

CLAIMS

What is claimed is:

1. A method for hybrid automatic repeat request acknowledgement HARQ-ACK feedback for a physical downlink control channel PDCCH without
5 scheduling data, performed by a terminal, the method comprising:

receiving configuration information of higher layer signaling, wherein the configuration information is used for determining a format of HARQ-ACK feedback information in a dynamic HARQ-ACK codebook for the PDCCH without scheduling data; and

- 10 in a case that the PDCCH without scheduling data is detected, feeding back, based on the format of the HARQ-ACK feedback information, the HARQ-ACK feedback information for the PDCCH without scheduling data in a first sub-codebook, wherein the HARQ-ACK feedback information is an acknowledgement ACK, and the first sub-codebook is used for a transport block
15 TB-based HARQ-ACK feedback.

2. The method according to claim 1, further comprising:

receiving the higher layer signaling or downlink control information DCI, wherein the higher layer signaling or the DCI indicates the terminal to feed back the HARQ-ACK feedback information for the PDCCH without scheduling data in the
20 first sub-codebook.

3. The method according to claim 2, wherein the DCI comprises a first field, and a bit in the first field indicates the terminal to feed back the HARQ-ACK feedback information for the PDCCH without scheduling data in the first sub-codebook; wherein

- 25 the first field comprises one or more of the following:

modulation and coding scheme MCS;

redundancy version RV;

HARQ process number;

new data indication NDI; and
total downlink assignment index t-DAI.

4. The method according to claim 1, wherein the configuration information indicates at least one of the following:

- 5 a quantity of TBs of a physical downlink shared channel PDSCH;
a quantity of CBGs of each TB of a PDSCH;
a quantity of transmission and reception points TRPs for transmitting the PDSCH;
a dynamic sub-codebook corresponding to the HARQ-ACK feedback
10 information for the PDCCH without scheduling data; and
whether HARQ-ACK spatial bundling indication is enabled.

5. The method according to claim 4, wherein

- the configuration information indicates that a maximum quantity of downlink TBs of a PDSCH is 2, and the format of the HARQ-ACK feedback information for
15 the PDCCH without scheduling data comprises 2 HARQ-ACK bits;

or

- the configuration information indicates that a maximum quantity of downlink TBs of a PDSCH is 2 and that the HARQ-ACK spatial bundling indication is enabled, and the format of the HARQ-ACK feedback information for the PDCCH
20 without scheduling data comprises 1 HARQ-ACK bit.

6. The method according to claim 4, wherein the format of the HARQ-ACK feedback information comprises a quantity of bits of the HARQ-ACK feedback information, wherein the quantity of bits of the HARQ-ACK feedback information is determined based on the following:

- 25 a maximum quantity of CBGs of a TB of the PDSCH and a maximum quantity of TBs transmitted by the PDSCH that are indicated by the configuration information;
or

a maximum quantity of TRPs for transmitting the PDSCH and a maximum quantity of TBs transmitted by the PDSCH that are indicated by the configuration information;

or

- 5 a maximum quantity of CBGs of a TB of the PDSCH, a maximum quantity of TBs transmitted by the PDSCH, and a maximum quantity of TRPs for transmitting the PDSCH that are indicated by the configuration information.

7. The method according to claim 6, wherein the quantity of bits of the HARQ-ACK feedback information in the dynamic HARQ-ACK codebook for the PDCCH without scheduling data is equal to:

a product of the maximum quantity of CBGs of a TB of the PDSCH and the maximum quantity of TBs transmitted by the PDSCH;

or

15 a product of the maximum quantity of TRPs for transmitting the PDSCH and the maximum quantity of TBs transmitted by the PDSCH;

or

a product of the maximum quantity of CBGs of a TB of the PDSCH, the maximum quantity of TBs transmitted by the PDSCH, and the maximum quantity of TRPs for transmitting the PDSCH.

20 8. The method according to claim 1, wherein the feeding back, based on the format of the HARQ-ACK feedback information, the HARQ-ACK feedback information for the PDCCH without scheduling comprises:

feeding back, based on a quantity of bits of the HARQ-ACK feedback information and the format of the HARQ-ACK feedback information, the HARQ-ACK feedback information for the PDCCH without scheduling data.

9. The method according to claim 8, wherein

all the bits in the HARQ-ACK feedback information are the ACK;

or

the first bit in the HARQ-ACK feedback information is the ACK;

30 or

at least one of the bits in the HARQ-ACK feedback information is the ACK.

10. A method for indicating a hybrid automatic repeat request acknowledgement HARQ-ACK feedback for a physical downlink control channel PDCCH without scheduling data, performed by a network device, the method comprising:

5 sending configuration information of higher layer signaling, wherein the configuration information is used for determining a format of HARQ-ACK feedback information in a dynamic HARQ-ACK codebook for the PDCCH without scheduling data; and

 receiving the HARQ-ACK feedback information for the PDCCH without
10 scheduling data in a first sub-codebook which is fed back by a terminal in a case that the PDCCH without scheduling data is detected based on the format of the HARQ-ACK feedback information, wherein the HARQ-ACK feedback information is an acknowledgement ACK, and the first sub-codebook is used for a transport block, TB, -based HARQ-ACK feedback.

15 11. The method according to claim 10, further comprising:

 sending the higher layer signaling or downlink control information DCI, wherein the higher layer signaling or the DCI indicates the terminal to feed back the HARQ-ACK feedback information for the PDCCH without scheduling data in the first sub-codebook.

20 12. A terminal, comprising a processor, a memory, and a program stored in the memory and capable of running on the processor, wherein the program, when being executed by the processor, implements a method for hybrid automatic repeat request acknowledgement HARQ-ACK feedback for a physical downlink control channel PDCCH without scheduling data comprising a step of:

25 receiving configuration information of higher layer signaling, wherein the configuration information is used for determining a format of HARQ-ACK feedback information in a dynamic HARQ-ACK codebook for the PDCCH without scheduling data;

 wherein the program, when being executed by the processor, further
30 implements:

feeding back, based on the format of the HARQ-ACK feedback information, the HARQ-ACK feedback information for the PDCCH without scheduling data in a first sub-codebook, wherein the HARQ-ACK feedback information is an acknowledgement ACK, and the first sub-codebook is used for a transport block
5 TB-based HARQ-ACK feedback.

13. The terminal according to claim 12, wherein the program, when being executed by the processor, further implements:

receiving the higher layer signaling or downlink control information DCI, wherein the higher layer signaling or the DCI indicates the terminal to feed back the
10 HARQ-ACK feedback information for the PDCCH without scheduling data in the first sub-codebook.

14. The terminal according to claim 12, wherein the configuration information indicates at least one of the following:

a quantity of TBs of a physical downlink shared channel PDSCH;
15 a quantity of CBGs of each TB of a PDSCH;
a quantity of transmission and reception points TRPs for transmitting the PDSCH;
a dynamic sub-codebook corresponding to the HARQ-ACK feedback information for the PDCCH without scheduling data; and
20 whether HARQ-ACK spatial bundling indication is enabled.

15. The terminal according to claim 14, wherein the configuration information indicates that a maximum quantity of downlink TBs of a PDSCH is 2, and the format of the HARQ-ACK feedback information for the PDCCH without scheduling data comprises 2 HARQ-ACK bits;

25 or

the configuration information indicates that a maximum quantity of downlink TBs of a PDSCH is 2 and that the HARQ-ACK spatial bundling indication is enabled, and the format of the HARQ-ACK feedback information for the PDCCH without scheduling data comprises 1 HARQ-ACK bit.

16. The terminal according to claim 12, wherein the feeding back, based on the format of the HARQ-ACK feedback information, the HARQ-ACK feedback information for the PDCCH without scheduling comprises:

5 in a case that the PDCCH without scheduling data is detected, feeding back, based on a quantity of bits of the HARQ-ACK feedback information and the format of the HARQ-ACK feedback information, the HARQ-ACK feedback information for the PDCCH without scheduling data.

17. The terminal according to claim 16, wherein

all the bits in the HARQ-ACK feedback information are the ACK;

10 or

the first bit in the HARQ-ACK feedback information is the ACK;

or

at least one of the bits in the HARQ-ACK feedback information is the ACK.

18. A network device, comprising a processor, a memory, and a program stored
15 in the memory and capable of running on the processor, wherein the program, when being executed by the processor, implements the steps of the method for HARQ-ACK feedback for a PDCCH without scheduling data according to claim 10 or 11.