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(54) **A PHYSICAL UPLINK SHARED CHANNEL TRANSMISSION POWER CONTROL METHOD AND SYSTEM**

VERFAHREN UND SYSTEM ZUR STEUERUNG DER ÜBERTRAGUNGSLEISTUNG EINES MEHRFACH GENUTZTEN PHYSIKALISCHEN UPLINK-KANALS

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Description

TECHNICAL FIELD

[0001] The present invention relates to a communication field, and particularly to a transmission power control method and system for a physical uplink shared channel.

BACKGROUND

[0002] In a LTE (Long Term Evolution) system, physical uplink channels mainly include a PUCCH (Physical Uplink Control Channel) and a PUSCH (Physical Uplink Shared Channel) and so on. The PUCCH is used for transmitting uplink control information, which includes uplink feedback such as ACK (Acknowledge)/NACK (Non-Acknowledge), CQI (Channel Quality Indication), RI (Rank Indication), and PMI (Precoding Matrix Indicator) and so on. PUSCH may only transmit Uplink Shared Channel (UL-SCH) data or may only transmit uplink control information, or may transmit both uplink shared channel data and uplink control information.

[0003] All User Equipments (UE) in a cell need to set transmission power of a physical uplink shared channel in every subframe. In an adjustment process of uplink closed loop power control, for a certain subframe i, the setting formula (or called as a power control formula, hereinafter referred to as formula 1) for the transmission power of its physical uplink shared channel (take dBm as a unit) is:

$$P_{\mathrm{PUSCH}}(i) = \min\{P_{\mathrm{MAX}}, 10 \cdot \log_{10}(M_{\mathrm{PUSCH}}(i)) + P_{\mathrm{O\_PUSCH}}(j) + \alpha \cdot PL + \Delta_{\mathrm{TF}}(i) + f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;

$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i, that is the number of resource blocks used for transmitting the PUSCH in subframe i;

P_{O_PUSCH} (j) represents target reference power. For the specific definition of variable j, please refer to relative standard documents of LTE, such as the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer);

α represents a path loss correction factor;

PL represents path loss;

$\Delta_{TF}(i)$ represents a transmission format offset parameter, wherein

When K_S=1.25, $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1)$; when K_S= 0, $\Delta_{TF}(i)$=0;

K_S is a parameter configured by RRC (Radio Resource Control) at a high layer;

$MPR = TBS / N_{RE}$, where TBS represents the size of a transmission block; N_{RE} represents the number of resource elements, $N_{RE} = M_{\mathrm{PUSCH}} \cdot N_{\mathrm{sc}}^{\mathrm{RB}} \cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of SC-FDMA (Single Carrier-Frequency Division Multiple Access) symbols used for transmitting the PUSCH; $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of subcarriers (resource elements) contained in a resource block, which is used for representing the size of a resource block in a frequency domain. TBS and M_{PUSCH} can be obtained according to a signaling in an initial PDCCH of a transmission block;

f(i) represents the power control correction function of subframe i.

[0004] As TBS represents the size of a transmission block, when there is only uplink control information but no uplink shared channel data sent over a physical uplink shared channel, the size of a transmission block is 0, that is TBS = 0, then,

$$\Delta_{\mathrm{TF}}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1) = 10 \times \log_{10}(2^{0 \times 1.25} - 1) = 10 \times \log_{10} 0,$$

where $\Delta_{TF}(i)$ is an infinite value, which is meaningless; this can lead to troubles in system realization. When there is only uplink control information but no uplink shared channel data sent over a physical uplink shared channel, the power control of the physical uplink shared channel can not be realized, the transmission performance of uplink control information can be affected, and thereby the overall performance of a system can be caused to decline.

SUMMARY

[0005] The technical problem to be solved by this invention is to overcome the shortcomings of the existing technology by providing a transmission power control method and a system for a PUSCH when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, thus to ensure the overall performance of a system.

[0006] To solve the problem as above, this invention provides a transmission power control method for a physical uplink shared channel. The method includes: when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, the transmission power of the physical uplink shared channel is set according to the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check as well as amplitude offset.

[0007] Further, the aforesaid method may also have the following characteristic, the transmission power of the physical uplink shared channel is set according to the following formula:

$$P_{\text{PUSCH}}(i) = \min\{P_{\text{MAX}}, 10 \cdot \log_{10}(M_{\text{PUSCH}}(i)) + P_{\text{O\_PUSCH}}(j) + \alpha \cdot PL + \Delta_{\text{TF}}(i) + f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the physical uplink shared channel in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power;
α represents a path loss correction factor;
PL represents path loss;
f(i) represents a power control correction function of subframe i;
$\Delta_{TF}(i)$ is a transmission format offset parameter;

[0008] When K_S=1.25, $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot K_S}-1) \cdot \Delta\beta)$, or $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S}-1)+\Delta\beta$; when $K_S = 0$, $\Delta_{TF}(i) = 0$; K_S is a parameter configured by radio resource control at a high layer; $MPR = O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE} = M_{\text{PUSCH}} \cdot N_{\text{sc}}^{\text{RB}} \cdot N_{\text{symb}}^{\text{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\text{symb}}^{\text{PUSCH}}$ represents the number of single carrier-frequency division multiple access (SC-FDMA) symbols used for transmitting the PUSCH, $N_{\text{sc}}^{\text{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents the amplitude offset; wherein when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$, and when $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot K_S}-1) \cdot \Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$, or when $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S}-1)+\Delta\beta$, $\Delta\beta = 10 \cdot \log_{10} \beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in the channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0009] Further, the aforesaid method may have the following characteristic, the β_{offset}^{CQI} is notified by a high layer signaling.

[0010] Further, the aforesaid method may also have the following characteristic, the value of β_{offset}^{CQI} may be 0.750, 1.000, 1.125, 1.250, 1.375, 1.625, 1.750, 2.000, 2.250, 2.500, 2.875, 3.125, 3.500, 4.000, 5.000 or 6.250.

[0011] Further, the aforesaid method may also have the following characteristic, when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, *O=TBS*, when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta = 1$, **or when** $\Delta_{TF}(i)= 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta=0$, where *TBS* represents the size of a transmission block, and *TBS* and M_{PUSCH} are obtained according to the signaling in the initial PDCCH of the transmission block.

[0012] Further, the aforesaid method may also have the following characteristic, when there is only uplink shared channel data sent over the physical uplink shared channel, *O=TBS*, when $\Delta_T(i)_F = 10._1\log_0((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, **or when** $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta = 0$, where *TBS* represents the size of a transmission block, and *TBS* and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0013] Further, the aforesaid method may also have the following characteristic, when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O=\sum_{r=0}^{C-1}K_r$; when

$$\Delta_{TF}(i)=10\cdot\log_{10}\left((2^{MPR\cdot K_S}-1)\cdot\Delta\beta\right)$$

$\Delta\beta=1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, C and K_r are obtained according to the signaling in the initial PDCCH of the transmission block.

[0014] Further, the aforesaid method may also have the following characteristic, when there is only uplink shared channel data sent over the physical uplink shared channel, $O=\sum_{r=0}^{C-1}K_r$, when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1) + \Delta\beta$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, C and K_r are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0015] Further, the aforesaid may also have the following characteristic, the uplink control information includes: Acknowledgment (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

[0016] This invention also provides a transmission power control system for a physical uplink shared channel. The system includes: a power setting module, used for setting the transmission power of the physical uplink shared channel according to the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check as well as an amplitude offset, when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel.

[0017] Further, the aforesaid system may have the following characteristic, the power setting module is used for setting the transmission power of the physical uplink shared channel according to the following formula:

$$P_{PUSCH}(i)=\min\{P_{MAX},10\cdot\log_{10}(M_{PUSCH}(i))+P_{O\_PUSCH}(j)+\alpha\cdot PL+\Delta_{TF}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the physical uplink shared channel in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power;
α represents a path loss correction factor;
PL represents path loss;
f(i) represents a power control correction function of subframe i;
$\Delta_{TF}(i)$ is a transmission format offset parameter;

[0018] When $K_S=1.25$, $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, or $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$; when $K_S = 0$, $\Delta_{TF}(i) = 0$;

K_S is a parameter configured by radio resource control at a high layer; $MPR = O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE} = M_{\mathrm{PUSCH}} \cdot N_{\mathrm{sc}}^{\mathrm{RB}} \cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents the amplitude offset; wherein when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O = O_{CQI}$, and when $\Delta_{\mathrm{TF}}(i) = 10 \cdot \log_{10}((2^{MPR \cdot K_S} - 1) \cdot \Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$, or when $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1) + \Delta\beta$, $\Delta\beta = 10 \cdot \log_{10} \beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0019] Further, the aforesaid system may have the following characteristic, the power setting module is used for obtaining the β_{offset}^{CQI} from a high layer signaling.

[0020] Further, the said system may have the following characteristic, the power setting module is used for determining values of the O and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel: $O=TBS$, when $\Delta_{\mathrm{TF}}(i) = 10 \cdot \log_{10}((2^{MPR \cdot K_S} - 1) \cdot \Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1) + \Delta\beta$, $\Delta\beta = 0$, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to the signaling in the initial PDCCH of the transmission block.

[0021] Further, the aforesaid system may have the following characteristic, the power setting module is used for determining values of O and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel: $O=TBS$, when $\Delta_{\mathrm{T}}(i)_{\mathrm{F}} = 10_{\cdot 1}\log_0(2^{MPR \cdot K_S} - 1) \cdot \Delta\beta$, $\Delta\beta=1$, **or when** $\Delta_{\mathrm{TF}}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1)\Delta + \beta$, $\Delta\beta = 0$, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0022] Further, the aforesaid system may have the following characteristic, the power setting module is used for determining values of O and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel: $O = \sum_{r=0}^{C-1} K_r$, when $\Delta_{\mathrm{TF}}(i) = 10 \cdot \log_{10}((2^{MPR \cdot K_S} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, or when $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1) + \Delta\beta$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coking block with an index of r, and the M_{PUSCH}, C and K_r are obtained according to the signaling in the initial PDCCH of the transmission block.

[0023] Further, the aforesaid system may have the following characteristic, the power setting module is used for determining values of O and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel: $O = \sum_{r=0}^{C-1} K_r$, when $\Delta_{\mathrm{T}}(i)_{\mathrm{F}} = 10_{\cdot 1}\log_0((2^{MPR \cdot K_S} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, or when $\Delta_{\mathrm{TF}}(i) = 10 \cdot \log_{10}(2^{MPR \cdot K_S} - 1) + \Delta\beta$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, C and K_r are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0024] This invention provides a transmission power control method and a system for a physical uplink shared channel to solve the problem of power control of the physical uplink shared channel when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, thus to ensure the overall performance of a system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Fig.1 is the flow chart for calculating the transmission power of a physical uplink shared channel when there is only uplink control information but no uplink shared channel data sent over a physical uplink shared channel in the embodiments of this invention.

DETAILED DESCRIPTION

[0026] The basic thought of this invention is that, when there is only uplink control information but no uplink shared channel data sent over a physical uplink shared channel, a transmission format offset parameter is set according to the total number of bits contained in a channel quality indication signaling and its corresponding Cyclic Redundancy Check (CRC) as well as an amplitude offset, and then the transmission power of a physical uplink shared channel is set according to the transmission format offset parameter.

[0027] As shown in Fig. 1, a transmission power control method for a physical uplink shared channel in this invention includes the following steps:

step 101 : Obtaining types of data currently transmitted over the physical uplink shared channel;
step 102: Setting a transmission format offset parameter when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel;
step 103: Calculating the transmission power of the physical uplink shared channel, and setting the transmission power of the physical uplink shared channel according to the result of the calculation.

[0028] In step 102, the transmission format offset parameter is set according to the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check as well as an amplitude offset; in step 103, the transmission power of the physical uplink shared channel is set according to the transmission format offset parameter.

Embodiment 1

[0029] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{\mathrm{PUSCH}}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{\mathrm{O\_PUSCH}}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{\mathrm{TF}}(i)$ is called as a transmission format offset parameter.

[0030] When K_S=1.25, $\Delta_T(i)_F = 10._1\log_0((2^{MPR\cdot K_S}\text{-}1)\cdot\Delta\beta)$; when K_S=0, $\Delta_{\mathrm{TF}}(i)$ =0; K_S is parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements,

$$N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$$

where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, N_{sc}^{RB} represents the number of resource elements contained in a resource block, *O* represents the size of information bits, and Δβ represents an amplitude offset.

[0031] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O = O_{CQI}$ and $\Delta\beta = \beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0032] In other cases (when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel), *O=TBS* and Δβ=1, where *TBS* represents the size of a transmission block, *TBS* and M_{PUSCH} are obtained according to a signaling in an initial PDCCH of the transmission block.

[0033] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high level index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.

[0034] Table 1: Correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI}

I_{offset}^{CQI}	β_{offset}^{CQI}
0 0 .	7 5 0
1 1 .	0 0 0
2 1 .	1 2 5
3 1 .	2 5 0
4 1 .	3 7 5
5 1 .	6 2 5
6 1 .	7 5 0
7 2 .	0 0 0
8 2 .	2 5 0
9 2 .	5 0 0
1 0 2 .	8 7 5
1 1 3 .	1 2 5
1 2 3 .	5 0 0
1 3 4 .	0 0 0
1 4 5 .	0 0 0
1 5 6 .	2 5 0

f(i) represents a power control correction function of subframe i.

[0035] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 2

[0036] The formula for calculating the transmission power of a physical uplink shared channel is shown as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\}.$$

where P_{MAX} represents an upper limit of the transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0037] When K_S=1.25, $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$; when K_S = 0, $\Delta_{TF}(i)$ = 0 ; K_S is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0038] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O = O_{CQI}$ and $\Delta\beta=\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0039] When there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O=TBS$ and $\Delta\beta$=1, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in an initial PDCCH of the transmission block.

[0040] When there is only uplink shared channel data sent over the physical uplink shared channel, $O=TBS$ and $\Delta\beta$=1, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0041] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0042] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 3

[0043] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0044] When K_S=1.25, $\Delta_T(i)_F = 10._1\log_0((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$; when K_S = 0, $\Delta_{TF}(i)$=0; K_S is a parameter cnfigured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0045] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O = O_{CQI}$ and $\Delta\beta=\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0046] In other cases (when there are both uplink control information and uplink shared channel data sent over the physical uplink shard channel, or when there is only uplink shared channel data sent over the physical uplink shared channel), $O=\sum_{r=0}^{C-1}K_r$ and $\Delta\beta$=1, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, C and K_r are obtained according to a signaling in an initial PDCCH of a transmission block.

[0047] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0048] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 4

[0049] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\text{PUSCH}}(i)=\min\{P_{\text{MAX}},10\cdot\log_{10}(M_{\text{PUSCH}}(i))+P_{\text{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\text{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0050] When K_S=1.25, $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$; when $K_S = 0$, $\Delta_{TF}(i) = 0$; K_S is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\text{PUSCH}}\cdot N_{\text{sc}}^{\text{RB}}\cdot N_{\text{symb}}^{\text{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\text{symb}}^{\text{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\text{sc}}^{\text{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0051] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$ and $\Delta\beta=\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0052] When there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O=\sum_{r=0}^{C-1}K_r$ and $\Delta\beta = 1$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, C and K_r are obtained according to a signaling in an initial PDCCH of a transmission block.

[0053] When there is only uplink shared channel data sent over the physical uplink shared channel, $O=\sum_{r=0}^{C-1}K_r$ and $\Delta\beta$=1, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, C and K_r are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0054] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1.

However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0055] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 5

[0056] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0057] When K_S=1.25, $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$; when K_S=0, $\Delta_{TF}(i)$=0; K_S is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0058] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O = O_{CQI}$ and $\Delta\beta=10\cdot\log_{10}\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0059] In other cases (when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel), $O=TBS$ and $\Delta\beta$ = 0, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in an initial PDCCH of the transmission block.

[0060] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0061] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 6

[0062] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0063] When K_S=1.25, $\Delta_T(i)_F = 10_1\cdot\log_0(2^{MPR\cdot K_S}\text{-}1)+\Delta\beta$; when K_S=0, $\Delta_{TF}(i)$ = 0; K_S is a parameter configured by radio resource control at a high layer; $MPR = O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0064] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$ and $\Delta\beta=10\cdot\log_{10}\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0065] When there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O=TBS$ and $\Delta\beta$=0, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in an initial PDCCH of the transmission block.

[0066] When there is only uplink shared channel data sent over the physical uplink shared channel, $O=TBS$ and $\Delta\beta$=0, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block;

[0067] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0068] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 7

[0069] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0070] When K_S=1.25, $\Delta_T(i)_F = 10_1\cdot\log_0(2^{MPR\cdot K_S}-1)+\Delta\beta$; when K_S= 0, $\Delta_{TF}(i)$ = 0; K_S is a prameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N^{PUSCH}{}_{symb}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0071] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$ and $\Delta\beta=10\cdot\log_{10}\beta_{offset}^{CQI}$ where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0072] In other cases (when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, or when there is only uplink shared channel data sent over the physical uplink shared channel), $O=\sum_{r=0}^{C-1}K_r$ and $\Delta\beta$=0, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, C and K_r are obtained according to a signaling in an initial PDCCH of a transmission block.

[0073] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0074] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

Embodiment 8

[0075] The formula for calculating the transmission power of a physical uplink shared channel is as follows:

$$P_{\mathrm{PUSCH}}(i)=\min\{P_{\mathrm{MAX}},10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i))+P_{\mathrm{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\mathrm{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the PUSCH in the subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power (For specific definition, please refer to the definition in section 5.1.1.1 of TS 36.213 (LTE physical layer));
α represents a path loss correction factor;
PL represents path loss;
$\Delta_{TF}(i)$ is called as a transmission format offset parameter.

[0076] When K_S=1.25, $\Delta_T\ (i)_F = 10_1 \cdot \log_0(2^{MPR \cdot K_S}-1)+\Delta\beta$; when K_S = 0, $\Delta_{TF}(i)$ = 0 ; K_S is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\mathrm{PUSCH}}\cdot N_{\mathrm{sc}}^{\mathrm{RB}}\cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH; $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents an amplitude offset.

[0077] When there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$ and $\Delta\beta=10\cdot\log_{10}\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, which is notified by a high layer signaling, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

[0078] Where there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O=\sum_{r=0}^{C-1}K_r$ and $\Delta\beta$=0, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, C and K_r are obtained according to a signaling in an initial PDCCH of a transmission block.

[0079] When there is only uplink shared channel data sent over the physical uplink shared channel, $O=\sum_{r=0}^{C-1}K_r$ and $\Delta\beta$=0, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, C and K_r are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0080] β_{offset}^{CQI} represents the amplitude offset of channel quality indication information, which is notified by a high layer index I_{offset}^{CQI}. The correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is shown in Table 1. However, in this invention, the correspondence between the high layer index I_{offset}^{CQI} and β_{offset}^{CQI} is not limited to that as shown in Table 1, and may be in other ways.
f(i) represents a power control correction function of subframe i.

[0081] Moreover, the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

[0082] This invention also provides a transmission power control system for a physical uplink shared channel. The system includes: a power setting module, used for setting the transmission power of the physical uplink shared channel according to the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check as well as an amplitude offset, when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel.

[0083] Wherein the power setting module is used for setting the transmission power of the physical uplink shared channel according to the following formula:

$$P_{\text{PUSCH}}(i)=\min\{P_{\text{MAX}},10\cdot\log_{10}(M_{\text{PUSCH}}(i))+P_{\text{O\_PUSCH}}(j)+\alpha\cdot PL+\Delta_{\text{TF}}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the physical uplink shared channel in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power;
α represents a path loss correction factor;
PL represents path loss;
f(i) represents a power control correction function of subframe i;
$\Delta_{TF}(i)$ is a transmission format offset parameter;
when K_S=1.25, $\Delta_{IF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, or $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$;
when K_S = 0, $\Delta_{TF}(i)$=0 ; K_s is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE}=M_{\text{PUSCH}}\cdot N_{\text{sc}}^{\text{RB}}\cdot N_{\text{symb}}^{\text{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\text{symb}}^{\text{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\text{sc}}^{\text{RB}}$ represents the number of resource elements contained in a resource block, *O* represents the size of information bits, and $\Delta\beta$ represents the amplitude offset;
wherein when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$, and when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta=\beta_{offset}^{CQI}$ **or when** $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta=10\cdot\log_{10}\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in the channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.
The power setting module obtains the β_{offset}^{CQI} from a high layer signaling.

[0084] The power setting module is also used for determining values of *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel: $O=TBS$, when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta$ = 1, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta$ =0, where *TBS* represents the size of a transmission block, and *TBS* and M_{PUSCH} are obtained according to the signaling in the initial PDCCH of the transmission block.

[0085] The power setting module is also used for determining values of *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel: $O=TBS$, when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta$=1, or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1) + \Delta\beta$, $\Delta\beta$ =0, where *TBS* represents the size of a transmission block, and *TBS* and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0086] The power setting module is also used for determining values of *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel: $O=\sum_{r=0}^{C-1}K_r$, when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta=0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, C and K_r are obtained according to the signaling in the initial PDCCH of the transmission block.

[0087] The power setting module is also used for determining values of O and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel: $O=\sum_{r=0}^{C-1}K_r$, when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta=0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, C and K_r are obtained according to a signaling in a most recent PDCCH related to the transmission block.

[0088] The foregoing descriptions are only preferred embodiments of this invention, and are not intended to limit this invention. For those skilled in the art, this invention may have various changes and modifications. All modifications, identical replacements and improvements made without departing from the principle of this invention shall be within the protection scope of this invention.

Industrial Applicability

[0089] This invention provides a transmission power control method and a system for a physical uplink shared channel, which are used for setting the transmission power of the physical uplink shared channel according to the total number of bits contained in a channel indication signaling and its corresponding cyclic redundancy check as well as an amplitude offset when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, thus to ensure the overall performance of a system.

Claims

1. A transmission power control method for a physical uplink shared channel, including: when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, setting the transmission power of the physical uplink shared channel according to the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check as well as an amplitude offset.

2. The method according to claim 1, wherein the transmission power of the physical uplink shared channel is set according to the following formula:

$$P_{PUSCH}(i)=\min\{P_{MAX},10\cdot\log_{10}(M_{PUSCH}(i))+P_{O\_PUSCH}(j)+\alpha\cdot PL+\Delta_{TF}(i)+f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the physical uplink shared channel in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power;
α represents a path loss correction factor;
PL represents path loss;
f(i) represents a power control correction function of subframe i;
$\Delta_{TF}(i)$ is a transmission format offset parameter;
When $K_S=1.25$, $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1))\cdot\Delta\beta$ or $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$;
when $K_S=0$, $\Delta_{TF}(i)=0$; K_S is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where

N_{RE} represents the number of resource elements, $N_{RE} = M_{\mathrm{PUSCH}} \cdot N_{\mathrm{sc}}^{\mathrm{RB}} \cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access symbols used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, O represents the size of information bits, and $\Delta\beta$ represents the amplitude offset;
wherein when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$, and when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta = 10\cdot\log_{10}\beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in the channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

3. The method according to claim 2, wherein the β_{offset}^{CQI} is notified by a high layer signaling.

4. The method according to claim 2 or 3, wherein the value of the N β_{offset}^{CQI} is 0.750, 1.000, 1.125, 1.250, 1.375, 1.625, 1.750, 2.000, 2.250, 2.500, 2.875, 3.125, 3.500, 4.000, 5.000 or 6.250.

5. The method according to claim 2, wherein when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O=TBS$, when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta$, $\Delta\beta = 1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta=0$, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to the signaling in the initial PDCCH of the transmission block.

6. The method according to claim 2, wherein when there is only uplink shared channel data sent over the physical uplink shared channel, $O=TBS$, when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)\cdot\Delta\beta$, $\Delta\beta = 0$, where TBS represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block.

7. The method according to claim 2, wherein when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel, $O = \sum_{r=0}^{C-1} K_r$; when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta = 1$, or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, *C and* K_r are obtained according to the signaling in the initial PDCCH of the transmission block.

8. The method according to claim 2, wherein when there is only uplink shared channel data sent over the physical uplink shared channel, $O = \sum_{r=0}^{C-1} K_r$, when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1).\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta)$, $\Delta\beta=0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and the M_{PUSCH}, *C* and K_r are obtained according to a signaling in a most recent PDCCH related to the transmission block.

9. The method according to claim 1 or 2, wherein the uplink control information includes: Acknowledge (ACK), and/or Non-Acknowledge (NACK), and/or Rank Indication (RI), Channel Quality Indication (CQI), and/or Precoding Matrix Indicator (PMI).

10. A transmission power control system for a physical uplink shared channel, including a power setting module, used for setting the transmission power of the physical uplink shared channel according to the total number of bits contained in a channel quality indication signaling and its corresponding cyclic redundancy check as well as an amplitude offset, when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel.

11. The system according to claim 10, wherein the power setting module is used for setting the transmission power of the physical uplink shared channel according to the following formula:

$$P_{\mathrm{PUSCH}}(i) = \min\{P_{\mathrm{MAX}}, 10 \cdot \log_{10}(M_{\mathrm{PUSCH}}(i)) + P_{\mathrm{O\_PUSCH}}(j) + \alpha \cdot PL + \Delta_{\mathrm{TF}}(i) + f(i)\},$$

where P_{MAX} represents an upper limit of transmission power;
$M_{PUSCH}(i)$ represents bandwidth used for transmitting the physical uplink shared channel in subframe i;
$P_{O\_PUSCH}(j)$ represents target reference power;
α represents a path loss correction factor;
PL represents path loss;
f(i) represents a power control correction function of subframe i;
$\Delta_{TF}(i)$ is a transmission format offset parameter;
when K_S=1.25, $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, or $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot K_S}-1)+\Delta\beta)$; when K_S=0, $\Delta_{TF}(i) = 0$; K_S is a parameter configured by radio resource control at a high layer; $MPR=O/N_{RE}$, where N_{RE} represents the number of resource elements, $N_{RE} = M_{\mathrm{PUSCH}} \cdot N_{\mathrm{sc}}^{\mathrm{RB}} \cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$, where M_{PUSCH} represents the bandwidth used for transmitting the physical uplink shared channel, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ represents the number of single carrier-frequency division multiple access signals used for transmitting the PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ represents the number of resource elements contained in a resource block, *O* represents the size of information bits, and $\Delta\beta$ represents the amplitude offset;
wherein when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel, $O=O_{CQI}$, and when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$ or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta)$, $\Delta\beta = 10 \cdot \log_{10} \beta_{offset}^{CQI}$, where O_{CQI} represents the total number of bits contained in the channel quality indication signaling and its corresponding cyclic redundancy check, β_{offset}^{CQI} represents an amplitude offset of channel quality indication information, and M_{PUSCH} is obtained according to a signaling in an initial PDCCH of a transmission block.

12. The system according to claim 11, wherein the power setting module is use for obtaining the β_{offset}^{CQI} from a high layer signaling.

13. The system according to claim 11, wherein the power setting module is used for determining values of the *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel: *O=TBS*, when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot K_S}-1)\cdot\Delta\beta)$, $\Delta\beta$=1, or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot K_S}-1)+\Delta\beta$, $\Delta\beta$ = 0, where *TBS* represents the size of a transmission block, and *TBS* and M_{PUSCH} are obtained according to the signaling in the initial PDCCH of the transmission block.

14. The system according to claim 11, wherein the power setting module is used for determining values of *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel: *O=TBS,* when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta)$, $\Delta\beta=0$, where *TBS* represents the size of a transmission block, and TBS and M_{PUSCH} are obtained according to a signaling in a most recent PDCCH related to the transmission block.

15. The system according to claim 11, wherein the power setting module is used for determining values of *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel, or when there are both uplink control information and uplink shared channel data sent over the physical uplink shared channel: $O=\sum_{r=0}^{C-1}K_r$, when $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta)$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, *C* and K_r are obtained according to the signaling in the initial PDCCH of the transmission block.

16. The system according to claim 11, wherein the power setting module is used for determining values of *O* and $\Delta\beta$ in the following way when there is only uplink shared channel data sent over the physical uplink shared channel: $O=\sum_{r=0}^{C-1}K_r$, when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, or when $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta = 0$, where C represents the total number of coding blocks, K_r represents the number of bits contained in a coding block with an index of r, and M_{PUSCH}, *C* and *K*, are obtained according to a signaling in a most recent PDCCH related to the transmission block.

Patentansprüche

1. Ein Übertragungsleistungssteuerungsverfahren für einen physikalischen Aufwärtsverbindungsgeteiltenkanal, beinhaltend:

wenn nur Aufwärtsverbindungssteuerungsinformationen aber keine Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, Setzen der Übertragungsleistung von dem physikalischen Aufwärtsverbindungsgeteiltenkanal gemäß der gesamten Anzahl von Bits, die in einer Kanalqualitätsanzeigesignalisierung beinhaltet sind und ihrer zugehöriger zyklischen Redundanzprüfung, genauso wie einen Amplitudenoffset.

2. Das Verfahren gemäß Anspruch 1, wobei die Übertragungsleistung von dem physikalischen Aufwärtsverbindungsgeteiltenkanal gemäß der folgenden Formel gesetzt wird:

$$P_{\mathrm{PUSCH}}(i) = \min\{P_{\max}, 10\cdot\log_{10}(M_{\mathrm{PUSCH}}(i)) + P_{\mathrm{O\_PUSCH}}(j) + \alpha\cdot PL + \Delta_{\mathrm{TF}}(i) + f(i)\},$$

wobei P_{MAX} ein oberes Limit der Übertragungsleistung darstellt; $M_{PUSCH}(i)$ stellt die Bandbereite dar, die verwendet wird zum Übertragen des physikalischen Aufwärtsverbindungsgeteiltenkanal in Unterrahmen i;
$P_{O\_PUSCH}(j)$ stellt die Zielreferenzleistung dar;
α stellt einen Pfadverlustkorrekturfaktor dar;
PL stellt den Pfadverlust dar;
f(i) stellt eine Leistungssteuerkorrekturfunktion von Unterrahmen i dar;
$\Delta_{TF}(i)$ ist ein Übertragungsformatoffsetparameter;
wenn Ks= 1.25, $\Delta_{TF}(i) = 10\cdot\log_{10}((2^{MPR\cdot Ks} - 1)\cdot\Delta\beta)$ oder $\Delta_{TF}(i) =10\cdot\log_{10}(2^{MPR\cdot Ks} - 1) + \Delta\beta$;

wenn Ks= 0, $\Delta_{TF}(i)$ = 0; K_S ist ein Parameter, der durch die Funkressourcensteuerung auf einer höheren Ebene konfiguriert ist; $MPR = O/N_{RE}$, wobei N_{RE} die Anzahl von Ressourcenelementen darstellt,

$$N_{RE} = M_{\mathrm{PUSCH}} \cdot N_{\mathrm{sc}}^{\mathrm{RB}} \cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$$

wobei M_{PUSCH} die Bandbreite darstellt, die zum Übertragen des physikalischen Aufwärtsverbindungsgeteiltenkanals genutzt wird, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ stellt die Anzahl von Einzelträgerfrequenzgeteiltenmehrfachzugriffssymbolen dar, die zum Übertragen des PUSCH genutzt werden, $N_{\mathrm{sc}}^{\mathrm{RB}}$ stellt die Anzahl von Ressourcenelementen dar, die in einem Ressourcenblock beinhaltet sind; *O* stellt die Größe von Informationsbits dar, und $\Delta\beta$ stellt den Amplitudenoffset dar; wobei wenn nur Aufwärtsverbindungssteuerungsinformationen, aber keine Aufwärtsverbindungsgeteiltekanaldaten über den Aufwärtsverbindungsgeteiltenkanal gesendet werden, $O = O_{CQI}$, und wenn $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$,

oder wenn $\Delta_{TF}(i) = 10\cdot\log_{10}(2^{MPR\cdot Ks} - 1) + \Delta\beta$, $\Delta\beta = 10 \cdot \log_{10} \beta_{offset}^{CQI}$, wobei O_{CQI} stellt die gesamte Anzahl von Bits dar, die in der Kanalqualitätsanzeigesignalisierung und ihrer zugehörigen zyklischen Redundanzprüfung beinhaltet sind, β_{offset}^{CQI} stellt einen Amplitudenoffset von Kanalqualitätsanzeigeinformationen dar, und M_{PUSCH} wird erhalten gemäß einer Signalisierung in einem anfänglichen PDCCH von einem Übertragungsblock.

3. Das Verfahren gemäß Anspruch 2, wobei der β_{offset}^{CQI} unterrichtet wird durch eine höhere Ebenensignalisierung;

4. Das Verfahren gemäß Anspruch 2 oder 3, wobei der Wert von dem β_{offset}^{CQI} 0.750, 1.000, 1.125, 1.250, 1.375, 1.625, 1.750, 2.000, 2.250, 2.500, 2.875, 3.125, 3.500, 4.000, 5.000 oder 6.250 ist.

5. Das Verfahren gemäß Anspruch 2, wobei wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, oder wenn Beide Aufwärtsverbindungssteuerungsinformationen und Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, *0 = TBS,* wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR\cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR\cdot Ks} - 1) + \Delta\beta$; $\Delta\beta = 0$, wobei *TBS* die Größe von einem Übertragungsblock darstellt, und *TBS* und M_{PUSCH} werden gemäß der Signalisierung in dem anfänglichen PDCCH von dem Übertragungsblock erhalten.

6. Das Verfahren gemäß Anspruch 2, wobei wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, *0 = TBS*, wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR\cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR\cdot Ks} - 1) + \Delta\beta$; $\Delta\beta = 0$, wobei *TBS* die Größe von einem Übertragungsblock darstellt, und *TBS* und M_{PUSCH} werden gemäß der Signalisierung in einem jüngsten PDCCH bezüglich des Übertragungsblocks erhalten.

7. Das Verfahren gemäß Anspruch 2, wobei wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, oder wenn Beide Aufwärtsverbindungssteuerungsinformationen und Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, $O = \sum_{r=0}^{C-1} K_r;$ wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR\cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR\cdot Ks} - 1) + \Delta\beta$, $\Delta\beta = 0$, wobei C die ganze Anzahl von Kodierblöcken darstellt, K_r stellt die Anzahl von Bits dar, die in einem Kodierblock mit einem Index von r enthalten sind und der M_{PUSCH}, C und K_r werden erhalten gemäß der Signalisierung in dem anfänglichen PDCCH von dem Übertragungsblock.

8. Das Verfahren gemäß Anspruch 2, wobei wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, $O = \sum_{r=0}^{C-1} K_r,$ wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR\cdot Ks} - 1).\ \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR\cdot KS} - 1) + \Delta\beta$, $\Delta\beta = 0$, wobei C die ganze Anzahl von Kodierblöcken darstellt,

K_r stellt die Anzahl von Bits dar, die in einem Kodierblock mit einem Index von r enthalten sind, und der M_{PUSCH}, C *und* K_r werden erhalten gemäß der Signalisierung in einem jüngsten PDCCH bezüglich des Übertragungsblocks.

9. Das Verfahren gemäß Anspruch 1 oder 2, wobei die Aufwärtsverbindungssteuerinformation beinhaltet: Bestätigung (ACK) und/oder Nicht-Bestätigung (NACK), und/oder Rang-Anzeige (RI), Kanalqualitätsanzeige (CQI), und/oder Vorkodierungsmatrixanzeige (PMI).

10. Ein Übertragungsleistungssteuerungssystem für einen physikalischen Aufwärtsverbindungsgeteiltenkanal, beinhaltend:

ein Modul zum Setzen der Leistung, das verwendet wird zum Setzen der Übertragungsleistung von dem physikalischen Aufwärtsverbindungsgeteiltenkanal gemäß der gesamten Anzahl von Bits, die in einer Kanalqualitätsanzeigesignalisierung beinhaltet sind und ihrer zugehöriger zyklischen Redundanzprüfung, genauso wie einen Amplitudenoffset, wenn nur Aufwärtsverbindungssteuerungsinformationen, aber keine Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden.

11. Das System gemäß Anspruch 10, wobei das Modul zum Setzen der Leistung verwendet wird die Übertragungsleistung von dem physikalischen Aufwärtsverbindungsgeteiltenkanal gemäß der folgenden Formel zu setzen:

$$P_{\text{PUSCH}}(i) = \min\{P_{\max}, 10 \cdot \log_{10}(M_{\text{PUSCH}}(i)) + P_{\text{O\_PUSCH}}(j) + \alpha \cdot PL + \Delta_{\text{TF}}(i) + f(i)\},$$

wobei P_{MAX} ein oberes Limit der Übertragungsleistung darstellt; $M_{PUSCH}(i)$ stellt die Bandbreite dar, die verwendet wird zum Übertragen des physikalischen Aufwärtsverbindungs-geteiltenkanal in Unterrahmen i;
$P_{O\_PUSCH}(j)$ stellt die Zielreferenzleistung dar;
α stellt einen Pfadverlustkorrekturfaktor dar;
PL stellt den Pfadverlust dar;
f(i) stellt eine Leistungssteuerkorrekturfunktion von Unterrahmen i dar;
$\Delta_{TF}(i)$ ist ein Übertragungsformatoffsetparameter;
wenn Ks= 1.25, $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \,.\, \Delta\beta)$ oder $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$; wenn K_S= 0, $\Delta_{TF}(i)$ = 0; K_S ist ein Parameter, der durch die Funkressourcensteuerung auf einer höheren Ebene konfiguriert ist; $MPR = O/N_{RE}$, wobei N_{RE} die Anzahl von Ressourcenelementen darstellt, $N_{RE} = M_{\text{PUSCH}} \cdot N_{\text{sc}}^{\text{RB}} \cdot N_{\text{symb}}^{\text{PUSCH}}$, wobei M_{PUSCH} die Bandbreite darstellt, die zum Übertragen des physikalischen Aufwärtsverbindungsgeteiltenkanals genutzt wird, $N_{\text{symb}}^{\text{PUSCH}}$ stellt die Anzahl von Einzelträgerfrequenzgeteiltenmehrfachzugriffssignalen dar, die zum Übertragen des PUSCH genutzt werden, $N_{\text{sc}}^{\text{RB}}$ stellt die Anzahl von Ressourcenelementen dar, die in einem Ressourcenblock beinhaltet sind; O stellt die Größe von Informationsbits dar, und Δ/β stellt den Amplitudenoffset dar; wobei wenn nur Aufwärtsverbindungssteuerungsinformationen, aber keine Aufwärtsverbindungsgeteiltekanaldaten über den Aufwärtsverbindungsgeteiltenkanal gesendet werden, $O = O_{CQI}$, und wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$; $\Delta\beta = 10 \cdot \log_{10} \beta_{offset}^{CQI}$, wobei O_{CQI} stellt die gesamte Anzahl von Bits dar, die in der Kanalqualitätsanzeigesignalisierung und ihrer zugehörigen zyklischen Redundanzprüfung beinhaltet sind, β_{offset}^{CQI} stellt einen Amplitudenoffset von Kanalqualitätsanzeigeinformationen dar, und M_{PUSCH} wird erhalten gemäß einer Signalisierung in einem anfänglichen PDCCH von einem Übertragungsblock.

12. Das System gemäß Anspruch 11, wobei das Modul zum Setzen der Leistung verwendet wird zum Erhalten des

β_{offset}^{CQI} von einer höhere Ebenensignalisierung;

13. Das System gemäß Anspruch 11, wobei das Modul zum Setzen der Leistung verwendet wird zum Bestimmen der Werte von dem *0* und $\Delta\beta$ in der folgenden Weise wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, oder wenn Beide Aufwärtsverbindungssteuerungsinformationen und Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden: *0 = TBS,* wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$; $\Delta\beta = 0$, wobei *TBS* die Größe von einem Übertragungsblock darstellt, und *TBS* und M_{PUSCH} werden gemäß der Signalisierung in dem anfänglichen PDCCH von dem Übertragungsblock erhalten.

14. Das System gemäß Anspruch 11, wobei das Modul zum Setzen der Leistung verwendet wird zum Bestimmen der Werte von *0* und $\Delta\beta$ in der folgenden Weise wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden: *0 = TBS,* wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta = 0$, wobei *TBS* die Größe von einem Übertragungsblock darstellt, und *TBS* und M_{PUSCH} werden gemäß der Signalisierung in einem jüngsten PDCCH bezüglich des Übertragungsblocks erhalten.

15. Das System gemäß Anspruch 11, wobei das Modul zum Setzen der Leistung verwendet wird zum Bestimmen der Werte von *0* und Δ/β in der folgenden Weise wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, oder wenn Beide Aufwärtsverbindungssteuerungsinformationen und Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden, $O = \sum_{r=0}^{C-1} K_r,$ wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta = 0$, wobei C die ganze Anzahl von Kodierblöcken darstellt, K_r stellt die Anzahl von Bits dar, die in einem Kodierblock mit einem Index von r enthalten sind und M_{PUSCH}, C und K_r werden erhalten gemäß der Signalisierung in dem anfänglichen PDCCH von dem Übertragungsblock.

16. Das System gemäß Anspruch 11, wobei das Modul zum Setzen der Leistung verwendet wird zum Bestimmen der Werte von *0* und $\Delta\beta$ in der folgenden Weise wenn nur Aufwärtsverbindungsgeteiltekanaldaten über den physikalischen Aufwärtsverbindungsgeteiltenkanal gesendet werden: $O = \sum_{r=0}^{C-1} K_r,$ wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = 1$, oder wenn $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta = 0$, wobei C die ganze Anzahl von Kodierblöcken darstellt, K_r stellt die Anzahl von Bits dar, die in einem Kodierblock mit einem Index von r enthalten sind, und der M_{PUSCH}, C und K_r werden erhalten gemäß der Signalisierung in einem jüngsten PDCCH bezüglich des Übertragungsblocks.

Revendications

1. Procédé de commande de puissance de transmission pour un canal physique partagé en liaison montante, comprenant: quand il y a uniquement des informations de commande de liaison montante mais pas de données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, le réglage de la puissance de transmission du canal physique partagé en liaison montante en fonction du nombre total de bits contenus dans une signalisation d'indication de qualité de canal et son contrôle de redondance cyclique correspondant ainsi qu'un décalage d'amplitude.

2. Procédé selon la revendication 1, dans lequel la puissance de transmission du canal physique partagé en liaison montante est réglée conformément à la formule suivante :

$$P_{\text{PUSCH}}(i) = \min\{P_{\text{MAX}}, 10 \cdot \log_{10}(M_{\text{PUSCH}}(i)) + P_{\text{O\_PUSCH}}(j) + \alpha \cdot PL + \Delta_{\text{TF}}(i) + f(i)\}$$

où P_{MAX} représente une limite supérieure de la puissance de transmission ;

$M_{PUSCH}(i)$ représente la largeur de bande utilisée pour transmettre le canal physique partagé en liaison montante dans la sous-trame i;
$P_{O\_PUSCH}(j)$ représente la puissance de référence cible;
α représente un facteur de correction d'affaiblissement sur le trajet;
PL représente l'affaiblissement sur le trajet;
f(i) représente une fonction de correction de la commande de puissance de la sous-trame i ;
$\Delta_{TF}(i)$ est un paramètre de décalage du format de transmission ;
quand K_S=1,25, $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$ ou $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$;
quand K_S=0, $\Delta_{TF}(i)$=0 ; KS est un paramètre configuré par commande de ressource radio à une couche haute ;
MPR=O/N_{RE}, où N_{RE} représente le nombre d'éléments de ressource, $N_{RE} = M_{\mathrm{PUSCH}} \cdot N_{\mathrm{sc}}^{\mathrm{RB}} \cdot N_{\mathrm{symb}}^{\mathrm{PUSCH}}$,
où M_{PUSCH} représente la largeur de bande utilisée pour transmettre le canal physique partagé en liaison montante, $N_{\mathrm{symb}}^{\mathrm{PUSCH}}$ représente le nombre de symboles d'accès multiple par répartition en fréquence à porteuse unique utilisés pour transmettre le PUSCH, $N_{\mathrm{sc}}^{\mathrm{RB}}$ représente le nombre d'éléments de ressource contenus dans un bloc de ressources, O représente la taille des bits d'information et $\Delta\beta$ représente le décalage d'amplitude ;
dans lequel quand il y a uniquement des informations de commande de liaison montante mais pas de données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, O=O_{CQI}, et quand $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$ ou quand $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta = 10 \cdot \log_{10} \beta_{offset}^{CQI}$, où O_{CQI} représente le nombre total de bits contenus dans la signalisation d'indication de qualité de canal et son contrôle de redondance cyclique correspondant, β_{offset}^{CQI} représente un décalage d'amplitude de l'information d'indication de qualité de canal, et M_{PUSCH} est obtenu conformément à une signalisation dans un PDCCH initial d'un bloc de transmission.

3. Procédé selon la revendication 2, dans lequel β_{offset}^{CQI} est notifié par une signalisation de couche haute.

4. Procédé selon la revendication 2 ou 3, dans lequel la valeur de β_{offset}^{CQI} est 0,750, 1,000, 1,125, 1,250, 1,375, 1,625, 1,750, 2,000, 2,250, 2,500, 2,875, 3,125, 3,500, 4,000, 5,000 ou 6,250.

5. Procédé selon la revendication 2, dans lequel quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, ou quand il y a à la fois des informations de commande de liaison montante et des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, O=TBS, quand $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta$=1, ou quand $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta$=0, où TBS représente la taille d'un bloc de transmission, et TBS et M_{PUSCH} sont obtenus conformément à la signalisation dans le PDCCH initial du bloc de transmission.

6. Procédé selon la revendication 2, dans lequel quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, O=TBS, quand $\Delta_{TF}(i) = 10.\log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta$=1, ou quand $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR.Ks} - 1) + \Delta\beta$, $\Delta\beta$=0, où TBS représente la taille d'un bloc de transmission, et TBS et M_{PUSCH} sont obtenus conformément à une signalisation dans un PDCCH le plus récent associé au bloc de transmission.

7. Procédé selon la revendication 2, dans lequel quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, ou quand il y a à la fois des informations de commande de liaison montante et des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, $O = \sum_{r=0}^{C-1} K_r$; quand $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta=1$, ou quand $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta=0$, où C représente le nombre total de blocs de codage, K_r représente le nombre de bits contenus dans un bloc de codage avec un indice de r, et le M_{PUSCH}, C et K_r sont obtenus conformément à la signalisation dans le PDCCH initial du bloc de transmission.

8. Procédé selon la revendication 2, dans lequel quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, $O = \sum_{r=0}^{C-1} K_r$, quand $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$, $\Delta\beta=1$, ou quand $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$, $\Delta\beta=0$, où C représente le nombre total de blocs de codage, K_r représente le nombre de bits contenus dans un bloc de codage avec un indice de r, et le M_{PUSCH}, C et K_r sont obtenus conformément à une signalisation dans un PDCCH le plus récent associé au bloc de transmission.

9. Procédé selon la revendication 1 ou 2, dans lequel l'information de commande de liaison montante inclut: Acknowledge (ACK), et/ou Non-Acknowledge (NACK), et/ou Rank Indication (RI), Channel Quality Indication (CQI), et/ou Precoding Matrix Indicator (PMI).

10. Système de commande de puissance de transmission pour un canal physique partagé en liaison montante, comprenant un module de réglage de puissance, utilisé pour régler la puissance de transmission du canal physique partagé en liaison montante conformément au nombre total de bits contenus dans une signalisation d'indication de qualité de canal et son contrôle de redondance cyclique correspondant ainsi qu'un décalage d'amplitude, quand il y a uniquement des informations de commande de liaison montante mais pas de données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante.

11. Système selon la revendication 10, dans lequel le module de réglage de puissance est utilisé pour régler la puissance de transmission du canal physique partagé en liaison montante conformément à la formule suivante:

$$P_{\text{PUSCH}}(i) = \min\{P_{\text{MAX}}, 10 \cdot \log_{10}(M_{\text{PUSCH}}(i)) + P_{\text{O\_PUSCH}}(j) + \alpha \cdot PL + \Delta_{\text{TF}}(i) + f(i)\}$$

où P_{MAX} représente une limite supérieure de la puissance de transmission ;
$M_{PUSCH}(i)$ représente la largeur de bande utilisée pour transmettre le canal physique partagé en liaison montante dans la sous-trame i ;
$P_{O\_PUSCH}(j)$ représente la puissance de référence cible ;
α représente un facteur de correction d'affaiblissement sur le trajet ;
PL représente l'affaiblissement sur le trajet ;
f(i) représente une fonction de correction de la commande de puissance de la sous-trame i ; ;
$\Delta_{TF}(i)$ est un paramètre de décalage du format de transmission ;
quand Ks=1,25, $\Delta_{TF}(i) = 10 \cdot \log_{10}((2^{MPR \cdot Ks} - 1) \cdot \Delta\beta)$ ou $\Delta_{TF}(i) = 10 \cdot \log_{10}(2^{MPR \cdot Ks} - 1) + \Delta\beta$; quand Ks=0, $\Delta_{TF}(i)=0$; KS est un paramètre configuré par commande de ressource radio à une couche haute ; MPR=O/N_{RE}, où N_{RE} représente le nombre d'éléments de ressource, $N_{RE} = M_{\text{PUSCH}} \cdot N_{\text{sc}}^{\text{RB}} \cdot N_{\text{symb}}^{\text{PUSCH}}$, où M_{PUSCH} représente la largeur de bande utilisée pour transmettre le canal physique partagé en liaison montante, $N_{\text{symb}}^{\text{PUSCH}}$ représente le nombre de signaux d'accès multiple par répartition en fréquence à porteuse unique utilisés pour transmettre le PUSCH, $N_{\text{sc}}^{\text{RB}}$ représente le nombre d'éléments de ressource contenus dans un bloc de ressources, *O* représente la

taille des bits d'information et $\Delta\beta$ représente le décalage d'amplitude ;
dans lequel quand il y a uniquement des informations de commande de liaison montante mais pas de données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, $O=O_{CQI}$, et quand $\Delta_{TF}(i)10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta = \beta_{offset}^{CQI}$ ou quand $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta = 10\cdot\log_{10}\beta_{offset}^{CQI}$ où O_{CQI} représente le nombre total de bits contenus dans la signalisation d'indication de qualité de canal et son contrôle de redondance cyclique correspondant, β_{offset}^{CQI} représente un décalage d'amplitude de l'information d'indication de qualité de canal, et M_{PUSCH} est obtenu conformément à une signalisation dans un PDCCH initial d'un bloc de transmission.

12. Système selon la revendication 11, dans lequel le module de réglage de puissance est utilisé pour obtenir le à partir d'une signalisation de couche haute.

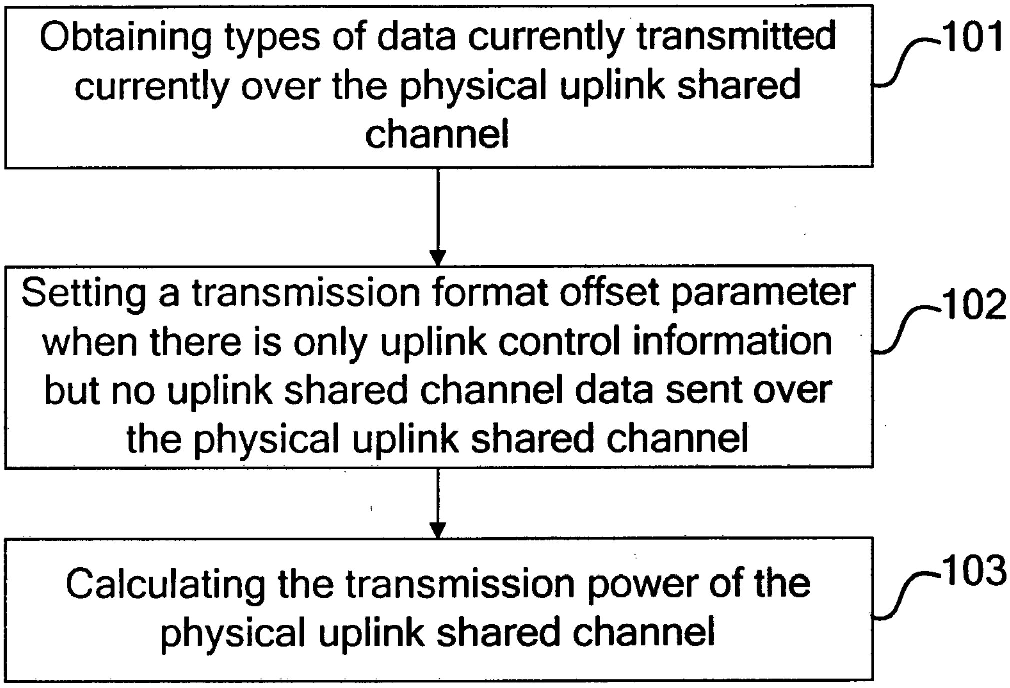
13. Système selon la revendication 11, dans lequel le module de réglage de puissance est utilisé pour déterminer les valeurs de O et $\Delta\beta$ de la manière suivante quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, ou quand il y a à la fois des informations de commande de liaison montante et des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante : O=TBS, quand $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, ou quand $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta=0$, où TBS représente la taille d'un bloc de transmission, et TBS et M_{PUSCH} sont obtenus conformément à la signalisation dans le PDCCH initial du bloc de transmission.

14. Système selon la revendication 11, dans lequel le module de réglage de puissance est utilisé pour déterminer les valeurs de O et $\Delta\beta$ de la manière suivante quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante : O=TBS, quand $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, ou quand $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta=0$, où TBS représente la taille d'un bloc de transmission, et TBS et M_{PUSCH} sont obtenus conformément à une signalisation dans un PDCCH le plus récent associé au bloc de transmission.

15. Système selon la revendication 11, dans lequel le module de réglage de puissance est utilisé pour déterminer les valeurs de O et $\Delta\beta$ de la manière suivante quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante, ou quand il y a à la fois des informations de commande de liaison montante et des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante: $O=\sum_{r=0}^{C-1}K_r$, quand $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, ou quand $\Delta_{TF}(i)=10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta=0$, où C représente le nombre total de blocs de codage, K_r représente le nombre de bits contenus dans un bloc de codage avec un indice de r, et M_{PUSCH}, C et K_r sont obtenus conformément à la signalisation dans le PDCCH initial du bloc de transmission.

16. Système selon la revendication 11, dans lequel le module de réglage de puissance est utilisé pour déterminer les valeurs de O et $\Delta\beta$ de la manière suivante quand il y a uniquement des données de canal partagé en liaison montante envoyées sur le canal physique partagé en liaison montante : $O=\sum_{r=0}^{C-1}K_r$, quand $\Delta_{TF}(i)=10\cdot\log_{10}((2^{MPR\cdot Ks}-1)\cdot\Delta\beta)$, $\Delta\beta=1$, ou quand $\Delta_{TF}(i) =10\cdot\log_{10}(2^{MPR\cdot Ks}-1)+\Delta\beta$, $\Delta\beta=0$, où C représente le nombre total de blocs de codage, K_r représente le nombre de bits contenus dans un bloc de codage avec un indice de r, et M_{PUSCH}, C et K_r sont obtenus conformément à une signalisation dans un PDCCH le plus récent associé au bloc de transmission.

Fig. 1


Obtaining types of data currently transmitted currently over the physical uplink shared channel
101
Setting a transmission format offset parameter when there is only uplink control information but no uplink shared channel data sent over the physical uplink shared channel
102
Calculating the transmission power of the physical uplink shared channel
103