment 1, and differs from Embodiment 1 in that: in Step 2, the RNC decides that the UE does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$, decides that the UE use the 16QAM instead of using the E-TFCI boost, and notifies a NodeB of the configuration information.

[0076] In the embodiment, since the RNC decides that the UE does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$ (i.e., Table 4), and decides that the UE use the 16QAM instead of using the E-TFCI boost, which corresponds to E-TFCI boost=0, the UE uses Table 1 (i.e., a case that E-TFCI≤E-TFCI boost).

[0077] Then, a process of determining SG is the same as Step 7 in Embodiment 1, and differs from Step 7 in Embodiment 1 in referring to Table 1 instead of Table 4.

Embodiment 4

[0078] The embodiment is basically the same as Embodiment 1, and differs from Embodiment 1 in that: the version of the UE is Rel 8, that is, the UE does not support the new quantization table of $\Delta_{E\text{-}DPDCH}$, then the RNC decides that the UE does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$, when the RNC decides that the UE uses the 16QAM and E-TFCI boost, the UE uses Table 1 or Table 2 respectively according to E-TFCI≤E-TFCI boost or E-TFCI>E-TFCI boost.

[0079] Then, a process of determining SG is the same as Step 7 in Embodiment 1, and differs from Step 7 in Embodiment 1 in referring to Table 1 or Table 2 instead of Table 4.

[0080] It needs to be indicated that the RNC may also learn a capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ by means of the following way: a cell is newly added into a RRC connection request message, and the UE notifies the RNC of the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ via the cell, when the RRC connection request message includes the cell, it is indicated that the UE supports the new quantization table of $\Delta_{E\text{-}DPDCH}$, otherwise, the UE does not support the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0081] In order to implement the above-mentioned method, the disclosure provides a UE as shown in FIG. **2**.

[0082] A UE for determining SG includes:

[0083] a first determining module configured to determine a non-quantization power gain factor of an E-DPDCH required by an E-TFCI;

[0084] a setting module configured, when a ratio of the non-quantization power gain factor of the E-DPDCH to a power gain factor of a DPCCH is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, to set the non-quantization power gain factor of the E-DPDCH required by the E-TFCI as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$, otherwise, to determine power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$, and to set a maximum value selected from the power gain factors of the E-DPDCHs as the power gain factor of the E-DPDCH required by the E-TFCI; and

[0085] a second determining module configured to perform a sum of squares on non-quantization power gain factors of various E-DPDCHs required by the E-TFCI, and to obtain SG required by the E-TFCI.

[0086] Wherein, the setting module is further configured, when a UE does not use a new quantization table of $\Delta_{E\text{-}DPDCH}$, to select a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI≤E-TFCI boost or a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost; otherwise, to select the new quantization table of $\Delta_{E\text{-}DPDCH}$.

[0087] The setting module is further configured to expand the quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost as adaptation to a case that a UE uses or does not use E-TFCI boost, and to generate the new quantization table of $\Delta_{E\text{-}DPDCH}$. It needs to be indicated that the function may also preferably implemented by a dedicated management module in an HSUPA system.

INDUSTRIAL APPLICABILITY

[0088] In the method and UE for determining SG of the disclosure, by means of improving Table 2 in the related art, Table 2 is modified to adapt to a case that a UE uses or does not use E-TFCI boost, and a new quantization table of $\Delta_{E\text{-}DPDCH}$ is generated. In this way, when a power gain factor of an E-DPDCH required by an E-TFCI is performed quantization, adoption of the new quantization table of $\Delta_{E\text{-}DPDCH}$ can make a maximum rate possibly achieved by a UE to be increased, so that a high-speed characteristic of HSUPA can be given more full play.

[0089] The above are only preferable embodiments of the disclosure, but are not intended to limit the scope of protection of the disclosure.

1. A method for determining Scheduling Grant (SG), comprising:

determining a non-quantization power gain factor of an Enhanced Dedicated Channel (E-DCH) Dedicated Physical Data Channel (E-DPDCH) required by an E-DCH Transport Format Combination Indicator (E-TFCI);

when a ratio of the non-quantization power gain factor of the E-DPDCH to a power gain factor of a Dedicated Physical Control Channel (DPCCH) is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, setting the non-quantization power gain factor of the E-DPDCH required by the E-TFCI as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$; otherwise, determining power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$, and setting a maximum value selected from the power gain factors of the E-DPDCHs as the power gain factor of the E-DPDCH required by the E-TFCI; and

performing a sum of squares on non-quantization power gain factors of various E-DPDCHs required by the E-TFCI, and obtaining SG required by the E-TFCI.

2. The method for determining SG according to claim **1**, wherein the quantization table of $\Delta_{E\text{-}DPDCH}$ is:

when it is decided that a UE does not use a new quantization table of $\Delta_{E\text{-}DPDCH}$, selecting a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI≤E-TFCI boost or a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost; otherwise, selecting the new quantization table of $\Delta_{E\text{-}DPDCH}$ to use.

3. The method for determining SG according to claim **2**, further comprising: expanding the quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost as adaptation to a case that a UE uses or does not use the E-TFCI boost, and generating the new quantization table of $\Delta_{E\text{-}DPDCH}$.

4. The method for determining SG according to claim **2**, wherein the step of deciding that the UE uses or does not use a new quantization table of $\Delta_{E\text{-}DPDCH}$ comprises:

notifying, by a Radio Network Controller (RNC), according to a capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$, the UE and a Node B (NodeB) of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$.

5. The method for determining SG according to claim **4**, wherein the step of determining, by the RNC, the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ comprises:

reporting, by the UE, its own version information to the RNC, and learning, by the RNC, the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ according to the version information; or

newly adding a cell into a Radio Resource Control (RRC) connection request message, and notifying, by the UE, the RNC of the capability of the UE in supporting the new quantization table of $\Delta_{E\text{-}DPDCH}$ via the cell.

6. The method for determining SG according to claim **4**, wherein the step of notifying the UE and a NodeB of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$ comprises:

notifying, by the RNC, via a newly-added dedicated cell on a Uu interface, the UE of a decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$; and

notifying, by the RNC, via a newly-added dedicated cell on an Iub interface, the NodeB of the decision result that the UE uses or does not use the new quantization table of $\Delta_{E\text{-}DPDCH}$.

7. A User Equipment (UE) for determining Scheduling Grant (SG), comprising:

a first determining module configured to determine a non-quantization power gain factor of an Enhanced Dedicated Channel (E-DCH) Dedicated Physical Data Channel (E-DPDCH) required by an E-DCH Transport Format Combination Indicator (E-TFCI);

a setting module configured, when a ratio of the non-quantization power gain factor of the E-DPDCH to a power gain factor of a Dedicated Physical Control Channel (DPCCH) is less than a minimum quantized value of $\Delta_{E\text{-}DPDCH}$ in a quantization table of $\Delta_{E\text{-}DPDCH}$, to set the non-quantization power gain factor of the E-DPDCH required by the E-TFCI as a power gain factor of an E-DPDCH corresponding to the minimum quantized value of $\Delta_{E\text{-}DPDCH}$; otherwise, to determine power gain factors of E-DPDCHs, which are less than or equal to the non-quantization power gain factor of the E-DPDCH, corresponding to various quantized values of $\Delta_{E\text{-}DPDCH}$ in the quantization table of $\Delta_{E\text{-}DPDCH}$, and to set a maximum value selected from the power gain factors of the E-DPDCHs as the power gain factor of the E-DPDCH required by the E-TFCI; and

a second determining module configured to perform a sum of squares on non-quantization power gain factors of various E-DPDCHs required by the E-TFCI, and to obtain SG required by the E-TFCI.

8. The UE for determining SG according to claim **7**, wherein

the setting module is further configured, when deciding a UE not to use a new quantization table of $\Delta_{E\text{-}DPDCH}$, to select a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI≤E-TFCI boost or a quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost; otherwise, to select the new quantization table of $\Delta_{E\text{-}DPDCH}$.

9. The UE for determining SG according to claim **8**, wherein

the setting module is further configured to expand the quantization table of $\Delta_{E\text{-}DPDCH}$ when E-TFCI>E-TFCI boost as adaptation to a case that a UE uses or does not use E-TFCI boost, and to generate the new quantization table of $\Delta_{E\text{-}DPDCH}$.

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