CLAIMS

1. A data transmission method based on cross-carrier scheduling in a Long Term Evolution, LTE, network, comprising:

determining (110) a first downlink subframe according to a timing relationship of an uplink hybrid automatic repeat request HARQ of a reference uplink and downlink configuration, wherein the first downlink subframe is used to indicate timing of sending uplink scheduling grant information of a first uplink subframe of a scheduled cell;

transmitting (120) the uplink scheduling grant information in a subframe of a scheduling cell corresponding to the first downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the first downlink subframe is a downlink subframe, wherein an uplink and downlink configuration of the scheduling cell and an uplink and downlink configuration of the scheduled cell are different, wherein the scheduling cell adopts one of uplink and downlink configurations 2 to 5 defined in an LTE release 8, and the uplink and downlink configuration of the scheduled cell serves as the reference uplink and downlink configuration; or the scheduling cell adopts an uplink and downlink configuration 0 or an uplink and downlink configuration 6 defined in an LTE release 8, and the uplink and downlink configuration 1 defined in the LTE release 8 serves as the reference uplink and downlink configuration; and

transmitting (130) uplink data in the first uplink subframe.

2. The method according to claim 1, wherein the reference uplink and downlink configuration allows performing the cross-carrier scheduling on at least one uplink subframe of the scheduled cell according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration.

3. The method according to claim 2, wherein that the reference uplink and downlink configuration allows performing the cross-carrier scheduling on at least one uplink subframe of the scheduled cell according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration comprises that:

the reference uplink and downlink configuration allows performing the cross-carrier scheduling on the at least one uplink subframe of the scheduled cell, under a circumstance that a subframe of the scheduling cell corresponding to a downlink subframe that is used to send uplink scheduling grant information of the at least one uplink subframe and determined

according to the timing relationship of the uplink HARQ is a downlink subframe, a subframe of the scheduling cell corresponding to a downlink subframe that is used to send physical hybrid automatic repeat request indicator channel PHICH information and determined according to the timing relationship of the uplink HARQ is a downlink subframe, and a subframe of the scheduled cell corresponding to an downlink subframe that is used to retransmit uplink data of the at least one uplink subframe and determined according to the timing relationship of the uplink HARQ is an uplink subframe.

4. The method according to any one of claims 1 to 3, further comprising:

determining a second downlink subframe according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration, wherein the second downlink subframe is used to indicate timing of transmitting physical hybrid automatic repeat request indicator channel PHICH information of the uplink data; and

transmitting the PHICH information in a subframe of the scheduling cell corresponding to the second downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is a downlink subframe,

wherein the transmitting the uplink scheduling grant information in a subframe of a scheduling cell corresponding to the first downlink subframe comprises:

transmitting the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink subframe, under the circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is the downlink subframe.

5. The method according to claim 4, wherein if a PHICH used for multiple uplink subframes is defined in the second downlink subframe of the reference uplink and downlink configuration, and a PHICH is also defined in the subframe of the scheduling cell corresponding to the second downlink subframe, one of the multiple uplink subframes uses the PHICH defined in the subframe of the scheduling cell, or the multiple uplink subframes use the PHICH defined in the subframe of the scheduling cell.

6. The method according to claim 4, wherein the transmitting the uplink scheduling grant information in a subframe of a scheduling cell corresponding to the first downlink subframe comprises:

transmitting the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is the downlink subframe and a PHICH is defined.

7. The method according to any one of claims 1 to 6, further comprising:

determining a second uplink subframe according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration, wherein the second uplink subframe is used to indicate timing of retransmitting the uplink data; and

retransmitting the uplink data in a subframe of the scheduled cell corresponding to the second uplink subframe, under a circumstance that the subframe of the scheduled cell corresponding to the second uplink subframe is an uplink subframe,

wherein the transmitting the uplink scheduling grant information in a subframe of a scheduling cell corresponding to the first downlink subframe comprises:

transmitting the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink subframe, under the circumstance that the subframe of the scheduled cell corresponding to the second uplink subframe is the uplink subframe.

8. A base station (400) for a Long Term Evolution, LTE, network, comprising:

a processor (410), configured to determine a first downlink subframe according to a timing relationship of an uplink hybrid automatic repeat request HARQ of a reference uplink and downlink configuration, wherein the first downlink subframe is used to indicate timing of sending uplink scheduling grant information of a first uplink subframe of a scheduled cell;

a sender (420), configured to send the uplink scheduling grant information in a subframe of a scheduling cell corresponding to the first downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the first downlink subframe is a downlink subframe, wherein an uplink and downlink configuration of the scheduling cell and an uplink and downlink configuration of the scheduled cell are different, wherein the scheduling cell adopts one of uplink and downlink configurations 2 to 5 defined in an LTE release 8, and the uplink and downlink configuration of the scheduled cell serves as the reference uplink and downlink configuration; or the scheduling cell adopts an uplink and downlink configuration 0 or an uplink and downlink configuration 6 defined in an LTE

release 8, and the uplink and downlink configuration 1 defined in the LTE release 8 serves as the reference uplink and downlink configuration; and

a receiver (430), configured to receive uplink data sent in the first uplink subframe by a user equipment.

9. The base station (400) according to claim 8, wherein the reference uplink and downlink configuration allows performing cross-carrier scheduling on at least one uplink subframe of the scheduled cell according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration.

10. The base station (400) according to claim 9, wherein the reference uplink and downlink configuration allows performing the cross-carrier scheduling on the at least one uplink subframe of the scheduled cell, under a circumstance that a subframe of the scheduling cell corresponding to a downlink subframe that is used to send uplink scheduling grant information of the at least one uplink subframe and determined according to the timing relationship of the uplink HARQ is a downlink subframe, a subframe of the scheduling cell corresponding to a downlink subframe that is used to send physical hybrid automatic repeat request indicator channel PHICH information and determined according to the timing relationship of the uplink HARQ is a downlink subframe, and a subframe of the scheduled cell corresponding to a downlink subframe that is used to retransmit uplink data of the at least one uplink subframe and determined according to the timing relationship of the uplink HARQ is an uplink subframe.

11. The base station (400) according to claim 8, wherein the processor (410) is further configured to determine a second downlink subframe according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration, wherein the second downlink subframe is used to indicate timing of sending physical hybrid automatic repeat request indicator channel PHICH information of the uplink data, and the sender (420) is further configured to send the PHICH information in a subframe of the scheduling cell corresponding to the second downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is a downlink subframe, wherein the sender (420) is further configured to send the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink

subframe, under the circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is the downlink subframe.

12. A user equipment (500) for a Long Term Evolution, LTE, network, comprising:

a processor (510), configured to determine a first downlink subframe according to a timing relationship of an uplink hybrid automatic repeat request HARQ of a reference uplink and downlink configuration, wherein the first downlink subframe is used to indicate timing of sending uplink scheduling grant information of a first uplink subframe of a scheduled cell;

a receiver (520), configured to receive the uplink scheduling grant information in a subframe of a scheduling cell corresponding to the first downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the first downlink subframe is a downlink subframe, wherein an uplink and downlink configuration of the scheduling cell and an uplink and downlink configuration of the scheduled cell are different, wherein the scheduling cell adopts one of uplink and downlink configurations 2 to 5 defined in an LTE release 8, and the uplink and downlink configuration of the scheduled cell serves as the reference uplink and downlink configuration; or the scheduling cell adopts an uplink and downlink configuration 0 or an uplink and downlink configuration 6 defined in an LTE release 8, and the uplink and downlink configuration 1 defined in the LTE release 8 serves as the reference uplink and downlink configuration; and

a sender (530), configured to send uplink data in the first uplink subframe according to the uplink scheduling grant information.

13. The user equipment (500) according to claim 12, wherein the reference uplink and downlink configuration allows performing cross-carrier scheduling on at least one uplink subframe of the scheduled cell according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration.

14. The user equipment (500) according to claim 13, wherein the reference uplink and downlink configuration allows performing the cross-carrier scheduling in the at least one uplink subframe of the scheduled cell, under a circumstance that a subframe of the scheduling cell corresponding to a downlink subframe that is used to send uplink scheduling grant information of the at least one uplink subframe and determined according to the timing relationship of the uplink HARQ is a downlink subframe, a subframe of the scheduling cell corresponding to a downlink subframe that is used to send physical hybrid automatic repeat

request indicator channel PHICH information and determined according to the timing relationship of the uplink HARQ is a downlink subframe, and a subframe of the scheduled cell corresponding to a downlink subframe that is used to retransmit uplink data of the at least one uplink subframe and determined according to the timing relationship of the uplink HARQ is an uplink subframe.

15. The user equipment (500) according to claim 12, wherein the processor (510) is further configured to determine a second downlink subframe according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration, wherein the second downlink subframe is used to indicate timing of receiving physical hybrid automatic repeat request indicator channel PHICH information of the uplink data, and the receiver (520) is further configured to receive the PHICH information in a subframe of the scheduling cell corresponding to the second downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is a downlink subframe, wherein the receiver (520) is further configured to receive the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink subframe, under the circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is the downlink subframe.

16. The user equipment (500) according to claim 15, wherein the receiver (520) is further configured to receive the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink subframe, under a circumstance that the subframe of the scheduling cell corresponding to the second downlink subframe is the downlink subframe and a PHICH is defined.

17. The user equipment (500) according to any one of claims 12to 16, wherein the processor (510) is further configured to determine a second uplink subframe according to the timing relationship of the uplink HARQ of the reference uplink and downlink configuration, wherein the second uplink subframe is used to indicate timing of retransmitting the uplink data, and the sender is further configured to retransmit the uplink data in a subframe of the scheduled cell corresponding to the second uplink subframe, under a circumstance that the subframe of the scheduled cell corresponding to the second uplink subframe is an uplink subframe, wherein the receiver is further configured to receive the uplink scheduling grant information in the subframe of the scheduling cell corresponding to the first downlink

subframe, under the circumstance that the subframe of the scheduled cell corresponding to the second uplink subframe is the uplink subframe.