

RESOURCE ALLOCATION METHOD AND COMMUNICATION APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202110247423.3, filed with the China National Intellectual Property Administration on March 5, 2021 and entitled "RESOURCE ALLOCATION METHOD AND COMMUNICATION APPARATUS", which is incorporated herein by reference in its entirety.

[0001][0002]

TECHNICAL FIELD

[0002][0003] This application relates to the field of mobile communication technologies, and in particular, to a resource allocation method and a communication apparatus.

BACKGROUND

[0003][0004] Transmit power of a device is limited by both a maximum power and a maximum power spectral density. That is, the transmit power of the device cannot exceed the maximum power or the maximum power spectral density. To enable the transmit power of the device to be higher, a corresponding transmit bandwidth may be expanded, that is, subcarriers allocated to the device become more discrete in frequency domain, that is, a quantity of subcarriers in each MHz is reduced.

[0004][0005] However, resource units (resource units, RUs) of different sizes may correspond to a plurality of discrete subcarrier combinations, and therefore more RUs or RU combinations need to be defined. In addition, to indicate more types of discrete RUs or discrete RU combinations, an existing method for allocating an RU formed by contiguous subcarriers needs to be changed, and implementation is complex for a transmit end.

SUMMARY

[0005][0006] This application provides a resource allocation method and a communication apparatus, so that a device can support higher transmit power.

[0006][0007] According to a first aspect, a resource allocation method is provided. The method may be performed by a first communication apparatus. The first communication apparatus may be a communication device or a communication apparatus that can support the communication device in implementing a function required for the method, for example, a chip system. The following
5 uses an example in which the communication device may be a transmit end and the transmit end is a first device, for example, an access point (access point, AP) for description. The method includes:

[0007][0008] A first device sends resource allocation information to a second device, where the resource allocation information indicates a first virtual resource unit (VRU), and the first VRU
10 includes a plurality of contiguous subcarriers in frequency domain; and the first device maps the first VRU to a first physical resource unit (PRU) based on a mapping relationship between a VRU and a PRU, and transmits data on the first PRU, where a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain.

[0008][0009] In this solution, the first device may notify the second device that an RU allocated
15 by the first device to the second device is a VRU, the first device sends data on a discrete PRU to which a contiguous VRU is mapped. Because the contiguous VRU is mapped to the discrete PRU, it is equivalent to reducing a quantity of subcarriers in each MHz, so that the first device can support higher transmit power.

[0009][0010] According to a second aspect, a resource allocation method is provided. The
20 method may be performed by a second communication apparatus. The second communication apparatus may be a communication device or a communication apparatus that can support the communication device in implementing a function required for the method, for example, a chip system. The following uses an example in which the communication device may be a transmit end and the transmit end is a second device, for example, a station (station, STA) for description. The
25 method includes:

[0010][0011] A second device receives resource allocation information from a first device, where the resource allocation information indicates a first VRU, and the first VRU includes a plurality of contiguous subcarriers in frequency domain;

the second device determines, based on a mapping relationship between a VRU and a
30 PRU, a first PRU corresponding to the first VRU, where a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain; and

the second device receives data from the first device on the first PRU.

[0011][0012] Corresponding to the solution provided in the first aspect, the resource allocation
35 information sent by the first device to the second device indicates that the first VRU is allocated to the second device, and the second device may receive the data from the first device on the first

PRU to which the first VRU is mapped, or certainly may send data to the first device on the first PRU. Because the plurality of subcarriers included in the first PRU are noncontiguous in frequency domain, it is equivalent to reducing a quantity of subcarriers in each MHz, so that the second device can support higher transmit power.

5 ~~{0012}~~**[0013]** In a possible implementation of the first aspect or the second aspect, the first device maps the first VRU to the first PRU based on an interleaving matrix, where the interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ where}$$

10 N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaving matrix.

~~{0013}~~**[0014]** This solution provides a mapping manner in which the first VRU is mapped to the first PRU, that is, is implemented by using the interleaving matrix (which may also be referred to as an interleaver). In other words, row-column transformation is performed, by using the interleaving matrix, on sequence numbers of a plurality of subcarriers included in a first frequency-domain resource in which the first VRU is located, and sequence numbers obtained by performing row-column transformation on the plurality of subcarriers are output. For example, interleaving is implemented in a row-in-column-out manner.

20 ~~{0014}~~**[0015]** According to a third aspect, a resource mapping method is provided. The method may be performed by a third communication apparatus. The third communication apparatus may be a communication device or a communication apparatus that can support the communication device in implementing a function required for the method, for example, a chip system. An example in which the communication device may be an interleaver is used below for description.

25 The method includes:

mapping a sequence number of a subcarrier of a first VRU to a sequence number of a subcarrier of a first PRU based on an interleaving matrix, where the first VRU includes a plurality of contiguous subcarriers in frequency domain, and a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain; and

30 outputting the sequence number of the subcarrier of the first PRU.

~~{0015}~~**[0016]** In a possible implementation of the first aspect, the second aspect, or the third aspect, a sequence number i of a subcarrier of the first PRU mapped from a subcarrier with a sequence number k of the first VRU based on the interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ where}$$

N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaving matrix.

[0016][0017] This solution provides a mapping manner in which the first VRU is mapped to the first PRU, that is, is implemented by using the interleaving matrix (which may also be referred to as an interleaver). In other words, row-column transformation is performed, by using the interleaving matrix, on sequence numbers of a plurality of subcarriers included in a first frequency-domain resource in which the first VRU is located, and sequence numbers obtained by performing row-column transformation on the plurality of subcarriers are output. For example, interleaving is implemented in a row-in-column-out manner.

[0017][0018] In a possible implementation of the first aspect, the second aspect, or the third aspect, any adjacent subcarriers included in the first PRU are noncontiguous in frequency domain. In this solution, the any adjacent subcarriers included in the first PRU are noncontiguous in frequency domain. In other words, the subcarriers included in the first PRU are more discrete, so that the first device supports higher transmit power.

[0018][0019] In a possible implementation of the first aspect, the second aspect, or the third aspect, before a sequence number of each subcarrier included in the interleaving matrix is output, an original row index sequence of the interleaving matrix is changed to a target row index sequence; and

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8}, and the target row index sequence is {1, 5, 3, 7, 2, 6, 4, 8} or {1, 6, 3, 8, 4, 7, 2, 5}; or

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}, and the target row index sequence is {1, 9, 5, 13, 3, 11, 7, 15, 2, 10, 6, 14, 4, 12, 8, 16}, or {1, 10, 3, 12, 5, 14, 7, 16, 8, 15, 6, 13, 4, 11, 2, 9}.

[0019][0020] This solution provides a possible implementation in which the any adjacent subcarrier included in the first PRU are noncontiguous in frequency domain. To be specific, before the sequence number of each subcarrier included in the interleaving matrix is output, row change is performed on the interleaving matrix. In other words, the original row index sequence of the interleaving matrix is changed to the target row index sequence, and then sequence numbers in the interleaving matrix are output by column.

[0020][0021] In a possible implementation of the first aspect, the second aspect, or the third aspect, that the first device maps the first VRU to the first PRU includes:

~~{0021}~~{0022} The first device sequentially inputs, into rows of the interleaving matrix according to a first order, sequence numbers of a plurality of subcarriers included in a first frequency-domain resource in which the first VRU is located, and outputs sequence numbers of the subcarriers in the interleaving matrix according to a column direction of the interleaving matrix, where the first order is an ascending order, or the first order is a descending order.

~~{0022}~~{0023} This solution provides an interleaving manner of the interleaving matrix, that is, a row-in-column-out manner. Certainly, the manner may also be a column-in-row-out manner. This is not limited in this application. In addition, an input order of the sequence number of the subcarrier is not limited in this application, and is more flexible.

~~{0023}~~{0024} In a possible implementation of the first aspect, the second aspect, or the third aspect, a row quantity of the interleaving matrix is predefined, and a column quantity of the interleaving matrix is a quantity of subcarriers that are to be input by the first device divided by the row quantity of the interleaving matrix; or

a row quantity of the interleaving matrix is predefined, and a column quantity of the interleaving matrix is a rounded-up result obtained by dividing a quantity of subcarriers that are to be input by the first device by the row quantity of the interleaving matrix.

~~{0024}~~{0025} In this solution, a row quantity of the interleaving matrix may be predefined, which is simpler. Certainly, a column quantity of the interleaving matrix may be predefined, or a row quantity or a column quantity of the interleaving matrix may be negotiated or predefined by the first device and the second device. This is not limited in this application.

~~{0025}~~{0026} In a possible implementation of the first aspect, the second aspect, or the third aspect, in the plurality of subcarriers included in the first frequency-domain resource, subcarriers that are input into the interleaving matrix are first-type subcarriers, or subcarriers that are input into the interleaving matrix are first-type subcarriers and a second-type subcarrier, the first-type subcarrier is used to carry data, and the second-type subcarrier includes one or more of a null subcarrier, a direct current subcarrier, a guard subcarrier, and a pilot subcarrier; and

sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of the first-type subcarriers in the plurality of subcarriers included in the first frequency-domain resource;

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the first preset sequence number; or

sequence numbers of the subcarriers that are input into the interleaving matrix are the

sequence numbers of the plurality of subcarriers included in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, ~~a sequence number of the first preset sequence number is located at a preset location of the interleaving matrix, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the first preset sequence number.~~

~~{0026}~~**[0027]** This solution provides a plurality of mapping manners of the plurality of subcarriers included in the first frequency-domain resource in which the first VRU is located. For example, the second-type subcarrier may not participate in mapping, that is, only the first-type subcarriers included in the first frequency-domain resource are mapped. Certainly, all the first-type subcarriers included in the first frequency-domain resource may participate in mapping, or some first-type resources included in the first frequency-domain resource may participate in mapping. This is not limited in this application. In this way, content of the interleaving matrix may be less, thereby improving interleaving efficiency.

~~{0027}~~**[0028]** In a possible implementation of the first aspect or the second aspect, the second-type subcarrier is a pilot subcarrier, and the pilot subcarrier is a maximum pilot subcarrier set of a 26-tone RU in the first frequency-domain resource.

~~{0028}~~**[0029]** A pilot subcarrier set of a 26-tone RU in any 20 MHz also includes pilot subcarriers of a 52-tone RU and a 106-tone RU in 20 MHz. Therefore, the pilot subcarrier is the maximum pilot subcarrier set of the 26-tone RU in the first frequency-domain resource, so that all RUs in an interleaving range (the first frequency-domain resource) can satisfy that pilot locations after mapping can remain unchanged regardless of which pilot subcarriers are selected.

~~{0029}~~**[0030]** In a possible implementation of the first aspect, the second aspect, or the third aspect, a quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers included in the first frequency-domain resource is less than a quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix; and

the sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of subcarriers that are in the first frequency-domain resource and that are to be input into the interleaving matrix and a sequence number of a padding subcarrier, the sequence number of the padding subcarrier is located in a preset location of the interleaving matrix, each sequence number of the padding subcarrier is a second preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the second preset sequence number.

~~{0030}~~**[0031]** In this solution, if the quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers included in the first frequency-

domain resource is less than the quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix, the interleaving matrix may be padded with the second preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the second preset sequence number. In this way, a mapping location of each subcarrier in the first VRU is not affected.

~~{0031}~~{0032} In a possible implementation of the first aspect, the second aspect, or the third aspect, a quantity of the plurality of subcarriers included in the first frequency-domain resource is determined based on a maximum bandwidth supported by the first device.

~~{0032}~~{0033} In this solution, the quantity of the plurality of subcarriers included in the first frequency-domain resource is determined based on the maximum bandwidth supported by the first device, to ensure that an allocated VRU can be scheduled within a supported maximum bandwidth range.

~~{0033}~~{0034} In a possible implementation of the first aspect, the second aspect, or the third aspect, the first device maps the first VRU to the first PRU based on a mapping relationship between a sequence number of each subcarrier included in the first VRU and a sequence number of each subcarrier included in the first PRU. A specific implementation of mapping the first VRU to the first PRU is not limited in this application. For example, the first VRU may be mapped to the first PRU based on the mapping relationship between the sequence number of each subcarrier included in the first VRU and the sequence number of each subcarrier included in the first PRU, which is more flexible.

~~{0034}~~{0035} In a possible implementation of the first aspect, the second aspect, or the third aspect, the sequence numbers of the subcarriers included in the first frequency-domain resource start from 0 or 1;

the sequence numbers of the subcarriers included in the first frequency-domain resource are subcarrier numbers in actual frequency bands corresponding to the subcarriers; or

the sequence numbers of the subcarriers included in the first frequency-domain resource are preset sequence numbers plus a preset offset value.

~~{0035}~~{0036} In this application, a purpose of mapping the VRU to the PRU is to make the subcarriers more discrete, and both the VRU and the PRU may be indicated by using the sequence numbers of the subcarriers. Therefore, a subcarrier sequence number sequence corresponding to the first frequency-domain resource may be mapped. The sequence number of each subcarrier may be a subcarrier number of the subcarrier in a corresponding actual frequency band, or may be self-defined. A specific implementation form of the sequence number of the subcarrier is not limited in this embodiment of this application.

~~{0036}~~{0037} In a possible implementation of the first aspect, the second aspect, or the third

aspect, the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, and the sequence numbers of the subcarriers corresponding to the first PRU are located in the first set;

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a second set, and there is no intersection between the first set and the second set; or

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a plurality of second sets, and there is no intersection between the plurality of second sets.

~~{0037}~~{0038} Ranges in which the VRU and the PRU participate in mapping are not limited in this application. In other words, the first VRU and the first PRU may be in a same frequency-domain location range, or may be in different frequency-domain location ranges. In addition, in this embodiment of this application, whether a frequency range in which the PRU participates in mapping is contiguous is not limited. In other words, the frequency-domain range in which the PRU participates in mapping may be contiguous, or may be discrete, provided that a size of the frequency range in which the PRU participates in mapping is the same as a size of a frequency range in which the VRU participates in mapping.

~~{0038}~~{0039} According to a fourth aspect, a communication apparatus is provided. For example, the communication apparatus is the foregoing first device or an apparatus disposed in the first device. The communication apparatus may be configured to perform the method according to any one of the first aspect or the possible implementations of the first aspect. Specifically, the communication apparatus may include modules configured to perform the method according to any one of the first aspect or the possible implementations of the first aspect, for example, include a processing module and a transceiver module that are coupled to each other. For example, the communication apparatus is the foregoing first device.

~~{0039}~~{0040} The transceiver module is configured to send resource allocation information to a second device, where the resource allocation information indicates a first virtual resource unit VRU, and the first VRU includes a plurality of contiguous subcarriers in frequency domain.

~~{0040}~~{0041} The processing module is configured to map the first VRU to a first physical resource unit PRU based on a mapping relationship between a VRU and a PRU, where a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain.

~~{0041}~~{0042} The transceiver module is further configured to transmit data on the first PRU.

~~{0042}~~{0043} According to a fifth aspect, a communication apparatus is provided. For example, the communication apparatus is the foregoing first device or an apparatus disposed in the first device. The communication apparatus may be configured to perform the method according to any

one of the second aspect or the possible implementations of the second aspect. Specifically, the communication apparatus may include modules configured to perform the method according to any one of the second aspect or the possible implementations of the second aspect, for example, include a processing module and a transceiver module that are coupled to each other. For example, the communication apparatus is the foregoing second device.

[0043][0044] The transceiver module is configured to receive resource allocation information from a first device, where the resource allocation information indicates a first virtual resource unit VRU, and the first VRU includes a plurality of contiguous subcarriers in frequency domain.

[0044][0045] The processing module is configured to determine, based on a mapping relationship between a VRU and a physical resource unit PRU, a first PRU corresponding to the first VRU, where a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain.

[0045][0046] The transceiver module is configured to receive data from the first device on the first PRU.

[0046][0047] According to a sixth aspect, a communication apparatus is provided. For example, the communication apparatus is the foregoing first device or an apparatus disposed in the first device. The communication apparatus may be configured to perform the method according to any one of the second aspect or the possible implementations of the second aspect. Specifically, the communication apparatus may include modules configured to perform the method according to any one of the second aspect or the possible implementations of the second aspect, for example, include a processing module and a transceiver module that are coupled to each other. For example, the communication apparatus is the foregoing second device.

[0047][0048] The processing module is configured to map a sequence number of a subcarrier of a first VRU to a sequence number of a subcarrier of a first PRU based on an interleaving matrix, where the first VRU includes a plurality of contiguous subcarriers in frequency domain, and a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain.

[0048][0049] The transceiver module is configured to output the sequence number of the subcarrier of the first PRU.

[0049][0050] In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, a sequence number k of a subcarrier of the first VRU is mapped to a sequence number i of a subcarrier of the first PRU based on the interleaving matrix, and the interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ where}$$

N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the

interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaving matrix.

~~{0050}~~**[0051]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, any adjacent subcarriers included in the first PRU are noncontiguous in frequency domain.

~~{0051}~~**[0052]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, before a sequence number of each subcarrier included in the interleaving matrix is output, an original row index sequence of the interleaving matrix is changed to a target row index sequence; and

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8}, and the target row index sequence is {1, 5, 3, 7, 2, 6, 4, 8} or {1, 6, 3, 8, 4, 7, 2, 5}; or

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}, and the target row index sequence is {1, 9, 5, 13, 3, 11, 7, 15, 2, 10, 6, 14, 4, 12, 8, 16}, or {1, 10, 3, 12, 5, 14, 7, 16, 8, 15, 6, 13, 4, 11, 2, 9}.

~~{0052}~~**[0053]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, that the communication apparatus maps the first VRU to the first PRU includes:

sequentially inputting, into rows of the interleaving matrix according to a first order, sequence numbers of a plurality of subcarriers included in a first frequency-domain resource in which the first VRU is located, and outputting sequence numbers of the subcarriers in the interleaving matrix according to a column direction of the interleaving matrix, where the first order is an ascending order, or the first order is a descending order.

~~{0053}~~**[0054]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, in the plurality of subcarriers included in the first frequency-domain resource, subcarriers that are input into the interleaving matrix are first-type subcarriers, or subcarriers that are input into the interleaving matrix are first-type subcarriers and a second-type subcarrier, the first-type subcarrier is used to carry data, and the second-type subcarrier includes one or more of a null subcarrier, a direct current subcarrier, a guard subcarrier, and a pilot subcarrier; and

sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of the first-type subcarriers in the plurality of subcarriers included in the first frequency-domain resource;

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the first preset sequence number; or

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, ~~a sequence number of the first preset sequence number is located at a preset~~
5 location of the interleaving matrix, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the first preset sequence number.

~~{0054}~~**[0055]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, the second-type subcarrier is a pilot subcarrier, and the pilot subcarrier is a maximum pilot subcarrier set of a 26-tone RU in the first frequency-domain resource.

10 ~~{0055}~~**[0056]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, a quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers included in the first frequency-domain resource is less than a quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix; and

15 the sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of subcarriers that are in the first frequency-domain resource and that are to be input into the interleaving matrix and a sequence number of a padding subcarrier, the sequence number of the padding subcarrier is located in a preset location of the interleaving matrix, each sequence number of the padding subcarrier is a second preset sequence number, and the sequence
20 numbers of the subcarriers output from the interleaving matrix do not include the second preset sequence number.

~~{0056}~~**[0057]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, a quantity of the plurality of subcarriers included in the first frequency-domain resource is determined based on a maximum bandwidth supported by the first device.

25 ~~{0057}~~**[0058]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, the first VRU is mapped to the first PRU based on a mapping relationship between a sequence number of each subcarrier included in the first VRU and a sequence number of each subcarrier included in the first PRU.

~~{0058}~~**[0059]** In a possible implementation of the fourth aspect, the fifth aspect, or the sixth
30 aspect, the sequence numbers of the subcarriers included in the first frequency-domain resource start from 0 or 1;

the sequence numbers of the subcarriers included in the first frequency-domain resource are subcarrier numbers in actual frequency bands corresponding to the subcarriers; or

the sequence numbers of the subcarriers included in the first frequency-domain
35 resource are preset sequence numbers plus a preset offset value.

~~{0059}~~{0060} In a possible implementation of the fourth aspect, the fifth aspect, or the sixth aspect, the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, and the sequence numbers of the subcarriers corresponding to the first PRU are located in the first set;

5 the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a second set, and there is no intersection between the first set and the second set, or a part of sequence numbers in the first set are the same as those in the second set are the same; or

10 the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a plurality of second sets, there is no intersection between the plurality of second sets, and there is no intersection between the first set and the plurality of second sets, or there is an intersection between the first set and a part of the plurality of second sets.

~~{0060}~~{0061} According to a seventh aspect, an embodiment of this application provides a communication apparatus. The communication apparatus may be the communication apparatus in any one of the fourth aspect to the sixth aspect in the foregoing embodiments, or may be a chip disposed in the communication apparatus in any one of the fourth aspect to the sixth aspect. The communication apparatus includes a communication interface and a processor, and optionally, further includes a memory. The memory is configured to store a computer program, instructions, or data. The processor is coupled to the memory and the communication interface. When the processor reads the computer program, the instructions, or the data, the communication apparatus performs the method performed by the first device, the second device, or the interleaver in the method embodiment in any one of the first aspect to the third aspect.

25 ~~{0061}~~{0062} It should be understood that the communication interface may be implemented by using an antenna, a feeder, a codec, and the like in the communication apparatus. Alternatively, if the communication apparatus is a chip disposed in the first device, the second device, or the interleaver, the communication interface may be an input/output interface of the chip, for example, an input/output pin. The communication apparatus may further include a transceiver, configured to perform communication between the communication apparatus and another device. For example, 30 when the communication apparatus is the first device, the another device is the second device, when the communication apparatus is the second device, the another device is the first device, or when the communication apparatus is the interleaver, the another device is the first device and/or the second device.

~~{0062}~~{0063} According to an eighth aspect, an embodiment of this application provides a chip system. The chip system includes a processor, and may further include a memory, configured to 35

implement the method performed by the communication apparatus in any one of the fourth aspect to the seventh aspect. In a possible implementation, the chip system further includes the memory, configured to store program instructions and/or data. The chip system may include a chip, or may include a chip and another discrete component.

5 ~~{0063}~~~~{0064}~~ According to a ninth aspect, an embodiment of this application provides a communication system. The communication system includes the communication apparatuses according to the fourth aspect and the fifth aspect.

~~{0064}~~~~{0065}~~ According to a tenth aspect, this application provides a computer-readable storage medium. The computer-readable storage medium stores a computer program. When the
10 computer program is run, the method performed by the first device in the foregoing aspects is implemented, or the method performed by the second device in the foregoing aspects is implemented, or the method performed by the interleaver in the foregoing aspect is implemented.

~~{0065}~~~~{0066}~~ According to an eleventh aspect, a computer program product is provided. The computer program product includes computer program code. When the computer program code is
15 run, the method performed by the first device in the foregoing aspects is implemented, the method performed by the second device in the foregoing aspects is implemented, or the method performed by the interleaver in the foregoing aspect is implemented.

~~{0066}~~~~{0067}~~ For beneficial effects of the seventh aspect to the eleventh aspect and the implementations thereof, refer to the descriptions of the beneficial effects of the method according
20 to the first aspect to the third aspect and the implementations thereof.

BRIEF DESCRIPTION OF DRAWINGS

~~{0067}~~~~{0068}~~ FIG. 1 shows a network architecture of a wireless local area network to which an embodiment of this application is applicable;

~~{0068}~~~~{0069}~~ FIG. 2 is a schematic diagram of a tone plan and RU distribution of 20 MHz;

25 ~~{0069}~~~~{0070}~~ FIG. 3 is a schematic diagram of a tone plan and RU distribution of 40 MHz;

~~{0070}~~~~{0071}~~ FIG. 4 is a schematic diagram of a tone plan and RU distribution of 80 MHz;

~~{0071}~~~~{0072}~~ FIG. 5 is a schematic diagram of a plurality of contiguous RUs corresponding to a discrete 26-tone RU;

~~{0072}~~~~{0073}~~ FIG. 6 is a schematic diagram of a plurality of contiguous RUs corresponding to
30 a discrete 996-tone RU;

~~{0073}~~~~{0074}~~ FIG. 7 is a schematic diagram of distribution of a 26-tone RU with discrete subcarriers;

~~{0074}~~~~{0075}~~ FIG. 8 is a schematic diagram of distribution of a 52-tone RU with discrete

subcarriers;

~~{0075}~~**[0076]** FIG. 9 is a schematic flowchart of a resource allocation method according to an embodiment of this application;

~~{0076}~~**[0077]** FIG. 10 is a schematic diagram of a mapping range between a VRU and a PRU
5 according to an embodiment of this application;

~~{0077}~~**[0078]** FIG. 11 is a schematic diagram of a mapping manner from a VRU to a PRU according to an embodiment of this application;

~~{0078}~~**[0079]** FIG. 12 is a schematic diagram in which all 242 subcarriers in 20 MHz participate in mapping according to an embodiment of this application;

10 ~~{0079}~~**[0080]** FIG. 13 is a schematic diagram in which a second-type subcarrier does not participate in mapping according to an embodiment of this application;

~~{0080}~~**[0081]** FIG. 14 is another schematic diagram in which a second-type subcarrier does not participate in mapping according to an embodiment of this application;

~~{0081}~~**[0082]** FIG. 15 is still another schematic diagram in which a second-type subcarrier does
15 not participate in mapping according to an embodiment of this application;

~~{0082}~~**[0083]** FIG. 16 is a schematic diagram of mapping a VRU of 20 MHz in 80 MHz to a PRU according to an embodiment of this application;

~~{0083}~~**[0084]** FIG. 17 is another schematic diagram of mapping a VRU of 20 MHz in 80 MHz to a PRU according to an embodiment of this application;

20 ~~{0084}~~**[0085]** FIG. 18 is a schematic diagram of a location of a pilot subcarrier in 80 MHz;

~~{0085}~~**[0086]** FIG. 19 is a schematic diagram of a row change of an interleaving matrix according to an embodiment of this application;

~~{0086}~~**[0087]** FIG. 20 is a schematic diagram of a correspondence between an original row index sequence and a target row index sequence according to an embodiment of this application;

25 ~~{0087}~~**[0088]** FIG. 21 is another schematic diagram of a correspondence between an original row index sequence and a target row index sequence according to an embodiment of this application;

~~{0088}~~**[0089]** FIG. 22 is still another schematic diagram of a correspondence between an original row index sequence and a target row index sequence according to an embodiment of this
30 application;

~~{0089}~~**[0090]** FIG. 23 is a schematic diagram of a structure of a communication apparatus according to an embodiment of this application; and

~~{0090}~~**[0091]** FIG. 24 is a schematic diagram of another structure of a communication apparatus according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

~~{0091}~~{0092} To make objectives, technical solution, and advantages of embodiments of this application clearer, the following further describes embodiments of this application in detail with reference to the accompanying drawings.

5 ~~{0092}~~{0093} Embodiments of this application may be applied to a wireless local area network (wireless local area network, WLAN) scenario, and may be applied to an IEEE 802.11 system standard, for example, 802.11a/b/g, 802.11n, 802.11ac, 802.11ax, or a next-generation standard, for example, 802.11be, or a further next-generation standard. Alternatively, embodiments of this application may be applied to a wireless local area network system, for example, an internet of
10 things (internet of things, IoT) network or a vehicle-to-everything (Vehicle to X, V2X) network. It is clear that embodiments of this application are also applicable to another possible communication system, for example, an LTE system, an LTE frequency division duplex (frequency division duplex, FDD) system, an LTE time division duplex (time division duplex, TDD) system, a universal mobile telecommunications system (universal mobile telecommunications system, UMTS), a
15 worldwide interoperability for microwave access (worldwide interoperability for microwave access, WiMAX) communication system, and a future 5G communication system.

~~{0093}~~{0094} The following uses an example in which embodiments of this application are applicable to a WLAN scenario. It should be understood that the WLAN develops from the 802.11a/g standard, and goes through 802.11n, 802.11ac, 802.11ax, and 802.11be that is currently
20 being discussed. 802.11n can also be referred to as high throughput (high throughput, HT), 802.11ac can also be referred to as very high throughput (very high throughput, VHT), 802.11ax can also be referred to as high efficiency (high efficient, HE) or Wi-Fi 6, and 802.11be can also be referred to as extremely high throughput (extremely high throughput, EHT) or Wi-Fi 7. Standards before HT, such as 802.11a/b/g, are collectively referred to as non-high throughput (Non-HT).

25 ~~{0094}~~{0095} FIG. 1 is a schematic diagram of a network architecture of a WLAN to which an embodiment of this application is applicable. In FIG. 1, that the WLAN includes one wireless access point (access point, AP) and two stations (station, STA) is used as an example. A STA associated with an AP can receive a radio frame sent by the AP, and can also send a radio frame to the AP. In addition, embodiments of this application are also applicable to communication between
30 APs. For example, the APs may communicate with each other by using a distributed system (distributed system, DS). Embodiments of this application are also applicable to communication between STAs. It should be understood that quantities of APs and STAs in FIG. 1 are merely an example. There may be more or less APs and STAs.

~~{0095}~~{0096} The STA in this embodiment of this application may be a user terminal, a user

apparatus, an access apparatus, a subscriber station, a subscriber unit, a mobile station, a user agent, a user device, or another device that has a wireless communication function. The user terminal may be a device having a wireless communication function, for example, a handheld device, a vehicle-mounted device, a wearable device, a computing device, and another processing device connected to a wireless modem. The user terminal may alternatively be user equipment (user equipment, UE), a mobile station (mobile station, MS), a terminal (terminal), terminal equipment (terminal equipment), a portable communication device, a handheld device, a portable computing device, an entertainment device, a game device or system, a global positioning system device, or any other suitable device in various forms configured to perform network communication via wireless media. For example, the STA may be a router, a switch, a bridge, or the like. Herein, for ease of description, the devices mentioned above are collectively referred to as a station or a STA.

~~{0096}~~**[0097]** The AP and the STA in embodiments of this application may be an AP and a STA that are applicable to an IEEE 802.11 system standard. The AP is an apparatus that is deployed in a wireless communication network and that provides a wireless communication function for a STA associated with the AP. The AP may be used as a center of the communication system, and is usually a network-side product that supports MAC and PHY in the 802.11 system standard, for example, may be a communication device such as a base station, a router, a gateway, a repeater, a communication server, a switch, or a bridge. The base station may include a macro base station, a micro base station, a relay station, or the like in various forms. Herein, for ease of description, the devices mentioned above are collectively referred to as an AP. The STA is usually a terminal product that supports media access control (media access control, MAC) and a physical layer (physical, PHY) of the 802.11 system standard, for example, a mobile phone or a notebook computer.

~~{0097}~~**[0098]** The AP communicates with the STA. The AP may allocate a resource to the STA. The STA receives and sends data on the allocated resource. For example, an orthogonal frequency division multiple access (orthogonal frequency division multiple access, OFDMA) technology or a multi-user multiple-input multiple-output (multi-users multiple-input multiple-output, MU-MIMO) technology may be used for wireless communication between the AP and the STA. It should be understood that a resource actually occupied by the STA for data transmission is a PRU, but a resource allocated by the AP to the STA may be a PRU or a virtual resource unit VRU. The VRU is a virtual RU, and is relative to the PRU. If the resource allocated by the AP to the STA may be the VRU, after receiving the VRU, the STA may convert the VRU into the PRU, and then send data on the PRU.

~~{0098}~~**[0099]** In OFDMA and MU-MIMO technologies, a spectrum bandwidth is divided into several resource units (resource unit, RU) according to a WLAN protocol. For example, bandwidth

configurations supported by the 802.11ax protocol include 20 MHz, 40 MHz, 80 MHz, 160 MHz, and 80+80 MHz. For example, in addition to the bandwidth configurations supported by the 802.11ax protocol, a bandwidth configuration supported by the 802.11be protocol may further include 320 MHz. A difference between 160 MHz and 80+80 MHz lies in that the former is a contiguous frequency band, and two 80 MHz segments of the latter may be separated. 160 MHz formed by 80+80 MHz is noncontiguous. The IEEE 802.11ax protocol specifies that a spectral bandwidth of 20 MHz, 40 MHz, 80 MHz, or 160 MHz may be divided into a plurality of types of RUs including a 26-tone RU, a 52-tone RU, a 106-tone RU, a 242-tone RU (a largest RU in a 20 MHz bandwidth), a 484-tone RU (a largest RU in a 40 MHz bandwidth), a 996-tone RU (a largest RU in an 80 MHz bandwidth), and a 2*996-tone RU (a largest RU in a 160 MHz bandwidth). Each RU includes contiguous subcarriers. For example, the 26-tone RU is an RU including 26 contiguous subcarriers. In the following, the 26-tone RU is denoted as a 26-tone RU, the 52-tone RU is denoted as a 52-tone RU, and so on. In addition to the 26-tone RU, the 52-tone RU, and the like that are used to transmit data, the entire bandwidth further include another subcarrier, for example, one or more of a guard (Guard) subcarrier, a null subcarrier, a direct current (direct current, DC) subcarrier, and a pilot subcarrier. For ease of description, in this specification, the subcarrier used to transmit data is referred to as a first-type subcarrier, and the another subcarrier is uniformly referred to as a second-type subcarrier.

~~{0099}~~{00100} FIG. 2 is a schematic diagram of a tone plan and RU distribution of 20 MHz. As shown in FIG. 2, when a bandwidth is 20 MHz, the entire bandwidth may include an entire 242-tone RU, or may include any combination of a 26-tone RU, a 52-tone RU, and a 106-tone RU. For example, the 20 MHz may include eight 26-tone RUs, four 52-tone RUs, or two 106-tone RUs. It can be learned from FIG. 2 that a bandwidth of one 242-tone RU is approximately 20 MHz, a bandwidth of one 106-tone RU is approximately 8 MHz, a bandwidth of one 52-tone RU is approximately 4 MHz, and a bandwidth of one 26-tone RU is approximately 2 MHz. It should be noted that the entire bandwidth further includes one or more of some guard subcarriers, null subcarriers, direct current subcarriers, and pilot subcarriers. For example, the 20 MHz shown in FIG. 2 further includes a guard subcarrier, a null subcarrier, and a direct current subcarrier.

~~{00100}~~{00101} When a bandwidth is 40 MHz, the entire bandwidth is approximately equivalent to replication of two tone plans of 20 MHz, and may include an entire 484-tone RU or any combination of a 26-tone RU, a 52-tone RU, a 106-tone RU, and a 242-tone RU, as shown in FIG. 3. In FIG. 3, "5 DC" represents five direct current subcarriers. Similar to the 20 MHz, the 40 MHz also includes one or more of some guard subcarriers, null subcarriers, and direct current subcarriers. It should be understood that a bandwidth of the 484-tone RU is approximately 40 MHz.

~~{00101}~~{00102} When a bandwidth is 80 MHz, the entire bandwidth includes a resource unit in a

unit of four 242-tone RUs. The entire bandwidth may include an entire 996-tone RU or any combination of a 26-tone RU, a 52-tone RU, a 106-tone RU, a 242-tone RU, and a 484-tone RU, as shown in FIG. 4. 484L and 484R in FIG. 4 represent a left half part and a right half part of the 484-tone RU, respectively including 242 subcarriers, which is another schematic diagram of "484+5 DC" in FIG. 3. In FIG. 4, "5 DC" represents five direct current subcarriers, and "23 DC" represents 23 direct current subcarriers. Similar to the 20 MHz, the 80 MHz also includes one or more of some guard subcarriers, null subcarriers, and direct current subcarriers. It should be understood that a bandwidth of the 996-tone RU is approximately 80 MHz.

~~{00102}~~{00103} It should be noted that when a bandwidth is 160 MHz, the entire bandwidth may be considered as replication of two tone plans of 80 MHz. The entire bandwidth may include an entire 2*996-tone RU, or may include any combination of a 26-tone RU, a 52-tone RU, a 106-tone RU, a 242-tone RU, a 484-tone RU, and a 996-tone RU. Similarly, when a bandwidth is 320 MHz, the entire bandwidth may be considered as replication of four tone plans of 80 MHz, and the entire bandwidth may include a resource unit in a unit of four 996-tone RUs. For simplicity, tone plans and RU distribution of 160 MHz and 320 MHz are not separately shown.

~~{00103}~~{00104} In the foregoing tone plans, the 242-tone RU is used as a unit. An RU on the left of each of FIG. 4 to FIG. 6 corresponds to a lowest frequency, and an RU on the right of each of FIG. 4 to FIG. 6 corresponds to a highest frequency. From left to right, 242-tone RUs may be numbered: 1st, 2nd, ..., and 16th. It should be noted that a maximum of 16 242-tone RUs are in a one-to-one correspondence with 16 20 MHz channels in ascending order of frequencies.

~~{00104}~~{00105} A plurality of contiguous or noncontiguous RUs may be allocated to one or more users, to improve RU allocation flexibility and/or frequency utilization. In this specification, a plurality of contiguous or noncontiguous RUs are referred to as a multi-RU. It should be understood that the multi-RU are RUs including a plurality of RUs. In some embodiments, the multi-RU may be denoted as a multi-RU, or may be denoted as an MRU. It should be noted that, in this specification, the multi-RU is uniformly denoted as an MRU.

~~{00105}~~{00106} For example, the 802.11be protocol further introduces a plurality of MRUs, for example, a 52+26-tone RU including one 52-tone RU and one 26-tone RU, a 106+26-tone RU including one 106-tone RU and one 26-tone RU, a 484+242-tone RU including one 484-tone RU and one 242-tone RU, a 996+484-tone RU including one 996-tone RU and one 484-tone RU, a 242+484+996-tone RU including one 242-tone RU, one 484-tone RU, and one 996-tone RU, a 2*996+484-tone RU including two 996-tone RUs and one 484-tone RU, a 3*996-tone RU including three 996-tone RUs, a 3*996+484-tone RU including three 996-tone RUs and one 484-tone RU, and the like.

~~{00106}~~{00107} Before the method provided in this application is described, the technical

concepts in this application are described first.

~~{00107}~~{00108} 1. Contiguous RU (continuous RU, CRU)

~~{00108}~~{00109} In this specification, the contiguous RU is an RU including a plurality of contiguous subcarriers, or the contiguous RU is an RU including two contiguous subcarrier groups.

5 A plurality of subcarriers included in each contiguous subcarrier group are contiguous, and only one or more of a guard subcarrier, a null subcarrier, or a direct current subcarrier is spaced between the two subcarrier groups. An RU supported in 802.11ax may be understood as the contiguous RU. The contiguous RU may also be referred to as a regular RU. Certainly, the contiguous RU may alternatively have another name. A specific name of the contiguous RU is not limited in this
10 embodiment of this application.

~~{00109}~~{00110} In this embodiment of this application, a contiguous RU including K subcarriers is referred to as a contiguous K-tone RU. For example, a contiguous 26-tone RU is a contiguous RU including 26 subcarriers. In other words, a concept of the contiguous K-tone RU is the same as a concept of a K-tone RU in the existing 802.11ax standard.

15 ~~{00110}~~{00111} It should be understood that a plurality of subcarriers of the contiguous RU may be contiguous, or the contiguous RU may include two contiguous subcarrier groups, and the two contiguous subcarrier groups are noncontiguous. For example, a 26-tone RU including a group of 13 contiguous subcarriers and another group of 13 contiguous subcarriers is the contiguous RU. Similarly, a 996-tone RU including a group of 484 contiguous subcarriers and another group of
20 484 contiguous subcarriers is the contiguous RU. Such RU may also be referred to as a special contiguous RU or a generalized contiguous RU. The contiguous RU in this application also includes the special contiguous RU or the generalized contiguous RU.

~~{00111}~~{00112} 2. Discrete RU (distribute RU, DRU)

~~{00112}~~{00113} Compared with the contiguous RU, an RU that includes a plurality of subcarrier
25 groups that are discrete in frequency domain may be referred to as the discrete RU. In other words, the discrete RU includes a plurality of subcarrier groups, and any two subcarrier groups are discrete in frequency domain. One subcarrier group includes one subcarrier, or one subcarrier group includes at least two contiguous subcarriers. That is, one subcarrier group includes one subcarrier or includes a plurality of contiguous subcarriers. The discrete RU may also be referred to as a
30 distributed RU (distributed RU, DRU). Certainly, in another embodiment, the discrete RU may also have another name. The name of the discrete RU is not limited in this application. A quantity of subcarrier groups included in one discrete RU in this application is greater than or equal to 2.

~~{00113}~~{00114} In this embodiment of this application, a discrete RU including K subcarriers may be referred to as a discrete K-tone RU. For example, a discrete 26-tone RU is a discrete RU
35 including 26 subcarriers. For a value of K, refer to a value of K used for the contiguous RU.

Certainly, the value of K may be different from the value of K used for the contiguous RU. For example, when a bandwidth is 20 MHz, the 20 MHz may include one or a combination of a discrete 26-tone RU, a discrete 52-tone RU, a discrete 106-tone RU, and a discrete 242-tone RU.

~~{00114}~~{00115} In this application, one discrete RU and another discrete RU may form a discrete MRU, and the discrete MRU can be allocated to one or more stations. For example, the discrete 242-tone RU and the discrete 484-tone RU may form a discrete 484+242-tone RU.

~~{00115}~~{00116} It should be noted that the special contiguous RU or the generalized contiguous RU mentioned above do not belong to the discrete RU in this embodiment of this application. For example, in the foregoing example, the 26-tone RU including the group of 13 contiguous subcarriers and the another group of 13 contiguous subcarriers is not the discrete RU defined in this application, but the special contiguous RU.

~~{00116}~~{00117} In some examples, quantities of subcarriers included in any two of the plurality of subcarrier groups included in the discrete RU may be the same or may be different. For example, a quantity of subcarriers in each subcarrier group may be 1. For another example, quantities of subcarriers in some subcarrier groups are 1, and quantities of subcarriers in the other subcarrier groups are 2. In other words, one discrete RU may include four subcarrier groups, and quantities of subcarriers in the four subcarrier groups may be 1, 1, 2, and 2 sequentially.

~~{00117}~~{00118} In some examples, when a quantity of subcarrier groups included in the discrete RU is greater than or equal to 3, in a plurality of discrete subcarrier groups included in the discrete RU, quantities of subcarriers between every two adjacent subcarrier groups may be the same or may be different. The every two adjacent subcarrier groups are two adjacent subcarrier groups of one discrete RU.

~~{00118}~~{00119} For example, for a discrete RU including three discrete subcarrier groups (denoted as a subcarrier group #1, a subcarrier group #2, and a subcarrier group #3), the subcarrier group #1 and the subcarrier group #2 are adjacent, and the subcarrier group #2 and the subcarrier group #3 are adjacent, that is, a frequency of a subcarrier included in the subcarrier group #1 is less than a frequency of a subcarrier included in the subcarrier group #2, and the frequency of the subcarrier included in the subcarrier group #2 is less than a frequency of a subcarrier included in the subcarrier group #3. In addition, a subcarrier with a maximum frequency in the subcarrier group #1 and a subcarrier with a minimum frequency in the subcarrier group #2 are noncontiguous in frequency (or frequency domain), that is, there is an interval of K1 ($K1 \geq 1$) subcarriers between the two, or there are K1 subcarriers between the two. A subcarrier with a maximum frequency in the subcarrier group #2 and a subcarrier with a minimum frequency in the subcarrier group #3 are noncontiguous in frequency (or frequency domain), that is, there is an interval of K2 ($K2 \geq 1$) subcarriers between the two, or there are K2 subcarriers between the two. K1 may be equal to K2,

or may not be equal to K_2 .

~~{00119}~~{00120} For another example, for a discrete RU including four discrete subcarrier groups (denoted as a subcarrier group #1, a subcarrier group #2, a subcarrier group #3, and a subcarrier group #4), the subcarrier group #1 and the subcarrier group #2 are adjacent, the subcarrier group #2 and the subcarrier group #3 are adjacent, and the subcarrier group #3 and the subcarrier group #4 are adjacent. In addition, a subcarrier with a maximum frequency in the subcarrier group #1 and a subcarrier with a minimum frequency in the subcarrier group #2 are spaced by K_1 ($K_1 \geq 1$) subcarriers, a subcarrier with a maximum frequency in the subcarrier group #2 and a subcarrier with a minimum frequency in the subcarrier group #3 are spaced by K_2 ($K_2 \geq 1$) subcarriers, and a subcarrier with a maximum frequency in the subcarrier group #3 and a subcarrier with a minimum frequency in the subcarrier group #4 are spaced by K_3 ($K_3 \geq 1$) subcarriers. K_1 , K_2 , and K_3 may be equal. Alternatively, any two of the three may be equal or may be unequal.

~~{00120}~~{00121} For example, refer to FIG. 5. A plurality of contiguous RUs corresponding to a discrete 26-tone RU shown in FIG. 5 are a first contiguous 26-tone RU (a contiguous RU #1) in first 20 MHz and a first contiguous 26-tone RU (a contiguous RU #2) in second 20 MHz. In this application, the discrete RU is a discrete RU corresponding to the contiguous RU #1 and the contiguous RU #2, the discrete RU is a discrete RU that has a mapping relationship with the contiguous RU #1 and the contiguous RU #2, or the contiguous RU #1 and the contiguous RU #2 are contiguous RUs occupied by the discrete RU.

~~{00121}~~{00122} For another example, refer to FIG. 6. A plurality of contiguous RUs corresponding to a discrete 996-tone RU shown in FIG. 6 are two contiguous 996-tone RUs shown in the figure.

~~{00122}~~{00123} The Federal Communications Commission has issued a regulation on the 6 GHz spectrum, which defines an indoor low power (low power indoor, LPI) communication mode. This communication mode limits a maximum transmit power and a maximum frequency spectral density. For an AP, it is specified that a maximum transmit power of the AP is 36 dBm (decibel-milliwatts, decibel-milliwatts), and a maximum power spectral density is 5 dBm/MHz (decibel-milliwatts/megahertz, decibel-milliwatts/megahertz). For a STA, it is specified that a maximum transmit power of the STA is 24 dBm, and a maximum power spectral density is -1 dBm/MHz.

~~{00123}~~{00124} Transmit power of a device is limited by both a maximum power and a maximum power spectral density. That is, the transmit power of the device cannot exceed the maximum power or the maximum power spectral density. That is, the transmit power per MHz cannot exceed a given value. For example, Table 1 shows a correspondence between a maximum power sent by a device and a bandwidth in an LPI scenario.

Table 1

Bandwidth	Maximum transmit power of an AP	Maximum transmit power of a STA
20 MHz	18 dBm	12 dBm
40 MHz	21 dBm	15 dBm
80 MHz	24 dBm	18 dBm
160 MHz	27 dBm	21 dBm
320 MHz	30 dBm	24 dBm

~~{00124}~~[00125] It should be understood that, 20 MHz in Table 1 is used as an example, 18 dBm–5 dBm=13 dB, and $13 \text{ dB} = 10^{1.3} = 19.95$, which is approximately equal to 20 MHz. It can be learned that a maximum power in a transmit bandwidth is approximately equal to a value obtained when the maximum transmit power is reached in each MHz. When a power spectral density is limited, a corresponding transmit bandwidth may be expanded to enable the device to support higher transmit power. It can be learned from tone plans and RU distribution in FIG. 2 to FIG. 4 that all subcarriers in a bandwidth are contiguous, that is, RUs in FIG. 2 to FIG. 4 are contiguous RUs. Compared with the discrete RU, each subcarrier included in the contiguous RU corresponds to a smaller bandwidth, and therefore the maximum transmit power of the device cannot be increased by using the transmit bandwidth. For example, the 20 MHz includes two subcarriers that belong to the 20 MHz and a plurality of subcarriers that belong to another RU. Compared with 20 MHz including 10 contiguous subcarriers, although a quantity of subcarriers allocated to the device is not increased, the subcarriers allocated to the device become more discrete in frequency domain, so that a quantity of subcarriers in each MHz is reduced. From a perspective of the subcarrier, it is equivalent to broadening a bandwidth corresponding to each subcarrier. Therefore, the device can support higher transmit power.

~~{00125}~~[00126] For example, FIG. 7 is a schematic diagram of distribution of a 26-tone RU with discrete subcarriers. In FIG. 7, 80 MHz is used as an example. The 26-tone RU includes 24 data subcarriers and two pilot subcarriers. The 24 data subcarriers may be designed in a form of two non-adjacent data subcarriers, as shown in FIG. 7.

~~{00126}~~[00127] For another example, FIG. 8 is a schematic diagram of distribution of a 52-tone RU with discrete subcarriers. In FIG. 8, 80 MHz is used as an example. The 52-tone RU includes 48 data subcarriers and four pilot subcarriers. The 48 data subcarriers may be designed in a form of two non-adjacent data subcarriers, as shown in FIG. 8. It should be noted that the discrete distribution (discrete design) manners of the data subcarriers in FIG. 7 and FIG. 8 are merely examples. Discrete distribution of the data subcarrier is not limited in this embodiment of this application.

~~[00127]~~[00128] It can be seen from FIG. 7 and FIG. 8 that, because the data subcarriers on the RU are discretely distributed, a quantity of subcarriers in each MHz is reduced. From a perspective of the subcarrier, it is equivalent to broadening a bandwidth corresponding to each subcarrier. Therefore, each subcarrier may support higher transmit power. However, in the manner shown in FIG. 7 or FIG. 8, more RUs or RU combinations need to be defined, for example, RUs or RU combinations formed by various discrete subcarriers. In addition, to indicate more types of RUs or MRUs (including the RUs or RU combinations formed by the various discrete subcarriers), an existing method for allocating an RU formed by contiguous subcarriers needs to be changed, and implementation is complex for a transmit end. In addition, in a possible case, for example, there may be an intersection between some predefined discrete subcarrier sets, and then a discrete RU (for example, an x-tone RU) is allocated, and another discrete RU (for example, a y-tone RU) cannot be used for sending. For another example, if preamble puncturing occurs, the predefined RU cannot be used, and RU utilization is low.

~~[00128]~~[00129] In view of this, this application provides a resource allocation method. The method is essentially to provide a mapping manner from a VRU to a PRU. In the mapping manner, a contiguous VRU may be mapped to a discrete PRU. Based on this mapping manner, a transmit end may notify a receive end that an RU allocated to the receive end is a VRU, but the transmit end sends data on the discrete PRU to which the contiguous VRU is mapped. Because the contiguous VRU is mapped to the discrete PRU, it is equivalent to reducing a quantity of subcarriers in each MHz, so that the transmit end can support higher transmit power.

~~[00129]~~[00130] It should be noted that, in this embodiment of this application, a subcarrier that needs to be discrete is a subcarrier (also referred to as a data subcarrier in this specification) used to carry data. For any RU, distribution of another subcarrier included in the RU, for example, a pilot subcarrier, is not limited. For example, a conventional design or another possible design may be used for distribution of the pilot subcarrier.

~~[00130]~~[00131] The technical solutions provided in embodiments of this application are described below in detail with reference to the accompanying drawings. In the following description, an example in which the transmit end is a first device and the receive end is a second device is used to describe how the first device indicates an allocated resource to the second device. The first device may be an AP, and the second device may be a STA or an AP, or the first device may be a STA, and the second device may also be a STA. For ease of description, in the following, an example in which the first device is an AP and the second device is a STA is used. FIG. 9 is a schematic flowchart of a resource allocation method according to an embodiment of this application. The procedure is described as follows.

~~[00131]~~[00132] S901: The AP sends resource allocation information to the STA, and

correspondingly the STA receives the resource allocation information from the AP, where the resource allocation information indicates a first VRU, and the first VRU is a contiguous RU.

~~{00132}~~{00133} S902: The AP maps the first VRU to a first PRU based on a mapping relationship between a VRU and a PRU.

5 ~~{00133}~~{00134} S903: The AP sends data on the first PRU, and the STA receives the data on the first PRU.

~~{00134}~~{00135} Generally, a resource allocated by the AP to the STA is the contiguous RU. To enable the AP to obtain higher transmit power, in this application, the contiguous RU may be mapped to a discrete RU, and the AP sends data to the STA on the discrete RU, so that the AP can obtain higher transmit power. It should be understood that the AP sends the data to the STA on the discrete RU, and the STA receives the data from the AP on the discrete RU, or may send data to the AP on the discrete RU. That is, the STA does not receive or send data on the contiguous RU allocated by the AP to the STA. It may be considered that the contiguous RU allocated by the AP to the STA is a VRU, and the discrete RU is a PRU. It may be considered that this embodiment of this application essentially provides a solution in which the VRU is mapped to the PRU. In this way, the transmit end may use a resource allocation manner in which a bandwidth is divided into several resource units, and there is no need to define a plurality of distributed RUs or care about how to select and allocate the distributed RU, so that maximum transmit power of a device can be increased.

20 ~~{00135}~~{00136} In this embodiment of this application, the AP may continue to use a current RU allocation manner, that is, a resource is allocated by using a resource unit allocation subfield (RU Allocation subfield). Generally, the AP allocates a resource to the STA by using the resource unit allocation subfield, and the STA considers that the allocated resource is a physical resource. For example, the AP sends resource allocation information to the STA, where the resource allocation information is carried in a resource unit allocation subfield, and indicates an RU allocated by the AP to the STA. However, in this embodiment of this application, the resource allocated to the STA by using the resource unit allocation subfield is not a resource actually used by the AP to send the data. Therefore, when allocating the resource to the STA, the AP notifies the STA that the resource allocated by the AP to the STA is a VRU. For example, the AP may send resource allocation information to the STA, where the resource allocation information indicates that the RU allocated by the AP to the STA is the first VRU. For example, the resource allocation information may be carried in a resource allocation subfield. For example, the resource allocation information may be a reserved bit sequence of the resource allocation subfield. Alternatively, the resource allocation information may be carried in a signaling field (signal field, SIG) included in a physical layer protocol data unit (physical protocol data unit, PPDU), for example, some bits in a universal field

(universal SIG, U-SIG) or in an extremely high throughput signaling field (extremely high throughput signal field, EHT-SIG), for example, a reserved bit such as a validate (validate) bit.

~~{00136}~~{00137} Before sending the data to the STA, the AP needs to map the VRU to the PRU, to send the data on the PRU. It should be understood that the AP may allocate a VRU to one STA, or may simultaneously allocate VRUs to a plurality of STAs. For example, the AP allocates a first VRU to a STA 1, and allocates a second VRU to a STA 2. In this case, the AP may simultaneously map the first VRU and the second VRU. For example, the AP maps frequency-domain resources on which the first VRU and the second VRU are located. For ease of description, the following uses an example in which the AP maps a first frequency-domain resource on which the first VRU is located. It should be understood that the first frequency-domain resource may further include one or more other VRUs. It should be noted that the AP may allocate VRUs to some STAs, and may also allocate PRUs to the other STAs. For example, the AP allocates a first VRU to a first STA, and allocates a second PRU to a second STA. The first VRU and the second PRU are located on the first frequency-domain resource. A solution in which the VRU is mapped to the PRU provided in this embodiment of this application may be applied to downlink transmission (that is, transmission from the AP to the STA), or may be applied to uplink transmission (that is, transmission from the STA to the AP). The solution in which the VRU is mapped to the PRU may be used in combination with the solution in which the AP allocates any resource to the STA by using the resource unit allocation subfield.

~~{00137}~~{00138} In this embodiment of this application, a purpose of mapping the VRU to the PRU is to make subcarriers more discrete, and both the VRU and the PRU may be indicated by using sequence numbers of the subcarriers. For details, refer to the following Appendix 1 to Appendix 5. Therefore, in this embodiment of this application, a subcarrier sequence number sequence corresponding to the first frequency-domain resource may be mapped, that is, the subcarrier sequence number sequence (a source subcarrier sequence number sequence) is mapped to another subcarrier sequence number sequence (a target subcarrier sequence number sequence). That is, sequence numbers in the source carrier sequence number sequence are mapped to corresponding elements in the target subcarrier sequence number sequence one by one.

~~{00138}~~{00139} A sequence number of each subcarrier may be a subcarrier number of the subcarrier in a corresponding actual frequency band, or may be self-defined. A specific implementation form of the sequence number of the subcarrier is not limited in this embodiment of this application.

~~{00139}~~{00140} For example, the sequence number of the subcarrier may be the subcarrier number of the subcarrier in the corresponding actual frequency band. For example, sequence numbers of 242 subcarriers corresponding to first 20 MHz in 80 MHz are sequentially –500 to –

259, sequence numbers of 242 subcarriers corresponding to second 20 MHz are sequentially –253 to –12, sequence numbers of 242 subcarriers corresponding to third 20 MHz are 12 to 253, and sequence numbers of 242 subcarriers corresponding to fourth 20 MHz are sequentially 259 to 500.

~~{00140}~~{00141} For example, the sequence number of the subcarrier may be numbered from 0 or

1. For example, sequence numbers of 242 subcarriers corresponding to first 20 MHz in 80 MHz are 0 to 241, or 1 to 242.

~~{00141}~~{00142} For example, the sequence number of the subcarrier is a preset sequence number plus a preset offset value. For example, the preset sequence number may be numbered from 0 or 1, and the preset offset value may be determined based on the subcarrier number of the subcarrier in the corresponding actual frequency band. For example, sequence numbers of 242 subcarriers corresponding to first 20 MHz in 80 MHz may be calculated based on preset sequence numbers and a preset offset value. Assuming that the preset sequence number is 1, the preset offset value may be –501.

~~{00142}~~{00143} It should be noted that ranges in which the VRU and the PRU participate in mapping are not limited in this embodiment of this application. In other words, the first VRU and the first PRU may be in a same frequency-domain location range, or may be in different frequency-domain location ranges. In addition, in this embodiment of this application, whether a frequency range in which the PRU participates in mapping is contiguous is not limited. In other words, the frequency-domain range in which the PRU participates in mapping may be contiguous, or may be discrete, provided that a size of the frequency range in which the PRU participates in mapping is the same as a size of a frequency range in which the VRU participates in mapping.

~~{00143}~~{00144} It may also be considered that a set in which the source subcarrier sequence number sequence is located and a set in which the target subcarrier sequence number sequence is located are not limited in this embodiment of this application. For example, a sequence number in the subcarrier sequence number sequence corresponding to the first frequency-domain resource may be mapped to another sequence number in a same set. For example, if the source subcarrier sequence number sequence is located in a first set, the target subcarrier sequence number sequence is also located in the first set. Alternatively, a sequence number in the subcarrier sequence number sequence corresponding to the first frequency-domain resource may be mapped to another sequence number in another set. For example, if the source subcarrier sequence number sequence is located in a first set, the target subcarrier sequence number sequence is also located in a second set, and there is no intersection between the first set and the second set. For another example, if the source subcarrier sequence number sequence is located in a first set, the target subcarrier sequence number sequence is located also in a second set, and some sequence numbers in the second set are the same as those in the first set. Similarly, whether the target subcarrier sequence

number sequence is contiguous is not limited in this embodiment of this application. In other words, sequence numbers included in the target subcarrier sequence number sequence may be located in different sets. For example, if the source subcarrier sequence number sequence is located in a first set, the target subcarrier sequence number sequence may be located in a plurality of second sets, there is no intersection between the plurality of second sets, and there is no intersection between the first set and the plurality of second sets, or there is an intersection between the first set and some second sets in the plurality of second sets.

~~[00144]~~[00145] For example, FIG. 10 is a schematic diagram of frequency ranges in which the VRU and the PRU participate in mapping. The source subcarrier sequence number sequence may correspond to first 20 MHz in the 80 MHz, and the target subcarrier sequence number sequence may also correspond to the first 20 MHz in the 80 MHz; the source subcarrier sequence number sequence may correspond to first 20 MHz in the 80 MHz, and the target subcarrier sequence number sequence may correspond to third 20 MHz in the 80 MHz, to represent the first frequency-domain resource; or the source subcarrier sequence number sequence may correspond to first 20 MHz in the 80 MHz, and the target subcarrier sequence number sequence may correspond to some frequencies in second 20 MHz in the 80 MHz, some frequencies in third 20 MHz in the 80 MHz, and some frequencies in fourth 20 MHz in the 80 MHz.

~~[00145]~~[00146] In other words, if the source subcarrier sequence number sequence is located in $\{-500, \dots, -259\}$, the target subcarrier sequence number sequence may be located in $\{-500, \dots, -259\}$; if the source subcarrier sequence number sequence is located in $\{-500, \dots, -259\}$, the target subcarrier sequence number sequence may be located in $\{-253, \dots, -12\}$; or if the source subcarrier sequence number sequence is located in $\{-500, \dots, -259\}$, the target subcarrier sequence number sequence may be located in $\{-253, \dots, -106\}$, $\{50, \dots, 88\}$, and $\{270, \dots, 326\}$.

~~[00146]~~[00147] The following uses an example in which the first VRU and the first PRU participate in mapping in a same frequency range, to describe several possible mapping manners in which the VRU is mapped to the PRU.

~~[00147]~~[00148] Mapping manner 1: In this embodiment of this application, the VRU may be mapped to the PRU by using an interleaving matrix.

~~[00148]~~[00149] A row quantity of the interleaving matrix may be predefined, and a column quantity of the interleaving matrix is an integer obtained by dividing a quantity of subcarriers to be input by the AP by the row quantity of the interleaving matrix. That is, if a value obtained by dividing the quantity of subcarriers to be input by the AP by the row quantity of the interleaving matrix is a decimal, the column quantity of the interleaving matrix is a rounded-up value obtained by dividing the quantity of subcarriers to be input by the AP by the row quantity of the interleaving matrix. Alternatively, a column quantity of the interleaving matrix may be predefined, and a row

quantity of the interleaving matrix is an integer obtained by dividing a quantity of subcarriers to be input by the AP by the column quantity of the interleaving matrix. That is, if a value obtained by dividing the quantity of subcarriers to be input by the AP by the column quantity of the interleaving matrix is a decimal, the row quantity of the interleaving matrix is a rounded-up value obtained by dividing the quantity of subcarriers to be input by the AP by the column quantity of the interleaving matrix. It should be noted that a specific implementation of the row quantity and the column quantity of the interleaving matrix is not limited in this embodiment of this application. For example, both the row quantity and the column quantity of the interleaving matrix may be predefined, or the row quantity and the column quantity of the interleaving matrix may be negotiated by the AP and the STA.

~~[00149]~~[00150] In other words, row-column transformation is performed, by using the interleaving matrix, on sequence numbers of a plurality of subcarriers, and sequence numbers obtained by performing row-column transformation on the plurality of subcarriers are output. That is, a sequence number of a subcarrier of the first VRU is mapped to a sequence number of a subcarrier of the first PRU based on the interleaving matrix. FIG. 11 shows a mapping manner from a VRU to a PRU. In FIG. 11, an example in which a row quantity of the interleaving matrix is N and a column quantity is M is used. In FIG. 11, an example in which sequence numbers of subcarriers are input into the interleaving matrix by row and output from the interleaving matrix by column is used. That is, the AP may sequentially input, according to a first order, sequence numbers of a plurality of subcarriers included in a first frequency-domain resource into rows of an interleaver (the interleaving matrix), and outputs sequence numbers of the subcarriers included the interleaving matrix according to a column direction of the interleaving matrix. Alternatively, the AP may sequentially input, according to a first order, sequence numbers of a plurality of subcarriers included in a first frequency-domain resource into columns of an interleaver (the interleaving matrix), and outputs sequence numbers of the subcarriers included the interleaving matrix according to a row direction of the interleaving matrix. For ease of description, the following uses an example in which sequence numbers of subcarriers are input into the interleaving matrix by row and output from the interleaving matrix by column.

~~[00150]~~[00151] For example, a sequence number i of a subcarrier of the first PRU mapped from a subcarrier with a sequence number k of the first VRU based on the interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ where}$$

N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix,

and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaving matrix.

~~[00151]~~[00152] The first order is an ascending order, the first order is a descending order, or the first order is an order obtained through resorting in ascending order or in descending order according to a preset rule. For example, there are n subcarriers in total, sequence numbers (that is, n sequence numbers) of the n subcarriers are sorted in ascending order, and the first order is an order obtained by shifting m sequence numbers selected from the n sequence numbers before a minimum sequence number. For example, a sequence number sequence of a subcarrier is 123456, and a first order is 345612. The following uses an example in which the first order is an ascending order.

~~[00152]~~[00153] For example, FIG. 12 shows mapping from a VRU to a PRU in 20 MHz. The 20 MHz in FIG. 12 may be, for example, any 20 MHz in 40 MHz, 80 MHz, or 160 MHz. A number in each rectangle in FIG. 12 indicates a quantity of subcarriers. In FIG. 12, that 242 subcarriers included in the 20 MHz participate in mapping and a row quantity of the interleaving matrix is 2 is used as an example. It can be learned from FIG. 12 that most subcarriers represented by a same shadow part are not adjacent. To be specific, a plurality of contiguous subcarriers included in the 20 MHz should become discrete after mapping. In other words, although subcarriers in each VRU are contiguous in the VRU, the subcarriers become discrete after mapping. In this mapping manner, the VRU formed by the contiguous subcarriers may be mapped to a PRU formed by the discrete subcarriers, which is equivalent to broadening a bandwidth corresponding to each subcarrier. Therefore, although the AP still uses a current RU allocation manner to allocate a resource to the STA, the AP may also obtain higher transmit power. In addition, for the AP, the current RU allocation manner is still used, and there is no need to define a plurality of distributed RUs and care about how to select and allocate the distributed RU.

~~[00153]~~[00154] All the 242 subcarriers (that is, all subcarriers) in the 20 MHz (the first frequency-domain resource) shown in FIG. 12 participate in mapping. That is, both first-type subcarriers and a second-type subcarrier that are included in the first frequency-domain resource participate in mapping. It should be understood that this embodiment of this application is intended to discrete the first-type subcarriers. Therefore, in some embodiments, the second-type subcarrier may not participate in mapping, that is, only the first-type subcarriers included in the first frequency-domain resource are mapped. Certainly, all the first-type subcarriers included in the first frequency-domain resource may participate in mapping, or some first-type resources included in the first frequency-domain resource may participate in mapping. This is not limited in this embodiment of this application. In this way, content of the interleaving matrix may be less, thereby improving interleaving efficiency. The following describes several mapping manners in which the

second-type subcarrier does not participate in mapping.

~~FIG. 13~~ FIG. 13 is a schematic diagram in which the second-type subcarrier does not participate in mapping. For example, a sequence number sequence obtained in ascending order of sequence numbers of subcarriers included in the first frequency-domain resource is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, and sequence numbers of the second-type subcarrier are 5 and 6. Because the second-type subcarrier does not participate in mapping, when the first frequency-domain resource is mapped, {1, 2, 3, 4, 7, 8, 9, 10} may be input into the interleaving matrix. It is assumed that a row quantity of the interleaving matrix is 2, and a column quantity is 4 (that is, $N=2$, $M=4$). In this case, elements in a first row of the interleaving matrix are sequentially {1, 2, 3, 4}, and elements in a second row are sequentially {7, 8, 9, 10}. Sequence numbers of subcarriers obtained through output by column are {1, 7, 2, 8, 3, 9, 4, 10}. That is, subcarriers whose sequence numbers are {1, 2, 3, 4, 7, 8, 9, 10} in the VRU are in a one-to-one correspondence with subcarriers whose sequence numbers are {1, 7, 2, 8, 3, 9, 4, 10} in the PRU. Because subcarriers whose sequence numbers are 5 and 6 do not participate in mapping, sequence numbers of the subcarriers whose sequence numbers are 5 and 6 in the PRU are still 5 and 6.

~~[00156]~~[00157] For example, sequence numbers of 242 subcarriers corresponding to first 20 MHz in 80 MHz are -500 to -259 , there are 18 pilot subcarriers in the first 20 MHz in 80 MHz, and sequence numbers of the pilot subcarriers are: sequence numbers in $\{-238, -224, -212, -198, -184, -170, -158, -144, -130, -116, -104, -90, -78, -64, -50, -36, -24, -10\}$ plus an offset value (that is, -256), that is, $\{-494, -480, -468, -454, -440, -426, -414, -400, -386, -372, -360, -346, -334, -320, -306, -292, -280, -266\}$.

~~1001574~~**[00158]** During mapping of the first 20 MHz in the 80 MHz, it may be determined that the 18 pilot subcarriers do not participate in mapping. That is, the 18 pilot subcarriers are not input into the interleaving matrix, and a quantity of subcarriers participating in mapping is $242-18=224$ subcarriers. In this case, an $8*28$ matrix may be designed as the interleaving matrix. In this case, subcarriers participating in mapping are input into the interleaving matrix, as shown in Table 2. It should be understood that all blank parts in the table are corresponding to subcarrier sequence numbers. For brevity, Table 2 shows only some subcarrier sequence numbers.

Table 2

[illegible]

the plurality of subcarriers included in the first time-frequency resource are input into the interleaving matrix by row according to the first order, the sequence number of the second-type subcarrier that does not participate in mapping in the interleaving matrix is replaced with "*".

~~{00161}~~{00162} For example, FIG. 14 shows another example in which the second-type

subcarrier does not participate in mapping. For example, the foregoing example is still used, that is, a row quantity of the interleaving matrix is 2, and a column quantity is 4. A sequence number sequence obtained in ascending order of sequence numbers of subcarriers included in the first frequency-domain resource is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, and sequence numbers of the second-type subcarrier are 5 and 6. Because the second-type subcarrier participates in mapping, but the sequence number of the second-type subcarrier is not output after being processed by the interleaving matrix, the sequence number of the second-type subcarrier may be defined as "*".

When the first frequency-domain resource is mapped, {1, 2, 3, 4, *, *, 7, 8, 9, 10} may be input into the interleaving matrix. That is, elements in a first row of the interleaving matrix are sequentially {1, 2, 3, 4, *}, and elements in a second row are sequentially {7, 8, 9, 10, *}. Because the sequence number of "*" is not output, sequence numbers of subcarriers obtained through output by column are {1, 7, 2, 8, 3, 9, 4, 10}. That is, subcarriers whose sequence numbers are {1, 2, 3, 4, 7, 8, 9, 10} in the VRU are in a one-to-one correspondence with subcarriers whose sequence numbers are {1, 7, 2, 8, 3, 9, 4, 10} in the PRU. Sequence numbers of the subcarriers whose sequence numbers are 5 and 6 in the PRU are still 5 and 6.

~~{00162}~~{00163} In some other embodiments, in a sequence number sequence obtained based on the sequence numbers of the plurality of subcarriers included in the first time-frequency resource that are sorted according to the first order, the sequence number of the second-type subcarrier may be replaced with "*". However, the sequence number of the second-type subcarrier is input into a preset location of the interleaving matrix, and the sequence numbers of the first-type subcarriers are sequentially input, according to the first order, into locations other than the location occupied by the sequence number of the second-type subcarrier in rows of the interleaving matrix. For example, it may be specified that the sequence number of * is sequentially input into a last column of each row of the interleaving matrix, the sequence number of * is sequentially input into a first column of each row of the interleaving matrix, or the sequence number of * is sequentially input into a location obtained according to a preset rule in the interleaving matrix. A specific location of the sequence number of the second-type subcarrier in the interleaving matrix is not limited in this embodiment of this application.

~~{00163}~~{00164} For example, FIG. 15 shows still another example in which the second-type subcarrier does not participate in mapping. The foregoing example is still used, that is, a row quantity of the interleaving matrix is 2, and a column quantity is 4. A sequence number sequence

obtained in ascending order of sequence numbers of subcarriers included in the first frequency-domain resource is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, and sequence numbers of the second-type subcarrier are 5 and 6. Because the second-type subcarrier participates in mapping, but the sequence number of the second-type subcarrier is not output after being processed by the interleaving matrix, the sequence number of the second-type subcarrier may be defined as "*". It may be specified that the sequence number of * may be sequentially input into a last column of each row of the interleaving matrix. When the first frequency-domain resource is mapped, {1, 2, 3, 4, *, *, 7, 8, 9, 10} is input into the interleaving matrix. That is, elements in a first row of the interleaving matrix are sequentially {1, 2, 3, 4, *}, and elements in a second row are sequentially {7, 8, 9, 10, *}. Because the sequence number of "*" is not output, sequence numbers of subcarriers obtained through output by column are {1, 7, 2, 8, 3, 9, 4, 10}. That is, subcarriers whose sequence numbers are {1, 2, 3, 4, 7, 8, 9, 10} in the VRU are in a one-to-one correspondence with subcarriers whose sequence numbers are {1, 7, 2, 8, 3, 9, 4, 10} in the PRU. Sequence numbers of the subcarriers whose sequence numbers are 5 and 6 in the PRU are still 5 and 6.

~~[00164]~~**[00165]** For example, FIG. 16 shows an example in which a VRU of 20 MHz in 80 MHz is mapped to a PRU. In FIG. 15, an example in which a row quantity of the interleaving matrix is 2 and some first-type subcarriers participate in mapping is used, that is, the second-type subcarrier does not participate in mapping, and some first-type subcarriers participate in mapping. The second-type subcarrier that does not participate in mapping is a null subcarrier, that is, the second-type subcarrier that does not participate in mapping includes one null subcarrier on a left side and a right side of a 26-tone RU adjacent to a 106-tone RU, one null subcarrier on a left side of a first 26-tone RU, and one null subcarrier on a right side of the 106-tone RU. First-type subcarriers that do not participate in mapping are all subcarriers included in the 26-tone RU adjacent to the 106-tone RU. It can be learned from FIG. 16 that a quantity of subcarriers participating in mapping is $242 - 2 - 2 - 26 = 212$, that is, content of the interleaving matrix is less, thereby improving interleaving efficiency.

~~[00165]~~**[00166]** FIG. 17 shows another example in which a VRU of 20 MHz in 80 MHz is mapped to a PRU. A difference between FIG. 17 and FIG. 16 lies in that, in FIG. 17, that a row quantity of the interleaving matrix is 4 is used as an example. It should be understood that 106-1 and 106-2 in FIG. 17 show two parts of 106 subcarriers.

~~[00166]~~**[00167]** It should be noted that, in FIG. 16 and FIG. 17, that the second-type subcarrier that does not participate in mapping is the null subcarrier is used as an example. Which type of subcarrier of the second-type subcarrier is not limited in this embodiment of this application. For example, the second-type subcarrier may also be a direct current subcarrier, may be a pilot subcarrier, or may be at least one of a null subcarrier, a direct current subcarrier, a guard subcarrier,

or a pilot subcarrier.

~~[00167]~~**[00168]** For example, sequence numbers of 242 subcarriers corresponding to first 20 MHz in 80 MHz are -500 to -259 , there are 18 pilot subcarriers in the first 20 MHz in 80 MHz, and sequence numbers of the pilot subcarriers are: sequence numbers in $\{-238, -224, -212, -198, -184, -170, -158, -144, -130, -116, -104, -90, -78, -64, -50, -36, -24, -10\}$ plus an offset value (that is, -256), that is, $\{-494, -480, -468, -454, -440, -426, -414, -400, -386, -372, -360, -346, -334, -320, -306, -292, -280, -266\}$.

~~100168~~100169 During mapping of the first 20 MHz in the 80 MHz, it may be determined that the 18 pilot subcarriers do not participate in mapping. For example, sequence numbers of the 18 pilot subcarriers are input into the interleaving matrix, but the sequence numbers of the 18 pilot subcarriers are not output during output. In this case, the interleaving matrix may be designed as an 8*32 matrix, and subcarriers participating in mapping are input into the interleaving matrix, as shown in Table 3. Gray parts in Table 3 are sequence numbers of pilot subcarriers. It should be understood that all blank parts in the table are corresponding to subcarrier sequence numbers. For brevity, Table 3 shows only some subcarrier sequence numbers.

Table 3

[illegible]

~~100169~~100170 Sequence numbers in the interleaving matrix are output by column, that is, a subcarrier sequence number set of the VRU is $\{-500, -499, \dots, \text{and } -259\} - \{-494, -480, -468, -454, -440, -426, -414, -400, -386, -372, -360, -346, -334, -320, -306, -292, -280, -266\}$, and is in a one-to-one correspondence with elements in the following sequences: $\{-500, -436, -404, -340, \dots, -277\}$.

~~FIG. 17~~[00171] It should be understood that, for the pilot subcarrier, quantities of locations of the pilot subcarriers on different RUs are different. For example, FIG. 18 shows locations of pilot subcarriers in 80 MHz. It can be learned from FIG. 18 that a pilot subcarrier set of a 26-tone RU in any 20 MHz also includes pilot subcarriers of a 52-tone RU and a 106-tone RU in 20 MHz. To

enable all RUs in an interleaving range (the first frequency-domain resource) can satisfy that pilot locations after mapping can remain unchanged regardless of which pilot subcarriers are selected. In this embodiment of this application, a maximum pilot set in the interleaving range may be set as a pilot subcarrier set that does not participate in mapping. For example, the pilot subcarrier that does not participate in mapping is a maximum pilot subcarrier set in the 26-tone RU in the first frequency-domain resource. In this way, mapping of the 26-tone RU, the 52-tone RU, or the 106-tone RU may be randomly selected in the range of 20 MHz, and original locations of the pilot subcarriers in the VRU and the PRU are not changed.

~~{00171}~~[00172] It should be noted that if a quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers included in the first frequency-domain resource is less than a quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix, for example, a sequence number sequence obtained in ascending order of sequence numbers of subcarriers included in the first frequency-domain resource is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, and the interleaving matrix is a matrix with two rows and six columns, the AP may input the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource and a sequence number of a padding subcarrier into the interleaving matrix. The sequence number of the padding subcarrier is not output after being processed by interleaving matrix, that is, the padding subcarrier does not participate in mapping. To distinguish the padding subcarrier from the first-type subcarrier and the second-type subcarrier, the sequence number of the padding subcarrier may be a second preset sequence number, for example, "#". In this case, it may be specified that the sequence number of the second-type subcarrier is input into a preset location of the interleaving matrix, and remaining sequence numbers of subcarriers that are in the first frequency-domain resource and that need to be input into the interleaving matrix are sequentially input, according to the first order, into locations other than the location occupied by the padding subcarrier in rows of the interleaving matrix. For example, it may be specified that some rows (or columns) fixed in the interleaving matrix are sequentially input into the interleaving matrix from a first column (or a first row), or it may be specified that some rows (or columns) fixed in the interleaving matrix are sequentially input into the interleaving matrix from a last column (or a last row). A specific location of the sequence number of the padding subcarrier in the interleaving matrix is not limited in this embodiment of this application.

~~{00172}~~[00173] It should be noted that, in the foregoing example, the first frequency-domain resource is 20 MHz, that is, a mapping granularity (interleaving granularity) of the RU is 242 subcarriers. It should be understood that a size of the mapping granularity may be determined based on a maximum bandwidth supported by the device, that is, a quantity of subcarriers that are

in the first frequency-domain resource and that are input into the interleaving matrix is determined based on the maximum bandwidth supported by the device. For example, if the bandwidth supported by the device is greater than a PPDU bandwidth, various mapping granularities, such as 20 MHz, 40 MHz, and 80 MHz, may be supported in the PPDU bandwidth. If the bandwidth supported by the device is less than a PPDU bandwidth, the PPDU bandwidth needs to be ensured within the bandwidth supported by the device. For example, if the bandwidth supported by the device is 80 MHz, and a VRU allocated to the device is a 996-tone RU, scheduling cannot be performed in a mapping range of 160 MHz. In other words, if a VRU of 80 MHz is mapped to 160 MHz, an allocated resource cannot be scheduled.

~~{00173}~~{00174} In the foregoing mapping manner 1, that is, after the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource are input into the rows of the interleaving matrix according to the first order, sequence numbers of the plurality of subcarriers participating in mapping in the interleaving matrix are directly output in a column direction, and subcarriers in some RUs may not be more discrete. For example, in FIG. 17, after the 106-tone RU is mapped, there are still two contiguous adjacent subcarriers.

~~{00174}~~{00175} Therefore, in some embodiments, before the sequence numbers of the plurality of subcarriers participating in mapping of the interleaving matrix are output in the column direction, a row change operation may be performed on the rows of the interleaving matrix. For example, a shift operation performed on some rows in the interleaving matrix is essentially changing a row index sequence of the interleaving matrix. The example in FIG. 17 is still used. For example, a row index sequence {1, 2, 3, 4} of the interleaving matrix in FIG. 17 may be changed to {1, 3, 2, 4}, as shown in FIG. 19. It can be learned from FIG. 19 that, compared with a left diagram in FIG. 19, subcarriers included in the 106-tone RU are more discrete in a right diagram in FIG. 19. In other words, any two adjacent subcarriers included in the first PRU are noncontiguous in frequency domain. It should be understood that, that the any two adjacent subcarriers included in the first PRU are noncontiguous in frequency domain means that every two subcarriers are noncontiguous. The subcarriers included in the PRU herein include the first-type subcarrier and the second-type subcarrier.

~~{00175}~~{00176} In the foregoing embodiment, a discrete design is performed by using a single subcarrier as a granularity, that is, every two subcarriers are noncontiguous. In another implementation, a discrete granularity may also be a subcarrier group. One subcarrier group includes two or more subcarriers, every two subcarrier groups are noncontiguous, and subcarriers in the subcarrier group are contiguous.

~~{00176}~~{00177} In an example, a matrix may be constructed according to an original row index sequence of the interleaving matrix. An element in the matrix is each original row index.

Operations are performed on the matrix for a plurality of times, to change the original row index sequence to a target row index sequence. The following provides two possible change manners.

[00177][00178] Change manner 1: A first matrix is constructed according to the original row index sequence of the interleaving matrix, where a row quantity of the first matrix is 1, and a column quantity of the first matrix is greater than or equal to a row index quantity of the interleaving matrix. For example, the row index quantity of the interleaving matrix is N. If N is an odd number, the column quantity of the first matrix may be N+1. If N is an even number, the column quantity of the first matrix may be N. For example, if N=8, the row quantity of the first matrix is 1, the column quantity of the first matrix is 8, and an element in the first matrix is a row index. That is, the first matrix may be:

1	2	3	4	5	6	7	8
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[00178][00179] Transformation operations are performed on the first matrix for a plurality of times until the first matrix becomes a target matrix with N rows and one column. In this case, row indexes in the target matrix are output in a row-first-column-later order, to obtain the target row index sequence.

[00179][00180] For example, each transformation operation is performed to first divide, by column, a matrix obtained in a previous change into a first submatrix and a second submatrix, and then to move the second submatrix to a row added to the first submatrix, to form a new matrix. Then,

1	2	3	4	5	6	7	8
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[00180][00181] After row change for the first time, the first matrix may be changed to:

1	2	3	4
5	6	7	8

[00181][00182] After row change for the second time, the first matrix may be changed to:

1	2
5	6
3	4
7	8

[00182][00183] After row change for the third time, the first matrix may be changed to:

1
5

3
7
2
6
4
8

[00183][00184] Based on the change manner 1, the original row index sequence changes from {1, 2, 3, 4, 5, 6, 7, 8} to the target row index sequence {1, 5, 3, 7, 2, 6, 4, 8}. That is, when row-column transformation is performed by using the interleaving matrix, when output is performed by column, the output may not be performed according to an order of the original row index sequence, but may be performed according to an order of the target row index sequence. For example, when the sequence numbers of the plurality of subcarriers participating in mapping of the interleaving matrix are output according to the column direction, a first row of a first column is output first, then a fifth row of the first column is output, and then a third row of the first column is output, ..., until all rows of the first column are output, and then sequence numbers of a second column are output until a sequence number of an eighth row of a last column is output.

[00184][00185] In this manner, the subcarriers may be more discrete, as shown in FIG. 20. FIG. 20 shows a correspondence between the original row index sequence and the target row index sequence. In FIG. 20, a row quantity of the interleaving matrix is 8. When the first frequency-domain resource is mapped, the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource are sequentially input into the interleaving matrix according to the first order, to obtain a left diagram shown in FIG. 19. Before the sequence numbers of the subcarriers in the interleaving matrix are output in a column direction, a left diagram in FIG. 20 is changed by row, to obtain a right diagram in FIG. 20. Then, the sequence numbers of the subcarriers in the interleaving matrix are output in the column direction. It can be learned from FIG. 19 that, before the sequence numbers of the subcarriers in the interleaving matrix are output, a row transformation operation is performed on the interleaving matrix, so that the subcarriers can be more discrete.

[00185][00186] It should be understood that $N=8$ (an even number) is used as an example in the foregoing. When N is an odd number, an element in an $(N+1)^{\text{th}}$ column may be a predefined sequence number, for example, *.

[00186][00187] Similarly, if $N=16$, an original sequence number sequence is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}, and a target row index sequence {1, 9, 5, 13, 3, 11, 7, 15, 2, 10, 6,

~~{00193}~~{00194} For example, a row quantity of the second matrix is 2. If the original row index sequence is $\{1, 2, \dots, N\}$, row indexes in the original row index sequence may be sequentially input into the second matrix in a row-first-column-later order. If N is an odd number, a last row index may be represented by *. When a transformation operation is performed on the original row index sequence, row indexes corresponding to rows may be alternately output from a first column of the second matrix in ascending order of columns, and then in descending order of columns, to obtain the target row index sequence.

~~{00194}~~{00195} For example, FIG. 21 shows an example of outputting a row index sequence. A solid line in FIG. 21 indicates that row indexes corresponding to a first row and a second row are alternately output in ascending order of columns, and a dashed line in FIG. 21 indicates that row indexes corresponding to the first row and the second row are alternately output in descending order of columns.

~~{00195}~~{00196} For example, if $N=8$, a row quantity of the second matrix is 2, a column quantity is 4, and the original row index sequence is $\{1, 2, 3, 4, 5, 6, 7, 8\}$, that is, the first matrix may be:

1	2	3	4
5	6	7	8

~~{00196}~~{00197} According to the mapping manner of the row index sequence in FIG. 21, a target row index sequence $\{1, 6, 3, 8, 4, 7, 2, 5\}$ is output.

~~{00197}~~{00198} In this manner, the subcarriers may also be more discrete, as shown in FIG. 22. FIG. 22 shows a correspondence between the original row index sequence and the target row index sequence. In FIG. 22, a row quantity of the interleaving matrix is 8. When the first frequency-domain resource is mapped, the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource are sequentially input into the interleaving matrix according to the first order, to obtain a left diagram shown in FIG. 22. Before sequence numbers of the subcarriers in the interleaving matrix are output in a column direction, a left diagram in FIG. 22 is changed by row, to obtain a right diagram in FIG. 22. Then, the sequence numbers of the subcarriers in the interleaving matrix are output in the column direction. It can be learned from FIG. 22 that, before the sequence numbers of the subcarriers in the interleaving matrix are output, a row transformation operation is performed on the interleaving matrix, so that the subcarriers can be more discrete.

~~{00198}~~{00199} Similarly, if $N=16$, an original sequence number sequence is $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16\}$, and a target row index sequence $\{1, 10, 3, 12, 5, 14, 7, 16, 8, 15, 6, 13, 4, 11, 2, 9\}$ is obtained in the second change manner.

~~{00199}~~{00200} For example, the example in Table 2 is still used, that is, sequence numbers of

242 subcarriers corresponding to first 20 MHz in 80 MHz are –500 to –259, and sequence numbers of 18 pilot subcarriers in the first 20 MHz in 80 MHz are not input into the interleaving matrix. Therefore, before the sequence numbers in Table 2 are output, row index transformation may be performed on the Table 2, to obtain Table 6. It should be understood that all blank parts in the table are corresponding to subcarrier sequence numbers. For brevity, Table 6 shows only some subcarrier sequence numbers.

Table 6

—	—	—	—	—	—	—	—	—																	—
500	499	498	497	496	495	493	492	491																	471
—																									—
349																									319
—																									—
439																									410
—																								—	—
288																								260	259
—																									—
409																									380
—																									—
318																									289
—	—	—																							—
470	469	467																							441
—																									—
379																									350

[00200][00201] Sequence numbers of rows are sequentially output in a column output direction, to obtain subcarrier sequence numbers after mapping. That is, a subcarrier sequence number set {–500, –499, ..., –259} of the VRU is in a one-to-one correspondence with elements in the following sequences: {–500, –349, –439, –288, –409, –318, –470, –379, ..., –441, –350}.

[00201][00202] For another example, the example in Table 3 is still used, that is, sequence numbers of 242 subcarriers corresponding to first 20 MHz in 80 MHz are –500 to –259, and sequence numbers of 18 pilot subcarriers in the first 20 MHz in 80 MHz are input into the interleaving matrix. Therefore, before the sequence numbers in Table 3 are output, row index transformation may be performed on the Table 3, to obtain Table 7. Gray parts in Table 7 are sequence numbers of pilot subcarriers. It should be understood that all blank parts in the table are

corresponding to subcarrier sequence numbers. For brevity, Table 7 shows only some subcarrier sequence numbers.

Table 7

[illegible]

5 ~~{00202}~~[00203] Sequence numbers of rows are sequentially output in a column output direction, to obtain subcarrier sequence numbers after mapping. That is, a subcarrier sequence number set $\{-500, -499, \dots, -259\}$ of the VRU is in a one-to-one correspondence with elements in the following sequences: $\{-500, -340, -436, -276, -404, -308, -468, -372, \dots, -437, -341\}$.

[00203][00204] It should be noted that the foregoing two transformation methods of the row index may be applied to any size of row transformation of the interleaving matrix from the VRU to the PRU. For example, an interleaving matrix with a fixed row quantity, for example, 4 rows, 8 rows, or 16 rows, may also be an interleaving matrix with a fixed column quantity. Because a minimum RU is an RU of 26 subcarriers, a column quantity of the interleaving matrix may be 26 (without considering the subcarrier, the column quantity may even be 24), and a row quantity may be determined based on a total input size, and then discreteness is performed through row transformation. In conclusion, an example of eight rows in this embodiment is merely an example, and may be actually an interleaver with a fixed row quantity, an interleaver with a fixed column quantity, an interleaver with a variable row and column quantity, or the like.

~~[00204]~~[00205] Mapping manner 2: The mapping relationship between the VRU and the PRU is a mapping relationship table between a sequence number of each subcarrier included in the VRU and a sequence number of each subcarrier included in the PRU. That is, the AP may map a first frequency-domain resource based on the mapping relationship table. For example, a subcarrier 1 in the VRU corresponds to a subcarrier 5 in the PRU, and a subcarrier 2 in the VRU corresponds to a subcarrier 8 in the PRU. In this mapping manner, the STA can determine a location of each subcarrier in the PRU in a corresponding first frequency-domain resource only by searching the

mapping relationship table, which is simple.

~~{00205}~~**[00206]** For example, the mapping relationship table may be the foregoing Table 2 to Table 7. In a broad sense, the mapping relationship table may be considered as sequence number sequences obtained through outputting by column in Table 2 to Table 7.

5 ~~{00206}~~**[00207]** It should be noted that a specific implementation form of the mapping relationship between the VRU and the PRU is not limited in this embodiment of this application. For example, the mapping relationship may be the foregoing interleaving matrix (also considered as a mapping matrix), or may be the foregoing mapping relationship table. In some embodiments, the mapping relationship between the VRU and the PRU may also be a mapping formula, for

10 example, $i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor$, where

N_{ROW} is a row quantity of the matrix, N_{COL} is a column quantity of the matrix, k is a sequence number of a subcarrier that is input into the matrix, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the matrix.

~~{00207}~~**[00208]** An embodiment of this application further provides a resource mapping method.

15 The resource mapping method may be implemented by a communication apparatus, for example, an interleaver or a chip disposed in the interleaver.

~~{00208}~~**[00209]** In an example, the interleaver may be configured to map a sequence number of a subcarrier of the first VRU to a sequence number of a subcarrier of the first PRU based on the interleaving matrix. For example, a sequence number i of a subcarrier of the first PRU mapped from a subcarrier with a sequence number k of the first VRU based on the interleaver satisfies the

20 following formula: $i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor$. N_{ROW} is a row quantity of the interleaver,

N_{COL} is a column quantity of the interleaver, k is a sequence number of a subcarrier that is input into the interleaver, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaver. For specific implementation of the interleaver, refer to the implementation of the interleaving matrix in the foregoing method embodiment. Details are not described herein again. In addition, for a specific implementation in which the interleaver maps the VRU to the PRU, refer to related content in the mapping manner 1 and the mapping manner 2. Details are not described herein again.

25 ~~{00209}~~**[00210]** It should be noted that an interleaving level of the interleaver is not limited in this embodiment of this application. For example, directly outputting the sequence numbers of the plurality of subcarriers in a row-in-column-out manner may be considered as first-level interleaving, and outputting the sequence numbers of the plurality of subcarriers in a row-in-column-out manner as shown in the foregoing change manner 1 or change manner 2 may be

considered as second-level interleaving.

~~{00210}~~{00211} The resource allocation method provided in this embodiment of this application is essentially a mapping manner from a VRU to a PRU. In the mapping manner, a contiguous VRU may be mapped to a discrete PRU. Based on this mapping manner, a transmit end may notify a receive end that an RU allocated to the receive end is a VRU, but the transmit end sends data on the discrete PRU to which the contiguous VRU is mapped. Because the contiguous VRU is mapped to the discrete PRU, it is equivalent to reducing a quantity of subcarriers in each MHz, so that the transmit end can support higher transmit power. In addition, the transmit end may use a resource allocation manner in which a bandwidth is divided into several resource units, and there is no need to define a plurality of distributed RUs or care about how to select and allocate the distributed RU, so that maximum transmit power of a device can be increased.

~~{00211}~~{00212} In the foregoing embodiments provided in this application, the methods provided in embodiments of this application are separately described from a perspective of interaction between the first device and the second device. To implement functions in the foregoing methods provided in embodiments of this application, the first device and the second device may include a hardware structure and/or a software module, and implement the foregoing functions in a form of the hardware structure, the software module, or a combination of the hardware structure and the software module. Whether a function in the foregoing functions is performed by using the hardware structure, the software module, or the combination of the hardware structure and the software module depends on particular applications and design constraints of the technical solutions.

~~{00212}~~{00213} The following describes, with reference to the accompanying drawings, a communication apparatus for implementing the foregoing method in embodiments of this application. Therefore, all the foregoing content may be used in the following embodiments. Repeated content is not described again.

~~{00213}~~{00214} FIG. 23 is a schematic block diagram of a communication apparatus 2300 according to an embodiment of this application. The communication apparatus 2300 may correspondingly implement functions or steps implemented by the first device or the second device in the foregoing method embodiments. The communication apparatus may include a processing module 2310 and a transceiver module 2320. Optionally, the communication apparatus may further include a storage unit. The storage unit may be configured to store instructions (code or a program) and/or data. The processing module 2310 and the transceiver module 2320 may be coupled to the storage unit. For example, the processing module 2310 may read the instructions (code or program) and/or data in the storage unit, to implement a corresponding method. The foregoing units may be independently disposed, or may be partially or completely integrated.

~~{00214}~~{00215} In some possible implementations, the communication apparatus 2300 can correspondingly implement behavior and functions of the first device in the method embodiment. For example, the communication apparatus 2300 may be an AP, or may be a component (for example, a chip or a circuit) used in the AP. The transceiver module 2320 may be configured to perform all receiving or sending operations performed by the first device in the embodiment shown in FIG 9, for example, S901 and S903 in the embodiment shown in FIG. 9, and/or another process used to support the technology described in this specification. The processing module 2310 is configured to perform all operations other than the receiving or sending operations performed by the first device in the embodiment shown in FIG. 9, for example, S902 in the embodiment shown in FIG. 9, and/or another process used to support the technology described in this specification.

~~{00215}~~{00216} For example, the transceiver module 2320 is configured to send resource allocation information to a second device, where the resource allocation information indicates a first virtual resource unit VRU, and the first VRU includes a plurality of contiguous subcarriers in frequency domain; the processing module 2310 is configured to map the first VRU to a first physical resource unit PRU based on a mapping relationship between a VRU and a PRU, where a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain; and the transceiver module 2320 is further configured to transmit data on the first PRU.

~~{00216}~~{00217} In some possible implementations, the communication apparatus 2300 can correspondingly implement behavior and functions of the second device in the method embodiment. For example, the communication apparatus 2300 may be a STA or an AP, or may be a component (for example, a chip or a circuit) used in the STA or the AP. The transceiver module 2320 may be configured to perform all receiving or sending operations performed by the second device in the embodiment shown in FIG 9, for example, S901 and S903 in the embodiment shown in FIG. 9, and/or another process used to support the technology described in this specification. The processing module 2310 is configured to perform operations other than the receiving or sending operation performed by the second device in the embodiment shown in FIG. 9, for example, S902 in the embodiment shown in FIG. 9, and/or another process used to support the technology described in this specification.

~~{00217}~~{00218} For example, the transceiver module 2320 is configured to receive resource allocation information from a first device, where the resource allocation information indicates a first VRU, and the first VRU includes a plurality of contiguous subcarriers in frequency domain; the processing module 2310 is configured to determine, based on a mapping relationship between a VRU and a physical resource unit PRU, a first PRU corresponding to the first VRU, where a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain; and the transceiver module 2320 is configured to receive data from the first device on the first PRU.

~~{00218}~~{00219} In some possible implementations, the communication apparatus 2300 can correspondingly implement behavior and functions of the interleaver in the method embodiment. For example, the communication apparatus 2300 may be an interleaver, or may be a component (for example, a chip or a circuit) used in the interleaver. The transceiver module 2320 may be configured to perform all receiving or sending operations performed by the interleaver in this embodiment of this application. The processing module 2310 is configured to perform all operations other than the receiving or sending operations performed by the interleaver in this embodiment of this application.

~~{00219}~~{00220} For example, the processing module 2310 is configured to map a sequence number of a subcarrier of a first VRU to a sequence number of a subcarrier of a first PRU based on an interleaving matrix, where the first VRU includes a plurality of contiguous subcarriers in frequency domain, and a plurality of subcarriers included in the first PRU are noncontiguous in frequency domain; and the transceiver module 2320 is configured to output the sequence number of the subcarrier of the first PRU.

~~{00220}~~{00221} In a possible implementation of the communication apparatus 2300, a sequence number i of a subcarrier of the first PRU mapped from a subcarrier with a sequence number k of the first VRU based on the interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ where}$$

N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaving matrix.

~~{00221}~~{00222} In a possible implementation of the communication apparatus 2300, any adjacent subcarriers included in the first PRU are noncontiguous in frequency domain.

~~{00222}~~{00223} In a possible implementation of the communication apparatus 2300, before a sequence number of each subcarrier included in the interleaving matrix is output, an original row index sequence of the interleaving matrix is changed to a target row index sequence; and

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8}, and the target row index sequence is {1, 5, 3, 7, 2, 6, 4, 8} or {1, 6, 3, 8, 4, 7, 2, 5}; or

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}, and the target row index sequence is {1, 9, 5, 13, 3, 11, 7, 15, 2, 10, 6, 14, 4, 12, 8, 16}, or {1, 10, 3, 12, 5, 14, 7, 16, 8, 15, 6, 13, 4, 11, 2, 9}.

~~{00223}~~{00224} In a possible implementation of the communication apparatus 2300, that the communication apparatus 2300 maps the first VRU to the first PRU includes:

sequentially inputting, into rows of the interleaving matrix according to a first order, sequence numbers of a plurality of subcarriers included in a first frequency-domain resource in which the first VRU is located, and outputting sequence numbers of the subcarriers in the interleaving matrix according to a column direction of the interleaving matrix, where the first order is an ascending order, or the first order is a descending order.

~~{00224}~~{00225} In a possible implementation of the communication apparatus 2300, in the plurality of subcarriers included in the first frequency-domain resource, subcarriers that are input into the interleaving matrix are first-type subcarriers, or subcarriers that are input into the interleaving matrix are first-type subcarriers and a second-type subcarrier, the first-type subcarrier is used to carry data, and the second-type subcarrier includes one or more of a null subcarrier, a direct current subcarrier, a guard subcarrier, and a pilot subcarrier; and

sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of the first-type subcarriers in the plurality of subcarriers included in the first frequency-domain resource;

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the first preset sequence number; or

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers included in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, ~~a sequence number of the first preset sequence number is located at a preset location of the interleaving matrix,~~ and the sequence numbers of the subcarriers output from the interleaving matrix do not include the first preset sequence number.

~~{00225}~~{00226} In a possible implementation of the communication apparatus 2300, the second-type subcarrier is a pilot subcarrier, and the pilot subcarrier is a maximum pilot subcarrier set of a 26-tone RU in the first frequency-domain resource.

~~{00226}~~{00227} In a possible implementation of the communication apparatus 2300, a quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers included in the first frequency-domain resource is less than a quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix; and

the sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of subcarriers that are in the first frequency-domain resource and that are to be input into the interleaving matrix and a sequence number of a padding subcarrier, the sequence

number of the padding subcarrier is located in a preset location of the interleaving matrix, each sequence number of the padding subcarrier is a second preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not include the second preset sequence number.

5 ~~{00227}~~**[00228]** In a possible implementation of the communication apparatus 2300, a quantity of the plurality of subcarriers included in the first frequency-domain resource is determined based on a maximum bandwidth supported by the first device.

~~{00228}~~**[00229]** In a possible implementation of the communication apparatus 2300, the first VRU is mapped to the first PRU based on a mapping relationship between a sequence number of
10 each subcarrier included in the first VRU and a sequence number of each subcarrier included in the first PRU.

~~{00229}~~**[00230]** In a possible implementation of the communication apparatus 2300, the sequence numbers of the subcarriers included in the first frequency-domain resource start from 0 or 1;

the sequence numbers of the subcarriers included in the first frequency-domain
15 resource are subcarrier numbers in actual frequency bands corresponding to the subcarriers; or

the sequence numbers of the subcarriers included in the first frequency-domain resource are preset sequence numbers plus a preset offset value.

~~{00230}~~**[00231]** In a possible implementation of the communication apparatus 2300, the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, and the
20 sequence numbers of the subcarriers corresponding to the first PRU are located in the first set;

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a second set, and there is no intersection between the first set and the second set, or a part of sequence numbers in the first set are the same as those in the second set are the same; or

25 the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a plurality of second sets, there is no intersection between the plurality of second sets, and there is no intersection between the first set and the plurality of second sets, or there is an intersection between the first set and a part of the plurality of second sets.

30 ~~{00231}~~**[00232]** It should be understood that in this embodiment of this application, the processing module 2310 may be implemented by a processor or a processor-related circuit component, and the transceiver module 2320 may be implemented by a transceiver, a transceiver-related circuit component, or a communication interface.

~~{00232}~~**[00233]** FIG. 24 shows a communication apparatus 2400 according to an embodiment of
35 this application. The communication apparatus 2400 may be an AP, a STA, or an interleaver, and

can implement functions of the first device, the second device, or the interleaver in the methods provided in embodiments of this application. Alternatively, the communication apparatus 2400 may be an apparatus that can support the first device to implement a corresponding function in the methods provided in embodiments of this application, an apparatus that can support the second device to implement a corresponding function in the methods provided in embodiments of this application, or an apparatus that can support the interleaver to implement a corresponding function in the methods provided in embodiments of this application. The communication apparatus 2400 may be a chip or a chip system. In this embodiment of this application, the chip system may include a chip, or may include a chip and another discrete component.

~~{00233}~~{00234} In hardware implementation, the transceiver module 2320 may be a transceiver 2410.

~~{00234}~~{00235} The communication apparatus 2400 includes at least one processor 2420, configured to implement or support the communication apparatus 2400 to implement functions of the first device or the second device in the methods provided in embodiments of this application, for example, generating the foregoing PPDU. The communication apparatus 2400 may further include at least one memory 2430, configured to store program instructions and/or data. The memory 2430 is coupled to the processor 2420. The coupling in this embodiment of this application may be an indirect coupling or a communication connection between apparatuses, units, or modules in an electrical form, a mechanical form, or another form, and is used for information exchange between the apparatuses, the units, or the modules. The processor 2420 may collaborate with the memory 2430. The processor 2420 may execute the program instructions and/or the data stored in the memory 2430, to enable the communication apparatus 2400 to implement a corresponding method. At least one of the at least one memory may be located in the processor.

~~{00235}~~{00236} The communication apparatus 2400 may further include the transceiver 2410, configured to communicate with another device by using a transmission medium, so that an apparatus in the communication apparatus 2400 may communicate with the another device. For example, when the communication apparatus is a terminal, the another device is a network device. Alternatively, when the communication apparatus is a network device, the another device is a terminal. The processor 2420 may send and receive data by using the transceiver 2410. The transceiver 2410 may be specifically a transceiver. The communication apparatus 2400 may further include a radio frequency unit. The radio frequency unit may be independent of the communication apparatus 2400, or may be integrated into the communication apparatus 2400. Certainly, the transceiver 2410 may further include an antenna, for example, a remote antenna independent of the communication apparatus 2400, or an antenna integrated into the communication apparatus 2400.

~~{00236}~~{00237} A specific connection medium between the transceiver 2410, the processor 2420, and the memory 2430 is not limited in this embodiment of this application. In this embodiment of this application, the memory 2430, the processor 2420, and the transceiver 2410 are connected through a bus 2440 in FIG. 24. The bus is represented by using a thick line in FIG. 24. A manner of connection between other components is merely an example for description, and imposes no limitation. The bus may be classified into an address bus, a data bus, a control bus, and the like. For ease of expression, the bus is indicated by only a bold line in FIG. 24, which does not mean that only one bus or one type of bus exists.

~~{00237}~~{00238} In embodiments of this application, the processor 2420 may be a general-purpose processor, a digital signal processor, an application-specific integrated circuit, a field programmable gate array or another programmable logic device, a discrete gate or transistor logic device, or a discrete hardware component, and may implement or execute the methods, steps, and logical block diagrams disclosed in embodiments of this application. The general purpose processor may be a microprocessor or any conventional processor or the like. The steps of the method disclosed with reference to embodiments of this application may be directly performed by a hardware processor, or may be performed by using a combination of hardware in the processor and a software module.

~~{00238}~~{00239} In embodiments of this application, the memory 2430 may be a nonvolatile memory, a hard disk drive (hard disk drive, HDD) or a solid-state drive (solid-state drive, SSD), or may be a volatile memory (volatile memory), for example, a random access memory (random access memory, RAM). The memory is any other medium that can carry or store expected program code in a form of an instruction or a data structure and that can be accessed by a computer, but is not limited thereto. The memory in embodiments of this application may alternatively be a circuit or any other apparatus that can implement a storage function, and is configured to store the program instructions and/or the data.

~~{00239}~~{00240} It should be noted that the communication apparatus in the foregoing embodiments may be a terminal, a circuit, a chip used in the terminal, or another combined component, component, or the like that has a function of the terminal. When the communication apparatus is the terminal, the transceiver module may be a transceiver, and may include an antenna, a radio frequency circuit, and the like. The processing module may be a processor, for example, a central processing module (central processing unit, CPU). When the communication apparatus is a component having a function of the terminal, the transceiver module may be a radio frequency unit, and the processing module may be a processor. When the communication apparatus is the chip or a chip system, the transceiver module may be an input/output interface of the chip or the chip system, and the processing module may be a processor of the chip or the chip system.

~~{00240}~~{00241} As a possible product form, the AP or the STA described in this embodiment of this application may further be implemented by using the following components: one or more FPGAs (field programmable gate arrays), a PLD (programmable logic device), a controller, a state machine, gate logic, a discrete hardware component, any other suitable circuit, or any combination of circuits that can perform various functions described in this application.

~~{00241}~~{00242} The first device in embodiments of this application may be an AP or a STA. The second device may be an AP or a STA. It should be understood that the APs in various product forms have any function of the AP in the foregoing method embodiments. Details are not described herein again. The STAs in various forms have any function of the STA in the foregoing method embodiments. Details are not described herein again.

~~{00242}~~{00243} An embodiment of this application further provides a communication system. Specifically, the communication system includes a second device and a first device, or may further include more first devices and second devices. For example, the communication system includes a second device and a first device that are configured to implement related functions in FIG. 9.

~~{00243}~~{00244} The first device is configured to implement functions related to the first device in FIG. 9. The second device is configured to implement functions related to the second device in FIG. 9. For example, the second device may perform S902 and S903 in the embodiment shown in FIG. 9, and the first device may perform S901 and S902 in the embodiment shown in FIG. 9.

~~{00244}~~{00245} An embodiment of this application further provides a computer-readable storage medium, including instructions. When the instructions are run on a computer, the computer is enabled to perform the method performed by the first device or the second device in FIG. 9.

~~{00245}~~{00246} An embodiment of this application further provides a computer program product, including computer program code. When the computer program code is run on a computer, the computer is enabled to perform the method performed by the first device or the second device in FIG. 9.

~~{00246}~~{00247} An embodiment of this application provides a chip system. The chip system includes a processor, may further include a memory, and is configured to implement the function of the first device or the second device in the foregoing methods. The chip system may include a chip, or may include a chip and another discrete component.

~~{00247}~~{00248} An embodiment of this application further provides a communication apparatus, including a processor and an interface. The processor is configured to perform the resource allocation method or the resource mapping method in any one of the foregoing method embodiments.

~~{00248}~~{00249} It should be understood that the communication apparatus may be a chip. The processor may be implemented by hardware, or may be implemented by software. When the

processor is implemented by the hardware, the processor may be a logic circuit, an integrated circuit, or the like. When the processor is implemented by the software, the processor may be a general-purpose processor. The general-purpose processor is implemented by reading software code stored in a memory. The memory may be integrated into the processor, or may be located outside the processor and exist independently.

~~{00249}~~{00250} It should be understood that the terms "system" and "network" may be used interchangeably in embodiments of this application. "At least one" means one or more, and "a plurality of" means two or more. The term "and/or" describes an association relationship between associated objects, and represents that three relationships may exist. For example, A and/or B may represent the following cases: Only A exists, both A and B exist, and only B exists, where A and B may be singular or plural. The character "/" generally indicates an "or" relationship between the associated objects. "At least one of the following items (pieces)" or a similar expression thereof refers to any combination of these items, including any combination of singular items (pieces) or plural items (pieces). For example, at least one of a, b, or c may represent: a, b, c, a and b, a and c, b and c, or a, b, and c, where a, b, and c may be singular or plural.

~~{00250}~~{00251} In addition, unless otherwise stated, ordinal numbers such as "first" and "second" in embodiments of this application are for distinguishing between a plurality of objects, but are not intended to limit an order, a time sequence, priorities, or importance of the plurality of objects. For example, first information and second information are merely used to distinguish between different indication information, and do not indicate different priorities, importance, or the like of the two types of information.

~~{00251}~~{00252} It should be understood that sequence numbers of the foregoing processes do not mean execution sequences in various embodiments of this application. The execution sequences of the processes should be determined according to functions and internal logic of the processes, and should not be construed as any limitation on the implementation processes of embodiments of this application.

~~{00252}~~{00253} In addition, the term "for example" in embodiments of this application is used to represent an example or a description. Any embodiment or implementation solution described as an "example" in embodiments of this application should not be explained as being more preferred than another embodiment or implementation solution. That is, using the word "example" is intended to describe a concept in a specific manner.

~~{00253}~~{00254} All or some of the methods in embodiments of this application may be implemented by using software, hardware, firmware, or any combination thereof. When software is used to implement embodiments, all or a part of embodiments may be implemented in a form of a computer program product. The computer program product includes one or more computer

instructions. When the computer program instructions are loaded and executed on the computer, the procedure or functions according to embodiments of the present invention are all or partially generated. The computer may be a general-purpose computer, a dedicated computer, a computer network, a network device, user equipment, or another programmable apparatus. The computer instructions may be stored in a computer-readable storage medium or may be transmitted from a computer-readable storage medium to another computer-readable storage medium. For example, the computer instructions may be transmitted from a website, computer, server, or data center to another website, computer, server, or data center in a wired (for example, a coaxial cable, an optical fiber, or a digital subscriber line (digital subscriber line, DSL for short)) or wireless (for example, infrared, radio, or microwave) manner. The computer-readable storage medium may be any usable medium accessible by the computer, or a data storage device such as a server or a data center, integrating one or more usable media. The usable medium may be a magnetic medium (for example, a floppy disk, a hard disk, or a magnetic tape), an optical medium (for example, a digital video disc (digital video disc, DVD for short)), a semiconductor medium (for example, an SSD), or the like.

~~[00254]~~[00255] The foregoing descriptions are merely specific implementations of this application, but are not intended to limit the protection scope of this application. Any variation or replacement readily figured out by a person skilled in the art within the technical scope disclosed in this application shall fall within the protection scope of this application. Therefore, the protection scope of this application shall be subject to the protection scope of the claims.

Appendix 1: Data and pilot subcarrier indices for RUs in a 20 MHz EHT PPDU (Data and pilot subcarrier indices for RUs in a 20 MHz EHT PPDU)

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
26-tone RU	RU 1 [−121: −96]	RU 2 [−95: −70]	RU 3 [−68: −43]	RU 4 [−42: −17]	RU 5 [−16: −4, 4: 16]
	RU 6 [17: 42]	RU 7 [43: 68]	RU 8 [70: 95]	RU 9 [96: 121]	
52-tone RU	RU 1	RU 2	RU 3	RU 4	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[-121: -70]	[-68: -17]	[17: 68]	[70: 121]	
106-tone RU	RU 1 [-122: -17]		RU 2 [17: 122]		
242-tone RU	RU 1 [-122: -2, 2:122]				

Appendix 2: Data and pilot subcarrier indices for RUs in a 40 MHz EHT PPDU (Data and pilot subcarrier indices for RUs in a 40 MHz EHT PPDU)

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
26-tone RU	RU 1 [−243: −218]	RU 2 [−217: −192]	RU 3 [−189: −164]	RU 4 [−163: −138]	RU 5 [−136: −111]
	RU 6 [−109: −84]_	RU 7 [−83: −58]	RU 8 [−55: −30]	RU 9 [−29: −4]	
	RU 10 [4: 29]	RU 11 [30: 55]	RU 12 [58: 83]	RU 13 [84: 109]	RU 14 [111: 136]
	RU 15 [138: 163]	RU 16 [164: 189]	RU 17 [192: 217]	RU 18 [218: 243]	
52-tone RU	RU 1 [−243: −192]	RU 2 [−189: −138]	RU 3 [−109: −58]	RU 4 [−55: −4]	
	RU 5 [4: 55]	RU 6 [58: 109]	RU 7 [138: 189]	RU 8 [192: 243]	
106-tone RU	RU 1 [−243: −138]	RU 2 [−109: −4]	RU 3 [4: 109]	RU 4 [138: 243]	
242-tone RU	RU 1 [−244: −3]_		RU 2 [3: 244]		
484-tone RU	RU 1				

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)	
	[−244: −3, 3: 244]_	

Appendix 3: Data and pilot subcarrier indices for RUs in an 80 MHz EHT PPDU (Data and pilot subcarrier indices for RUs in an 80 MHz EHT PPDU)

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
26-tone RU	RU 1 [−499: −474]	RU 2 [−473: −448]	RU 3 [−445: −420]	RU 4 [−419: −394]	RU 5 [−392: −367]
	RU 6 [−365: −340]	RU 7 [−339: −314]	RU 8 [−311: −286]	RU 9 [−285: −260]	
	RU 10 [−252: −227]	RU 11 [−226: −201]	RU 12 [−198: −173]	RU 13 [−172: −147]	RU 14 [−145: −120]
	RU 15 [−118: −93]	RU 16 [−92: −67]	RU 17 [−64: −39]	RU 18 [−38: −13]	RU 19 [not defined]
	RU 20 [13: 38]	RU 21 [39: 64]	RU 22 [67: 92]	RU 23 [93: 118]	RU 24 [120: 145]
	RU 25 [147: 172]	RU 26 [173: 198]	RU 27 [201: 226]	RU 28 [227: 252]	
	RU 29 [260: 285]	RU 30 [286: 311]	RU 31 [314: 339]	RU 32 [340: 365]	RU 33 [367: 392]
	RU 34 [394: 419]	RU 35 [420: 445]	RU 36 [448: 473]	RU 37 [474: 499]	
52-tone RU	RU 1 [−499: −448]	RU 2 [−445: −394]	RU3 [−365: −314]	RU 4 [−311: −260]	
	RU 5 [−252: −201]_	RU 6 [−198: −147]	RU 7 [−118: −67]	RU 8 [−64: −13]	
	RU 9 [13: 64]	RU 10 [67: 118]	RU 11 [147: 198]	RU 12 [201: 252]	
	RU 13	RU 14	RU 15	RU 16	—

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[260: 311]	[314: 365]	[394: 445]	[448: 499]	
106-tone RU	RU 1 [−499: −394]	RU 2 [−365: −260]	RU 3 [−252: −147]	RU 4 [−118: −13]	
	RU 5 [13: 118]	RU 6 [147: 252]	RU 7 [260: 365]	RU 8 [394: 499]	
242-tone RU	RU 1 [−500: −259]	RU 2 [−253: −12]	RU 3 [12: 253]	RU 4 [259: 500]	
484-tone RU	RU 1 [−500: −259, −253: −12]	RU 2 [12: 253, 259: 500]			
996-tone RU	RU 1 [−500: −3, 3: 500]				

Appendix 4: Data and pilot subcarrier indices for RUs in a 160 MHz EHT PPDU (Data and pilot subcarrier indices for RUs in a 160 MHz EHT PPDU)

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
26-tone RU	RU 1 [−1011: −986]	RU 2 [−985: −960]	RU 3 [−957: −932]	RU 4 [−931: −906]	RU 5 [−904: −879]
	RU 6 [−877: −852]	RU 7 [−851: −826]	RU 8 [−823: −798]	RU 9 [−797: −772]	
	RU 10 [−764: −739]	RU 11 [−738: −713]	RU 12 [−710: −685]	RU 13 [−684: −659]	RU 14 [−657: −632]
	RU 15 [−630: −605]	RU 16 [−604: −579]	RU 17 [−576: −551]	RU 18 [−550: −525]	RU 19 [not defined]
	RU 20 [−499: −474]	RU 21 [−473: −448]	RU 22 [−445: −420]	RU 23 [−419: −394]	RU 24 [−392: −367]
	RU 25	RU 26	RU 27	RU 28	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[−365: −340]	[−339: −314]	[−311: −286]	[−285: −260]	
	RU 29 [−252: −227]	RU 30 [−226: −201]	RU 31 [−198: −173]	RU 32 [−172: −147]	RU 33 [−145: −120]
	RU 34 [−118: −93]	RU 35 [−92: −67]	RU 36 [−64: −39]	RU 37 [−38: −13]	
	RU 38 [13: 38]	RU 39 [39: 64]	RU 40 [67: 92]	RU 41 [93: 118]	RU 42 [120: 145]
	RU 43 [147: 172]	RU 44 [173: 198]	RU 45 [201: 226]	RU 46 [227: 252]	
	RU 47 [260: 285]	RU 48 [286: 311]	RU 49 [314: 339]	RU 50 [340: 365]	RU 51 [367: 392]
	RU 52 [394: 419]	RU 53 [420: 445]	RU 54 [448: 473]	RU 55 [474: 499]	RU 56 [not defined]
	RU 57 [525: 550]	RU 58 [551: 576]	RU 59 [579: 604]	RU 60 [605: 630]	RU 61 [632: 657]
	RU 62 [659: 684]	RU 63 [685: 710]	RU 64 [713: 738]	RU 65 [739: 764]	
	RU 66 [772: 797]	RU 67 [798: 823]	RU 68 [826: 851]	RU 69 [852: 877]	RU 70 [879: 904]
	RU 71 [906: 931]	RU 72 [932: 957]	RU 73 [960: 985]	RU 74 [986: 1011]	
52-tone RU	RU 1_ [−1011: −960]	RU 2 [−957: −906]	RU 3 [−877: −826]	RU 4 [−823: −772]	
	RU 5 [−764: −713]	RU 6 [−710: −659]	RU 7 [−630: −579]	RU 8 [−576: −525]	
	RU 9 [−499: −448]	RU 10 [−445: −394]	RU 11 [−365: −314]	RU 12 [−311: −260]	
	RU 13 [−252: −201]	RU 14 [−198: −147]	RU 15 [−118: −67]	RU 16 [−64: −13]	
	RU 17	RU 18	RU 19	RU 20	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[13: 64]	[67: 118]	[147: 198]	[201: 252]	
	RU 21 [260: 311]	RU 22 [314: 365]	RU 23 [394: 445]	RU 24 [448: 499]	
	RU 25 [525: 576]	RU 26 [579: 630]	RU 27 [659: 710]	RU 28 [713: 764]	
	RU 29 [772: 823]	RU 30 [826: 877]	RU 31 [906: 957]	RU 32 [960: 1011]	
106-tone RU	RU 1_ [−1011: −906]	RU 2 [−877: −772]	RU 3 [−764: −659]	RU 4 [−630: −525]	
	RU 5 [−499: −394]	RU 6 [−365: −260]	RU 7 [−252: −147]	RU 8 [−118: −13]	
	RU 9 [13: 118]	RU 10 [147: 252]	RU 11 [260: 365]	RU 12 [394: 499]	
	RU 13 [525: 630]	RU 14 [659: 764]	RU 15 [772: 877]	RU 16 [906: 1011]	
242-tone RU	RU 1 [−1012: −771]	RU 2 [−765: −524]	RU 3 [−500: −259]	RU 4 [−253: −12]	
	RU 5 [12: 253]	RU 6 [259: 500]	RU 7 [524: 765]	RU 8 [771: 1012]	
484-tone RU	RU 1_ [−1012: −771, −765: −524]	RU 2 [−500: −259, −253: −12]	RU 3 [12: 253, 259: 500]	RU 4 [524: 765, 771: 1012]	
996-tone RU	RU 1 [−1012: −515, −509: −12]	RU 2 [12: 509, 515: 1012]			
2x996-tone RU	RU 1_ [−1012: −515, −509: −12, 12: 509, 515: 1012]				

Appendix 5: Data and pilot subcarrier indices for RUs in a 320 MHz EHT PPDU (Data and pilot subcarrier indices for RUs in a 320 MHz EHT PPDU)

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
26-tone RU	RU 1_ [−2035: −2010]	RU 2_ [−2009: −1984]	RU 3 [−1981: −1956]	RU 4 [−1955: −1930]	RU 5 [−1928: −1903]
	RU 6 [−1901: −1876]	RU 7 [−1875: −1850]	RU 8 [−1847: −1822]	RU 9 [−1821: −1796]	
	RU 10 [−1788: −1763]	RU 11 [−1762: −1737]	RU 12 [−1734: −1709]	RU 13 [−1708: −1683]	RU 14 [−1681: −1656]
	RU 15 [−1654: −1629]	RU 16 [−1628: −1603]	RU 17 [−1600: −1575]	RU 18 [−1574: −1549]	RU 19 [not defined]
	RU 20 [−1523: −1498]	RU 21 [−1497: −1472]	RU 22 [−1469: −1444]	RU 23 [−1443: −1418]	RU 24 [−1416: −1391]
	RU 25 [−1389: −1364]	RU 26 [−1363: −1338]	RU 27 [−1335: −1310]	RU 28 [−1309: −1284]	
	RU 29_ [−1276: −1251]	RU 30 [−1250: −1225]	RU 31 [−1222: −1197]	RU 32 [−1196: −1171]	RU 33 [−1169: −1144]
	RU 34 [−1142: −1117]	RU 35 [−1116: −1091]	RU 36 [−1088: −1063]	RU 37 [−1062: −1037]	
	RU 38 [−1011: −986]	RU 39 [−985: −960]	RU 40 [−957: −932]	RU 41 [−931: −906]	RU 42 [−904: −879]
	RU 43 [−877: −852]	RU 44 [−851: −826]	RU 45 [−823: −798]	RU 46 [−797: −772]	
	RU 47 [−764: −739]	RU 48 [−738: −713]	RU 49 [−710: −685]	RU 50 [−684: −659]	RU 51 [−657: −632]
	RU 52 [−630: −605]	RU 53 [−604: −579]	RU 54 [−576: −551]	RU 55 [−550: −525]	RU 56 [not defined]
	RU 57 [−499: −474]	RU 58_ [−473: −448]	RU 59 [−445: −420]	RU 60 [−419: −394]	RU 61 [−392: −367]
	RU 62	RU 63	RU 64	RU 65	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[−365: −340]	[−339: −314]	[−311: −286]	[−285: −260]	
	RU 66 [−252: −227]	RU 67 [−226: −201]	RU 68_ [−198: −173]	RU 69 [−172: −147]	RU 70 [−145: −120]
	RU 71 [−118: −93]	RU 72 [−92: −67]	RU 73 [−64: −39]	RU 74 [−38: −13]	
	RU 75 [13: 38]	RU 76 [39: 64]	RU 77 [67: 92]	RU 78 [93: 118]	RU 79 [120: 145]
	RU 80 [147: 172]	RU 81 [173: 198]	RU 82 [201: 226]	RU 83 [227: 252]	
	RU 84 [260: 285]	RU 85 [286: 311]	RU 86 [314: 339]	RU 87 [340: 365]	RU 88 [367: 392]
	RU 89 [394: 419]	RU 90 [420: 445]	RU 91 [448: 473]	RU 92 [474: 499]	RU 93 [not defined]
	RU 94 [525: 550]	RU 95 [551: 576]	RU 96 [579: 604]	RU 97 [605: 630]	RU 98 [632: 657]

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
26-tone RU	RU 99 [659: 684]	RU 100 [685: 710]	RU 101 [713: 738]	RU 102 [739: 764]	
	RU 103 [772: 797]	RU 104_ [798: 823]	RU 105 [826: 851]	RU 106 [852: 877]	RU 107 [879: 904]
	RU 108 [906: 931]	RU 109 [932: 957]	RU 110 [960: 985]	RU 111 [986: 1011]	
	RU 112 [1037: 1062]	RU 113_ [1063: 1088]	RU 114 [1091: 1116]	RU 115 [1117: 1142]	RU 116 [1144: 1169]
	RU 117 [1171: 1196]	RU 118 [1197: 1222]	RU 119 [1225: 1250]	RU 120 [1251: 1276]	
	RU 121	RU 122_ 	RU 123	RU 124	RU 125

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[1284: 1309]	[1310: 1335]	[1338: 1363]	[1364: 1389]	[1391: 1416]
	RU 126 [1418: 1443]	RU 127 [1444: 1469]	RU 128 [1472: 1497]	RU 129 [1498: 1523]	RU 130 [not defined]
	RU 131 [1549: 1574]	RU 132 [1575: 1600]	RU 133 [1603: 1628]	RU 134 [1629: 1654]	RU 135 [1656: 1681]
	RU 136 [1683: 1708]	RU 137 [1709: 1734]	RU 138 [1737: 1762]	RU 139 [1763: 1788]	
	RU 140 [1796: 1821]	RU 141 [1822: 1847]	RU 142 [1850: 1875]	RU 143 [1876: 1901]	RU 144 [1903: 1928]
	RU 145 [1930: 1955]	RU 146 [1956: 1981]	RU 147 [1984: 2009]	RU 148 [2010: 2035]	
52-tone RU	RU 1 [−2035: −1984]	RU 2 [−1981: −1930]	RU 3 [−1901: −1850]	RU 4 [−1847: −1796]	
	RU 5 [−1788: −1737]	RU 6 [−1734: −1683]	RU 7 [−1654: −1603]	RU 8 [−1600: −1549]	
	RU 9 [−1523: −1472]	RU 10 [−1469: −1418]	RU 11 [−1389: −1338]	RU 12 [−1335: −1284]	
	RU 13 [−1276: −1225]	RU 14 [−1222: −1171]	RU 15 [−1142: −1091]	RU 16 [−1088: −1037]	
	RU 17 [−1011: −960]	RU 18 [−957: −906]	RU 19 [−877: −826]	RU 20 [−823: −772]	
	RU 21 [−764: −713]	RU 22 [−710: −659]	RU 23 [−630: −579]	RU 24 [−576: −525]	
	RU 25 [−499: −448]	RU 26 [−445: −394]	RU 27 [−365: −314]	RU 28 [−311: −260]	
	RU 29 [−252: −201]	RU 30_ [−198: −147]	RU 31 [−118: −67]	RU 32 [−64: −13]	
	RU 33 [13: 64]	RU 34 [67: 118]	RU 35_ [147: 198]	RU 36 [201: 252]	
	RU 37	RU 38	RU 39_ [255: 306]	RU 40	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	[260: 311]	[314: 365]	[394: 445]	[448: 499]	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
52-tone RU	RU 41 [525: 576]	RU 42 [579: 630]	RU 43 [659: 710]	RU 44 [713: 764]	
	RU 45 [772: 823]	RU 46 [826: 877]	RU 47 [906: 957]	RU 48 [960: 1011]	
	RU 49 [1037: 1088]	RU 50 [1091: 1142]	RU 51 [1171: 1222]	RU 52 [1225: 1276]	
	RU 53 [1284: 1335]	RU 54 [1338: 1389]	RU 55 [1418: 1469]	RU 56 [1472: 1523]	
	RU 57 [1549: 1600]	RU 58 [1603: 1654]	RU 59 [1683: 1734]	RU 60 [1737: 1788]	
	RU 61 [1796: 1847]	RU 62 [1850: 1901]	RU 63 [1930: 1981]	RU 64 [1984: 2035]	
106-tone RU	RU 1 [−2035: −1930]	RU 2 [−1901: −1796]	RU 3 [−1788: −1683]	RU 4 [−1654: −1549]	
	RU 5 [−1523: −1418]	RU 6 [−1389: −1284]	RU 7 [−1276: −1171]	RU 8 [−1142: −1037]	
	RU 9 [−1011: −906]	RU 10 [−877: −772]	RU 11 [−764: −659]	RU 12 [−630: −525]	
	RU 13 [−499: −394]	RU 14 [−365: −260]	RU 15 [−252: −147]	RU 16 [−118: −13]	
	RU 17 [13: 118]	RU 18 [147: 252]	RU 19 [260: 365]	RU 20 [394: 499]	
	RU 21 [525: 630]	RU 22 [659: 764]	RU 23 [772: 877]	RU 24 [906: 1011]	
	RU 25 [1037: 1142]	RU 26 [1171: 1276]	RU 27 [1284: 1389]	RU 28 [1418: 1523]	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
	RU 29 [1549: 1654]	RU 30_ [1683: 1788]	RU 31 [1796: 1901]	RU 32 [1930: 2035]	
242-tone RU	RU 1 [−2036: −1795]	RU 2 [−1789: −1548]	RU 3_ [−1524: −1283]	RU 4 [−1277: −1036]	
	RU 5 [−1012: −771]	RU 6 [−765: −524]	RU 7_ [−500: −259]	RU 8 [−253: −12]	
	RU 9 [12: 253]	RU 10 [259: 500]	RU 11 [524: 765]	RU 12 [771: 1012]	
	RU 13 [1036: 1277]	RU 14 [1283: 1524]	RU 15 [1548: 1789]	RU 16 [1795: 2036]	
484-tone RU	RU 1 [−2036: −1795, −1789: −1548]	RU 2 [−1524: −1283, −1277: −1036]	RU 3 [−1012: −771, −765: −524]	RU 4 [−500: −259, −253: −12]	
	RU 5 [12: 253, 259: 500]	RU 6 [524: 765, 771: 1012]	RU 7 [1036: 1277, 1283: 1524]	RU 8 [1548: 1789, 1795: 2036]	

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
996-tone RU	RU 1 [−2036: −1539, −1533: −1036]	RU 2 [−1012: −515, −509: −12]	RU 3_ [12: 509, 515: 1012]	RU 4 [1036: 1533, 1539: 2036]	
2x996- tone RU	RU 1_ [−2036: −1539, −1533: −1036, −1012: −515, −509: −12]	RU 2 [12: 509, 515: 1012, 1036: 1533, 1539: 2036]			

RU type (type)	RU index and subcarrier sequence number range (RU index and subcarrier range)				
4x996- tone RU	RU 1_ [−2036: −1539, −1533: −1036, −1012: −515, −509: −12, 12: 509, 515: 1012, 1036: 1533, 1539: 2036]				

CLAIMS

What is claimed is:

1. A resource allocation method, comprising:

sending, by a first device, resource allocation information to a second device, wherein the
5 resource allocation information indicates a first virtual resource unit VRU, and the first VRU
comprises a plurality of contiguous subcarriers in frequency domain; and

mapping, by the first device, the first VRU to a first physical resource unit PRU based on a
mapping relationship between a VRU and a PRU, and transmitting data on the first PRU, wherein
a plurality of subcarriers comprised in the first PRU are noncontiguous in frequency domain.

10 2. A resource allocation method, comprising:

receiving, by a second device, resource allocation information from a first device, wherein
the resource allocation information indicates a first virtual resource unit VRU, and the first VRU
comprises a plurality of contiguous subcarriers in frequency domain;

determining, by the second device based on a mapping relationship between a VRU and a
15 physical resource unit PRU, a first PRU corresponding to the first VRU, wherein a plurality of
subcarriers comprised in the first PRU are noncontiguous in frequency domain; and

receiving, by the second device, data from the first device on the first PRU.

3. A resource mapping method, comprising:

mapping a sequence number of a subcarrier of a first virtual resource unit VRU to a sequence
20 number of a subcarrier of a first physical resource unit PRU based on an interleaving matrix,
wherein the first VRU comprises a plurality of contiguous subcarriers in frequency domain, and a
plurality of subcarriers comprised in the first PRU are noncontiguous in frequency domain; and

outputting the sequence number of the subcarrier of the first PRU.

4. The method according to claim 1, 2, or 3, wherein a sequence number i of a subcarrier of
25 the first PRU mapped from a subcarrier with a sequence number k of the first VRU based on the
interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ wherein}$$

N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the
interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix,
30 and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by
using the interleaving matrix.

5. The method according to any one of claims 1 to 4, wherein any adjacent subcarriers
comprised in the first PRU are noncontiguous in frequency domain.

6. The method according to any one of claims 3 to 5, wherein before a sequence number of each subcarrier comprised in the interleaving matrix is output, an original row index sequence of the interleaving matrix is changed to a target row index sequence; and

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8}, and the target row index sequence is {1, 5, 3, 7, 2, 6, 4, 8} or {1, 6, 3, 8, 4, 7, 2, 5}; or

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}, and the target row index sequence is {1, 9, 5, 13, 3, 11, 7, 15, 2, 10, 6, 14, 4, 12, 8, 16}, or {1, 10, 3, 12, 5, 14, 7, 16, 8, 15, 6, 13, 4, 11, 2, 9}.

7. The method according to any one of claims 1 to 6, wherein the mapping, by the first device, the first VRU to a first PRU comprises:

sequentially inputting, by the first device into rows of the interleaving matrix according to a first order, sequence numbers of a plurality of subcarriers comprised in a first frequency-domain resource in which the first VRU is located, and outputting sequence numbers of the subcarriers in the interleaving matrix according to a column direction of the interleaving matrix, wherein the first order is an ascending order, or the first order is a descending order.

8. The method according to claim 7, wherein in the plurality of subcarriers comprised in the first frequency-domain resource, subcarriers that are input into the interleaving matrix are first-type subcarriers, or subcarriers that are input into the interleaving matrix are first-type subcarriers and a second-type subcarrier, the first-type subcarrier is used to carry data, and the second-type subcarrier comprises one or more of a null subcarrier, a direct current subcarrier, a guard subcarrier, and a pilot subcarrier; and

sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of the first-type subcarriers in the plurality of subcarriers comprised in the first frequency-domain resource;

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers comprised in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not comprise the first preset sequence number; or

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers comprised in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, a sequence number of the first preset sequence number is located at a preset location of the interleaving matrix, and the sequence numbers of the subcarriers output from the interleaving matrix do not comprise the first preset sequence number.

9. The method according to claim 8, wherein the second-type subcarrier is a pilot subcarrier, and the pilot subcarrier is a maximum pilot subcarrier set of a 26-tone RU in the first frequency-domain resource.

10. The method according to any one of claims 7 to 9, wherein a quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers comprised in the first frequency-domain resource is less than a quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix; and

the sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of subcarriers that are in the first frequency-domain resource and that are to be input into the interleaving matrix and a sequence number of a padding subcarrier, the sequence number of the padding subcarrier is located in a preset location of the interleaving matrix, each sequence number of the padding subcarrier is a second preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not comprise the second preset sequence number.

11. The method according to any one of claims 7 to 10, wherein a quantity of the plurality of subcarriers comprised in the first frequency-domain resource is determined based on a maximum bandwidth supported by the first device.

12. The method according to any one of claims 1 to 11, wherein the first VRU is mapped to the first PRU based on a mapping relationship between a sequence number of each subcarrier comprised in the first VRU and a sequence number of each subcarrier comprised in the first PRU.

13. The method according to any one of claims 7 to 12, wherein the sequence numbers of the subcarriers comprised in the first frequency-domain resource start from 0 or 1;

the sequence numbers of the subcarriers comprised in the first frequency-domain resource are subcarrier numbers in actual frequency bands corresponding to the subcarriers; or

the sequence numbers of the subcarriers comprised in the first frequency-domain resource are preset sequence numbers plus a preset offset value.

14. The method according to any one of claims 1 to 13, wherein the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, and the sequence numbers of the subcarriers corresponding to the first PRU are located in the first set;

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a second set, and there is no intersection between the first set and the second set, or a part of sequence numbers in the first set are the same as those in the second set are the same; or

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a

plurality of second sets, there is no intersection between the plurality of second sets, and there is no intersection between the first set and the plurality of second sets, or there is an intersection between the first set and a part of the plurality of second sets.

15. A communication apparatus, comprising a processing module and a transceiver module,
5 wherein

the transceiver module is configured to send resource allocation information to a second device, wherein the resource allocation information indicates a first virtual resource unit VRU, and the first VRU comprises a plurality of contiguous subcarriers in frequency domain;

the processing module is configured to map the first VRU to a first physical resource unit PRU based on a mapping relationship between a VRU and a PRU, wherein a plurality of subcarriers comprised in the first PRU are noncontiguous in frequency domain; and

the transceiver module is further configured to transmit data on the first PRU.

16. A communication apparatus, comprising a processing module and a transceiver module,
wherein

15 the transceiver module is configured to receive resource allocation information from a first device, wherein the resource allocation information indicates a first virtual resource unit VRU, and the first VRU comprises a plurality of contiguous subcarriers in frequency domain;

the processing module is configured to determine, based on a mapping relationship between a VRU and a physical resource unit PRU, a first PRU corresponding to the first VRU, wherein a
20 plurality of subcarriers comprised in the first PRU are noncontiguous in frequency domain; and

the transceiver module is configured to receive data from the first device on the first PRU.

17. A communication apparatus, comprising a processing module and a transceiver module,
wherein

the processing module is configured to map a sequence number of a subcarrier of a first virtual
25 resource unit VRU to a sequence number of a subcarrier of a first physical resource unit PRU based on an interleaving matrix, wherein the first VRU comprises a plurality of contiguous subcarriers in frequency domain, and a plurality of subcarriers comprised in the first PRU are noncontiguous in frequency domain; and

the transceiver module is configured to output the sequence number of the subcarrier of the
30 first PRU.

18. The communication apparatus according to claim 15, 16, or 17, wherein a sequence number i of a subcarrier of the first PRU mapped from a subcarrier with a sequence number k of the first VRU based on the interleaving matrix satisfies the following formula:

$$i = N_{\text{ROW}} \cdot (k \bmod N_{\text{COL}}) + \left\lfloor \frac{k}{N_{\text{COL}}} \right\rfloor, \text{ wherein}$$

N_{ROW} is a row quantity of the interleaving matrix, N_{COL} is a column quantity of the interleaving matrix, k is a sequence number of a subcarrier that is input into the interleaving matrix, and i is a sequence number obtained by interleaving a subcarrier whose sequence number is k by using the interleaving matrix.

19. The communication apparatus according to any one of claims 15 to 18, wherein any adjacent subcarriers comprised in the first PRU are noncontiguous in frequency domain.

20. The communication apparatus according to any one of claims 17 to 19, wherein before a sequence number of each subcarrier comprised in the interleaving matrix is output, an original row index sequence of the interleaving matrix is changed to a target row index sequence; and

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8}, and the target row index sequence is {1, 5, 3, 7, 2, 6, 4, 8} or {1, 6, 3, 8, 4, 7, 2, 5}; or

the original row index sequence is {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}, and the target row index sequence is {1, 9, 5, 13, 3, 11, 7, 15, 2, 10, 6, 14, 4, 12, 8, 16}, or {1, 10, 3, 12, 5, 14, 7, 16, 8, 15, 6, 13, 4, 11, 2, 9}.

21. The communication apparatus according to any one of claims 15 to 20, wherein that the communication apparatus maps the first VRU to the first PRU comprises:

sequentially inputting, into rows of the interleaving matrix according to a first order, sequence numbers of a plurality of subcarriers comprised in a first frequency-domain resource in which the first VRU is located, and outputting sequence numbers of the subcarriers in the interleaving matrix according to a column direction of the interleaving matrix, wherein the first order is an ascending order, or the first order is a descending order.

22. The communication apparatus according to claim 21, wherein in the plurality of subcarriers comprised in the first frequency-domain resource, subcarriers that are input into the interleaving matrix are first-type subcarriers, or subcarriers that are input into the interleaving matrix are first-type subcarriers and a second-type subcarrier, the first-type subcarrier is used to carry data, and the second-type subcarrier comprises one or more of a null subcarrier, a direct current subcarrier, a guard subcarrier, and a pilot subcarrier; and

sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of the first-type subcarriers in the plurality of subcarriers comprised in the first frequency-domain resource;

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers comprised in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not comprise the first preset sequence number; or

sequence numbers of the subcarriers that are input into the interleaving matrix are the sequence numbers of the plurality of subcarriers comprised in the first frequency-domain resource, each sequence number of the second-type subcarrier in the plurality of subcarriers is a first preset sequence number, a sequence number of the first preset sequence number is located at a preset location of the interleaving matrix, and the sequence numbers of the subcarriers output from the interleaving matrix do not comprise the first preset sequence number.

23. The communication apparatus according to claim 22, wherein the second-type subcarrier is a pilot subcarrier, and the pilot subcarrier is a maximum pilot subcarrier set of a 26-tone RU in the first frequency-domain resource.

24. The communication apparatus according to any one of claims 21 to 23, wherein a quantity of the subcarriers that are input into the interleaving matrix and that are in the plurality of subcarriers comprised in the first frequency-domain resource is less than a quantity of subcarriers that are input into the interleaving matrix and that are supported by the interleaving matrix; and

the sequence numbers of the subcarriers that are input into the interleaving matrix are sequence numbers of subcarriers that are in the first frequency-domain resource and that are to be input into the interleaving matrix and a sequence number of a padding subcarrier, the sequence number of the padding subcarrier is located in a preset location of the interleaving matrix, each sequence number of the padding subcarrier is a second preset sequence number, and the sequence numbers of the subcarriers output from the interleaving matrix do not comprise the second preset sequence number.

25. The communication apparatus according to any one of claims 21 to 24, wherein a quantity of the plurality of subcarriers comprised in the first frequency-domain resource is determined based on a maximum bandwidth supported by the first device.

26. The communication apparatus according to claim 15 or 16, wherein the first VRU is mapped to the first PRU based on a mapping relationship between a sequence number of each subcarrier comprised in the first VRU and a sequence number of each subcarrier comprised in the first PRU.

27. The communication apparatus according to any one of claims 22 to 26, wherein the sequence numbers of the subcarriers comprised in the first frequency-domain resource start from 0 or 1;

the sequence numbers of the subcarriers comprised in the first frequency-domain resource are subcarrier numbers in actual frequency bands corresponding to the subcarriers; or

the sequence numbers of the subcarriers comprised in the first frequency-domain resource are preset sequence numbers plus a preset offset value.

28. The communication apparatus according to any one of claims 15 to 27, wherein the

sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, and the sequence numbers of the subcarriers corresponding to the first PRU are located in the first set;

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a second set, and there is no intersection between the first set and the second set, or a part of sequence numbers in the first set are the same as those in the second set are the same; or

the sequence numbers of the subcarriers corresponding to the first VRU are located in a first set, the sequence numbers of the subcarriers corresponding to the first PRU are located in a plurality of second sets, there is no intersection between the plurality of second sets, and there is no intersection between the first set and the plurality of second sets, or there is an intersection between the first set and a part of the plurality of second sets.

29. A chip, wherein the chip comprises at least one processor and an interface, the processor is configured to read and execute instructions stored in a memory, and when the instructions are run, the chip is enabled to perform the method according to any one of claims 1 to 14.

30. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, the computer program comprises program instructions, and when the program instructions are executed by a computer, the computer is enabled to perform the method according to any one of claims 1 to 14.