WHAT IS CLAIMED IS:

1. A physical-layer resource mapping method, implemented by user equipment (UE), the method comprising:

in response to hybrid automatic repeat request acknowledgement (HARQ-ACK) information and uplink data being multiplexed in transmission, determining a frequency-domain offset and a starting position for each of physical-layer resources that a HARQ-ACK modulation symbol is mapped to, wherein the frequency-domain offset is for one of a plurality of resource elements (REs) that different HARQ-ACK modulation symbols are mapped to; and

mapping each HARQ-ACK modulation symbol to an RE of an orthogonal frequency division multiplexing (OFDM) symbol by a same interval in frequency domain according to the starting position and the frequency-domain offset,

wherein the frequency-domain offset for each of physical-layer resources that the HARQ-ACK modulation symbol is mapped to is at least determined by following parameters: the number N of OFDM symbols mappable for the HARQ-ACK modulation symbols, the number K of REs occupied by the HARQ-ACK modulation symbols, and the number M of REs in each OFDM symbol, wherein $N=1$, $K<M$.

2. The method of claim 1, wherein the determining a starting position for each of physical-layer resources that a HARQ-ACK modulation symbol is mapped to comprises:

determining a lowest frequency-domain position of an orthogonal frequency division multiplexing (OFDM) symbol next to a demodulation reference signal (DMRS) of the uplink data as the starting position; or,

determining a lowest frequency-domain position of a first OFDM symbol other than a DMRS of the uplink data as the starting position.

3. The method of claim 1, wherein the determining a frequency-domain offset and a starting position for each of physical-layer resources that a HARQ-ACK modulation symbol is

mapped to comprises:

determining the frequency-domain offset for each of REs based on the number N of OFDM symbols mappable for the HARQ-ACK modulation symbols, the number K of REs occupied by the HARQ-ACK modulation symbols and the number M of REs in each OFDM symbol.

4. The method of claim 3, wherein the mapping each HARQ-ACK modulation symbol to a corresponding RE according to the starting position and the frequency-domain offset comprises:

mapping a first HARQ-ACK modulation symbol to an RE where the starting position is; and

mapping, in a frequency-domain-first manner, each of remaining HARQ-ACK modulation symbols to different REs according to the frequency-domain offset; and

in response to the frequency-domain offset exceeds a frequency-domain range of an OFDM symbol, mapping the remaining HARQ-ACK modulation symbols to REs of a next OFDM symbol sequentially.

5. The method of claim 3, wherein the mapping each HARQ-ACK modulation symbol to a corresponding RE according to the starting position and the frequency-domain offset comprises:

dividing the HARQ-ACK modulation symbols into P symbol groups, wherein each symbol group comprises at most N HARQ-ACK modulation symbols;

mapping each of HARQ-ACK modulation symbols in a first group of HARQ-ACK modulation symbols to different REs at a frequency-domain position where the starting position is;

determining a frequency-domain position, to which each group of HARQ-ACK modulation symbols in remaining groups of HARQ-ACK modulation symbols are mapped, based on the frequency-domain position where the starting position is and the frequency-domain offset; and

mapping, in a time-domain-first manner, the remaining groups of HARQ-ACK modulation symbols to different REs at frequency-domain positions of corresponding groups.

6. The method of claim 1, wherein the determining a frequency-domain offset for each of physical-layer resources that a HARQ-ACK modulation symbol is mapped to comprises:

determining the frequency-domain offset based on the number K of REs occupied by the HARQ-ACK modulation symbols and the number M of REs in each OFDM symbol.

7. The method of claim 6, wherein the mapping each HARQ-ACK modulation symbol to a corresponding RE according to the starting position and the frequency-domain offset comprises:

mapping, in a time-domain-first manner, Q HARQ-ACK modulation symbols to different REs being with the same frequency-domain position, wherein the REs start from a frequency-domain position where the starting position is, then offsetting the Q HARQ-ACK modulation symbols based on the frequency-domain offset, and then mapping next Q HARQ-ACK modulation symbols to different REs, wherein Q is calculated based on K and M.

8. The method of claim 1, wherein the determining a frequency-domain offset for each of physical-layer resources that a HARQ-ACK modulation symbol is mapped to comprises:

in a case that K is not greater than M, determining a first frequency-domain offset corresponding to first R HARQ-ACK modulation symbols by a first algorithm, and determining a second frequency-domain offset corresponding to remaining HARQ-ACK modulation symbols other than the first R HARQ-ACK modulation symbols by a second algorithm, wherein R is calculated based on a third algorithm, K is the number K of REs occupied by the HARQ-ACK modulation symbols and M is the number of REs in each OFDM symbol; or

in a case that K is greater than M, determining, by a fourth algorithm, a first count corresponding to REs that the HARQ-ACK modulation symbols are mapped to at each

frequency-domain position during first S offsetting of the HARQ-ACK modulation symbols, and determining, by a fifth algorithm, a second count corresponding to REs that the HARQ-ACK modulation symbols are mapped to at each frequency-domain position during offsetting of remaining HARQ-ACK modulation symbols other than the first S offsetting, wherein S is calculated based on a sixth algorithm, a frequency-domain offset corresponding to the first S offsetting is a first preset value, and a frequency-domain offset corresponding to frequency-domain offsetting other than the first S offsetting is a second set value.

9. The method of claim 8, wherein the mapping each HARQ-ACK modulation symbol to a corresponding RE according to the starting position and the frequency-domain offset comprises:

in a case that K is not greater than M, mapping, in a time-domain-first manner, each of the first R HARQ-ACK modulation symbols to different REs being with the same frequency-domain position according to the first frequency-domain offset, wherein the REs start from a frequency-domain position where the starting position is;

determining an RE that an (R+1)th HARQ-ACK modulation symbol is mapped to based on a frequency-domain position of an Rth HARQ-ACK modulation symbol and the second frequency-domain offset; and

mapping, in a time-domain-first manner, each of remaining HARQ-ACK modulation symbols other than the first R HARQ-ACK modulation symbols to different REs at different frequency-domain positions starting from the RE, that the (R+1)th HARQ-ACK modulation symbol is mapped to, according to the second frequency-domain offset.

10. The method of claim 8, wherein the mapping each HARQ-ACK modulation symbol to a corresponding RE according to the starting position and the frequency-domain offset comprises:

in a case that K is greater than M, performing, in a time-domain-first manner, the first S frequency-domain offsetting starting from the frequency-domain position where the starting position is according to the first preset value, and continuously mapping the first count of

HARQ-ACK modulation symbols at each frequency-domain position;

based on the frequency-domain position where the starting position is, the first preset value and the second set value, determining a starting position of (S+1)th offsetting; and

after completing the first S offsetting, performing, in a time-domain-first manner, frequency-domain offsetting starting from the starting position of (S+1)th offsetting according to the first preset value, and continuously mapping the second count of HARQ-ACK modulation symbols at each frequency-domain position.

11. The method of claim 1, further comprising:

in response to Channel State Information (CSI), the HARQ-ACK information and the uplink data being multiplexed in transmission, determining REs that CSI modulation symbols are mapped to; and

determining REs, other than the REs that the CSI modulation symbols are mapped to, as mappable REs for the HARQ-ACK modulation symbols, or determining REs, other than OFDM symbols comprising the REs that the CSI modulation symbols are mapped to, as mappable REs for the HARQ-ACK modulation symbols,

wherein the mapping each HARQ-ACK modulation symbol to a corresponding RE according to the starting position and the frequency-domain offset comprises:

mapping the HARQ-ACK modulation symbols to the mappable REs according to the starting position and the frequency-domain offset.

12. The method of claim 1, in response to CSI, the HARQ-ACK information and the uplink data being multiplexed in transmission, after mapping each HARQ-ACK modulation symbol to the corresponding RE, the method further comprising:

determining REs, other than the REs that the HARQ-ACK modulation symbols are mapped to, as mappable REs for CSI modulation symbols; and

mapping the CSI modulation symbols to the mappable REs for the CSI modulation symbols according to a preset mapping rule of the CSI modulation symbols.

13. A physical-layer resource mapping method, implemented by a base station, the method comprising:

receiving coded data from user equipment (UE), wherein the coded data comprises hybrid automatic repeat request acknowledgement (HARQ-ACK) modulation symbols and data modulation symbols;

determining resource elements (REs) comprising the HARQ-ACK modulation symbols mapped to an orthogonal frequency division multiplexing (OFDM) symbol by a same interval in frequency domain and REs comprising the data modulation symbols based on a starting position and a frequency-domain offset for each of physical-layer resources that a HARQ-ACK modulation symbol is mapped to, wherein the frequency-domain offset is for one of a plurality of REs that different HARQ-ACK modulation symbols are mapped to; and

acquiring HARQ-ACK information and uplink data based on the REs comprising the HARQ-ACK modulation symbols and the REs comprising the data modulation symbols,

wherein the frequency-domain offset for each of physical-layer resources that the HARQ-ACK modulation symbol is mapped to is at least determined by following parameters: the number N of OFDM symbols mappable for the HARQ-ACK modulation symbols, the number K of REs occupied by the HARQ-ACK modulation symbols, and the number M of REs in each OFDM symbol, wherein $N=1$, $K<M$.

14. The method of claim 13, wherein

the starting position of the physical-layer resources that HARQ-ACK modulation symbols mapped to is a lowest frequency-domain position of an orthogonal frequency division multiplexing (OFDM) symbol next to a demodulation reference signal (DMRS) of the uplink data; or,

the starting position of the physical-layer resources that HARQ-ACK modulation symbols mapped to is a lowest frequency-domain position of a first OFDM symbol other than a DMRS of the uplink data.

15. The method of claim 13, wherein the frequency-domain offset for one of a plurality of

REs that different HARQ-ACK modulation symbols are mapped to is obtained based on the number K of the REs occupied by the HARQ-ACK modulation symbols and the number M of REs in each OFDM symbol.

16. The method of claim 13, wherein the frequency-domain offset for one of a plurality of REs that different HARQ-ACK modulation symbols are mapped to is obtained based on the number N of OFDM symbols mappable for the HARQ-ACK modulation symbols, the number K of the REs occupied by the HARQ-ACK modulation symbols and the number M of the REs in each OFDM symbol.

17. User equipment (UE), comprising:

a processor; and

a memory configured to store instructions executable by the processor,

wherein the processor is configured to:

in response to hybrid automatic repeat request acknowledgement (HARQ-ACK) information and uplink data being multiplexed in transmission, determine a frequency-domain offset and a starting position for each of physical-layer resources that a HARQ-ACK modulation symbol is mapped to, wherein the frequency-domain offset is for one of a plurality of resource elements (REs) that different HARQ-ACK modulation symbols are mapped to; and

map each HARQ-ACK modulation symbol to an RE of an orthogonal frequency division multiplexing (OFDM) symbol by a same interval in frequency domain according to the starting position and the frequency-domain offset,

wherein the frequency-domain offset for each of physical-layer resources that the HARQ-ACK modulation symbol is mapped to is at least determined by following parameters: the number N of OFDM symbols mappable for the HARQ-ACK modulation symbols, the number K of REs occupied by the HARQ-ACK modulation symbols, and the number M of REs in each OFDM symbol, wherein N=1, K<M.

18. A base station, comprising:

a processor; and

a memory configured to store instructions executable by the processor,

wherein the processor is configured to implement steps of the method of claim 13.

19. A non-transitory computer-readable storage medium, having computer instructions stored thereon that, when executed by a processor, cause the processor to implement steps of the method of claim 1.

20. A non-transitory computer-readable storage medium, having computer instructions stored thereon that, when executed by a processor, cause the processor to implement steps of the method of claim 13.