in this application is used for an EHT NDP. This helps implement, in an aggregated PPDU transmission scenario, when hybrid transmission is performed on the EHT NDP and an HE NDP, alignment between symbols of the NDPs transmitted on all channels, so that out-of-band interference between different frequency bands can be avoided.

[0013] The NDP does not include the EHT-SIG. The U-SIG may not indicate the number of EHT-SIG symbols or a modulation and coding scheme (modulation and coding scheme, MCS), and does not need to indicate a coding-related indication, for example, a low density parity check (low density parity check, LDPC) extra symbol segment indication. A packet extension indication may use a fixed value, and therefore does not need to be indicated.

[0014] In this way, the U-SIG may not include the subfield indicating the number of EHT-SIG symbols, an MCS subfield, an LDPC extra symbol segment subfield, or a packet extension disambiguity subfield. Bits that are used to carry these fields in a U-SIG of a PPDU including a data field may be used to carry other information in the U-SIG of the NDP; or bits that are used to carry these fields may be used to carry other fields. For example, the bits that are used to carry these fields may be used to carry a subfield indicating a number of EHT-LTF symbols, so that the U-SIG of the NDP can include more information.

[0015] It should be understood that, in some optional implementations, based on a structure of an NDP shown in FIG. 9, the U-SIG may alternatively include the subfield indicating the number of EHT-SIG symbols. The subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is a specified value, and to indicate that the PPDU is the NDP. The subfield indicating the number of EHT-SIG symbols may be, but is not limited to, a subfield indicating a number of EHT-SIG symbols or MU-MIMO users (a subfield indicating a number of EHT-SIG symbols/MU-MIMO users), or a number of EHT-SIG symbols subfield that is used to indicate only the number of EHT-SIG symbols.

[0016] Optionally, the U-SIG further includes a number of spatial streams subfield and/or a subfield indicating a number of extremely high throughput-long training field (EHT-LTF) symbols, and the number of spatial streams subfield and/or the subfield indicating the number of EHT-LTF symbols indicate/indicates a number of spatial streams and the number of EHT-LTF symbols. The subfield indicating the number of EHT-LTF symbols may be, for example, a number of EHT-LTF symbols, midamble periodicity and doppler subfield; or may be a number of EHT-LTF symbols subfield that individually indicates the number of EHT-LTF symbols.

The NDP helps improve efficiency of reading the NDP by the Bfee.

[0024] In some implementations, an NDP indication subfield or a PPDU format subfield in the U-SIG indicates that the PPDU is in an uncompressed mode. When the PPDU is in the uncompressed mode, the subfield indicating the number of EHT-SIG symbols or MU-MIMO users in the U-SIG indicates the number of EHT-SIG symbols. In this way, the subfield indicating the number of EHT-SIG symbols or MU-MIMO users can indicate that the number of EHT-SIG symbols is 1.

[0025] In some implementations, a number of space-time streams subfield and/or a subfield indicating a number of EHT-LTF symbols in the EHT-SIG indicate/indicates a number of space-time streams and the number of EHT-LTF symbols. The subfield indicating the number of EHT-LTF symbols may be, for example, a number of EHT-LTF symbols, midamble periodicity and doppler subfield; or may be a number of EHT-LTF symbols subfield that individually indicates the number of EHT-LTF symbols.

[0026] According to a third aspect, this application further provides a PPDU transmission method, including: generating a PPDU, where the PPDU is an NDP, the PPDU includes an EHT-SIG, the EHT-SIG includes an AID subfield indicating an association identifier AID, and the AID is used to indicate information related to a user of the NDP; and sending the PPDU.

[0027] In this way, a Bfee can determine, based on the AID in the EHT-SIG of the NDP, the information related to the user of the NDP. In this way, the Bfee can accurately determine whether the Bfee is a user that needs to perform channel sounding and feed back a beamforming report.

[0028] The PPDU in this solution is an NDP used for a standard after 802.11ax, and does not include a data field. The NDP is used by the Bfee to perform channel sounding.

[0029] In some implementations, if the user of the NDP is one station, the AID indicated by the AID subfield is an AID of the station. In this way, the station corresponding to the AID can determine, based on the AID in the NDP, that the station is a station that needs to perform channel sounding and feed back a beamforming report based on a channel sounding result.

[0030] In this way, even if the station fails to read a user field including the AID of the station because the station does not correctly read an NDPA frame, the station can determine, based on the NDP, that the station is a station that needs to perform channel sounding and feed back a beamforming report based on a channel sounding result, so that a success rate of obtaining the beamforming report by a Bfer can be improved.

[0031] In addition, after receiving the NDP, if a device that does not match the AID indicated by the AID subfield reads that the AID indicated by the AID subfield is inconsistent with an AID of the device, the device does not continue to receive the NDP, so that power consumption of the device that does not match the AID indicated by the AID subfield can be reduced.

[0032] In some implementations, if the user of the NDP is a plurality of stations, the AID indicated by the user field is 0, indicating that the NDP is sent through broadcast. In this implementation, an EHT-SIG of an NDPA frame sent before the NDP includes a plurality of station fields, and an AID subfield in the plurality of station fields indicates an AID of a station that needs to perform channel sounding and feed back a beamforming report. In this way, the station receives the NDP, and determines, based on that the AID subfield in the NDP is 0, that the user of the NDP is the plurality of stations. In this way, all stations that receive the NDP or stations corresponding to AIDs indicated by user fields in NDPA frames continue to receive the NDP, to obtain channel state information based on the NDP and feed back beamforming reports.

[0033] In some implementations, if the user of the NDP is an access point, the AID indicated by the AID subfield is a specified value. The specified value may be notified by the AP through broadcast, or may be a fixed value, for example, 2045, preset in a standard. It should be understood that the specified value may alternatively be another value.

[0034] In some implementations, the PPDU further includes a U-SIG, the U-SIG includes a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP. In this way, after identifying the PPDU, the Bfee can identify, based on the format subfield or the compressed subfield, that the PPDU is the NDP. In this way, before it is calculated that a number of symbols of the data field of the PPDU is 0, the PPDU may be identified as the NDP, and the PPDU is read based on a format of the NDP, so that the Bfee can prepare in advance a procedure of calculating channel state information, obtain longer processing time, and improve NDP reading efficiency.

[0035] In some implementations, the PPDU further includes a U-SIG and an EHT-LTF, the U-SIG includes a number of space-time streams subfield that indicates a number of space-time streams, and a number of EHT-LTF symbols is greater than the number of space-time streams. In this way, in an aggregated PPDU transmission scenario, when a plurality of NDPs of a same structure are transmitted on different channels, even if spatial streams on the channels are different, quantities of EHT-LTF symbols of the NDPs transmitted on the channels may be the same. This helps align

data field may be used to carry other information in the U-SIG of the NDP; or bits that are used to carry these fields may be used to carry other fields. For example, the bits that are used to carry these fields may be used to carry a subfield indicating a number of EHT-LTF symbols, so that the U-SIG of the NDP can include more information.

[0043] It should be understood that, in some optional implementations, based on a structure of an NDP shown in FIG. 9, the U-SIG may alternatively include the subfield indicating the number of EHT-SIG symbols. The subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is a specified value, to indicate that the PPDU is the NDP. The subfield indicating the number of EHT-SIG symbols may be, but is not limited to, a subfield indicating a number of EHT-SIG symbols or MU-MIMO users (a subfield indicating a number of EHT-SIG symbols/MU-MIMO users), or a number of EHT-SIG symbols subfield that is only used to indicate the number of EHT-SIG symbols.

[0044] Optionally, the U-SIG further includes a number of spatial streams subfield and/or a subfield indicating a number of extremely high throughput-long training (field EHT-LTF) symbols, and the number of spatial streams subfield and/or the subfield indicating the number of EHT-LTF symbols indicate/indicates a number of spatial streams and the number of EHT-LTF symbols. The subfield indicating the number of EHT-LTF symbols may be, for example, a number of EHT-LTF symbols, midamble periodicity and doppler subfield; or may be a number of EHT-LTF symbols subfield that individually indicates the number of EHT-LTF symbols.

[0045] According to a fifth aspect, this application further provides a PPDU transmission method, including: receiving a PPDU, where the PPDU is an NDP, the PPDU includes an extremely high throughput-signal field EHT-SIG, a number of EHT-SIG symbols is 1, and the EHT-SIG is modulated by using BPSK and a code rate of 1/2; and performing channel estimation by using the NDP.

[0046] The PPDU is an NDP used for a standard after 802.11ax, and does not include a data field. The NDP is used by a Bfee to perform channel sounding.

[0047] In the technical solutions of this application, the number of EHT-SIG symbols of the NDP is 1. A structure of the NDP can reduce the number of EHT-SIG symbols, so that overheads required for transmitting the NDP can be reduced.

[0048] In some implementations, the PPDU further includes a universal signal field U-SIG, the U-SIG includes a subfield indicating the number of EHT-SIG symbols, and the subfield

indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is any value greater than or equal to 1. The subfield indicating the number of EHT-SIG symbols may be, but is not limited to, a subfield indicating a number of EHT-SIG symbols or MU-MIMO users, or a number of EHT-SIG symbols subfield that is only used to indicate the number of EHT-SIG symbols.

[0049] The subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is 1, and the Bfee that receives the NDP can calculate that a length of the data field in the PPDU is 0, to determine that the PPDU is the NDP. The subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is greater than 1, and the Bfee can calculate that the length of the data field in the PPDU is less than 0, to determine that the PPDU is the NDP.

[0050] In some implementations, the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is 1, the U-SIG further includes a modulation and coding scheme MCS subfield, and the MCS subfield indicates that the EHT-SIG is modulated by using the BPSK and the code rate of 1/2. In this way, the Bfee can identify, without calculating a number of symbols of the data field, that the PPDU is the NDP. In this way, the Bfee can prepare in advance a procedure of calculating channel state information, to obtain longer processing time, and does not need to determine, after calculating that a length of a data part of the PPDU is 0, that the PPDU is the NDP. The NDP helps improve efficiency of reading the NDP by the Bfee.

[0051] In some implementations, an NDP indication subfield or a PPDU format subfield in the U-SIG indicates that the PPDU is in an uncompressed mode. When the PPDU is in the uncompressed mode, the subfield indicating the number of EHT-SIG symbols or MU-MIMO users in the U-SIG indicates the number of EHT-SIG symbols. In this way, the subfield indicating the number of EHT-SIG symbols or MU-MIMO users can indicate that the number of EHT-SIG symbols is 1.

[0052] In some implementations, a number of space-time streams subfield and/or a subfield indicating a number of EHT-LTF symbols in the EHT-SIG indicate/indicates a number of space-time streams and the number of EHT-LTF symbols. The subfield indicating the number of EHT-LTF symbols may be, for example, a number of EHT-LTF symbols, midamble periodicity and doppler subfield; or may be a number of EHT-LTF symbols subfield that individually indicates the number of EHT-LTF symbols.

to AIDs indicated by user fields in NDPA frames continue to receive the NDP, to obtain channel state information based on the NDP and feed back beamforming reports.

[0059] In some implementations, if the user of the NDP is an access point, the AID indicated by the AID subfield is a specified value. The specified value may be notified by the AP through broadcast, or may be a fixed value, for example, 2045, preset in a standard. It should be understood that the specified value may alternatively be another value.

[0060] In some implementations, the PPDU further includes a U-SIG, the U-SIG includes a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP. In this way, after identifying the PPDU, the Bfee can identify, based on the format subfield or the compressed subfield, that the PPDU is the NDP. In this way, before it is calculated that a number of symbols of the data field of the PPDU is 0, the PPDU may be identified as the NDP, and the PPDU is read based on a format of the NDP, so that the Bfee can prepare in advance a procedure of calculating channel state information, obtain longer processing time, and improve NDP reading efficiency.

[0061] In some implementations, the PPDU further includes a U-SIG and an EHT-LTF, the U-SIG includes a number of space-time streams subfield that indicates a number of space-time streams, and a number of EHT-LTF symbols is greater than the number of space-time streams. In this way, in an aggregated PPDU transmission scenario, when a plurality of NDPs of a same structure are transmitted on different channels, even if spatial streams on the channels are different, quantities of EHT-LTF symbols of the NDPs transmitted on the channels may be the same. This helps align symbols of fields of the NDPs, to avoid out-of-band interference between different frequency bands.

[0062] According to a seventh aspect, this application further provides a transmission apparatus, including a processing unit and a sending unit. The processing unit is configured to generate a PPDU, where the PPDU includes a universal signal field U-SIG, and the U-SIG includes a subfield indicating that the PPDU is a null data packet NDP. The sending unit is configured to send the PPDU.

[0063] In this way, a Bfee that receives the NDP can determine, based on the subfield, in the U-SIG, indicating that the PPDU is the NDP, that the PPDU is the NDP, so that the Bfee can prepare in advance a procedure of calculating channel state information, to obtain longer processing time, and does not need to determine, after calculating that a length of a data part of

the PPDU is 0, that the PPDU is the NDP. The NDP helps improve efficiency of receiving the NDP by the Bfee.

[0064] The transmission apparatus may be understood as a Bfer. The transmission apparatus may be, for example, an access point or a station. Alternatively, the transmission apparatus is deployed at an access point or a station.

[0065] In some implementations, the PPDU further includes an extremely high throughput-short training field EHT-STF adjacent to and following the U-SIG.

[0066] In some implementations, the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a number of EHT-SIG symbols, in the U-SIG.

[0067] In some implementations, the U-SIG further includes a number of spatial streams subfield and/or a subfield indicating a number of extremely high throughput-long training field (EHT-LTF) symbols, and the number of spatial streams subfield and/or the subfield indicating the number of EHT-LTF symbols indicate/indicates a number of spatial streams and the number of EHT-LTF symbols.

[0068] According to an eighth aspect, this application further provides a transmission apparatus, including a processing unit and a sending unit. The processing unit is configured to generate a PPDU, where the PPDU is an NDP, the PPDU includes an extremely high throughput-signal field EHT-SIG, a number of EHT-SIG symbols is 1, and the EHT-SIG is modulated by using BPSK and a code rate of 1/2. The sending unit is configured to send the PPDU. In this way, the number of EHT-SIG symbols can be reduced, so that overheads required for transmitting the NDP can be reduced.

[0069] The transmission apparatus may be understood as a Bfer. The transmission apparatus may be, for example, an access point or a station. Alternatively, the transmission apparatus is deployed at an access point or a station.

[0070] In some implementations, the PPDU further includes a universal signal field U-SIG, the U-SIG includes a subfield indicating the number of EHT-SIG symbols, and the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is any value greater than or equal to 1.

[0071] In some implementations, the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is 1, the U-SIG further includes a modulation and

coding scheme MCS subfield, and the MCS subfield indicates that the EHT-SIG is modulated by using the BPSK and the code rate of 1/2.

[0072] In some implementations, an NDP indication subfield or a PPDU format subfield in the U-SIG indicates that the PPDU is in an uncompressed mode.

[0073] In some implementations, a number of space-time streams subfield and/or a subfield indicating a number of EHT-LTF symbols in the EHT-SIG indicate/indicates a number of space-time streams and the number of EHT-LTF symbols.

[0074] According to a ninth aspect, this application further provides a transmission apparatus, including a processing unit and a sending unit. The processing unit is configured to generate a PPDU, where the PPDU is an NDP, the PPDU includes an EHT-SIG, the EHT-SIG includes an AID subfield indicating an association identifier AID, and the AID is used to indicate information related to a user of the NDP. The sending unit is configured to send the PPDU.

[0075] In this way, a Bfee can determine, based on the AID in the EHT-SIG of the NDP, the information related to the user of the NDP. In this way, the Bfee can accurately determine whether the Bfee is a user that needs to perform channel sounding and feed back a beamforming report.

[0076] The transmission apparatus may be understood as a Bfer. The transmission apparatus may be, for example, an access point or a station. Alternatively, the transmission apparatus is deployed at an access point or a station.

[0077] In some implementations, if the user of the NDP is one station, the AID indicated by the AID subfield is an AID of the station.

[0078] In some implementations, if the user of the NDP is a plurality of stations, the AID indicated by the user field is 0, indicating that the NDP is sent through broadcast.

[0079] In some implementations, if the user of the NDP is an access point, the AID indicated by the AID subfield is a specified value.

[0080] In some implementations, the PPDU further includes a U-SIG, the U-SIG includes a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP.

[0081] In some implementations, the PPDU further includes a U-SIG and an EHT-LTF, the U-SIG includes a number of space-time streams subfield that indicates a number of space-time streams, and a number of EHT-LTF symbols is greater than the number of space-time streams.

[0082] According to a tenth aspect, this application further provides a transmission apparatus,

including a receiving unit and a processing unit. The receiving unit is configured to receive a PPDU, where the PPDU is an NDP, the PPDU includes a universal signal field U-SIG, and the U-SIG includes a subfield indicating that the PPDU is a null data packet NDP. The processing unit is configured to perform channel estimation by using the NDP.

[0083] In this way, a Bfee that receives the NDP can determine, based on the subfield, in the U-SIG, indicating that the PPDU is the NDP, that the PPDU is the NDP, so that the Bfee can prepare in advance a procedure of calculating channel state information, to obtain longer processing time, and does not need to determine, after calculating that a length of a data part of the PPDU is 0, that the PPDU is the NDP. The NDP helps improve efficiency of receiving the NDP by the Bfee.

[0084] The transmission apparatus may be understood as the Bfee. The transmission apparatus may be, for example, a station or an access point. Alternatively, the transmission apparatus is deployed at a station or an access point.

[0085] In some implementations, the PPDU further includes an extremely high throughput-short training field EHT-STF adjacent to and following the U-SIG.

[0086] In some implementations, the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a number of EHT-SIG symbols, in the U-SIG.

[0087] In some implementations, the U-SIG further includes a number of spatial streams subfield and/or a subfield indicating a number of extremely high throughput-long training field (EHT-LTF) symbols, and the number of spatial streams subfield and/or the subfield indicating the number of EHT-LTF symbols indicate/indicates a number of spatial streams and the number of EHT-LTF symbols.

[0088] According to an eleventh aspect, this application further provides a transmission apparatus, including a receiving unit and a processing unit. The receiving unit is configured to receive a PPDU, where the PPDU is an NDP, the PPDU includes an extremely high throughput-signal field EHT-SIG, a number of EHT-SIG symbols is 1, and the EHT-SIG is modulated by using BPSK and a code rate of 1/2. The processing unit is configured to perform channel estimation by using the NDP. In this way, the number of EHT-SIG symbols can be reduced, so that overheads required for transmitting the NDP can be reduced.

[0089] The transmission apparatus may be understood as a Bfee. The transmission apparatus

by the AID subfield is a specified value.

[00100] In some implementations, the PPDU further includes a U-SIG, the U-SIG includes a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP.

[00101] In some implementations, the PPDU further includes a U-SIG and an EHT-LTF, the U-SIG includes a number of space-time streams subfield that indicates a number of space-time streams, and a number of EHT-LTF symbols is greater than the number of space-time streams.

[00102] For related descriptions of the implementations of the foregoing transmission apparatuses, refer to related content of the implementations of the foregoing PPDU transmission method. Details are not described herein again.

[00103] According to a thirteenth aspect, an implementation of this application further provides a PPDU transmission apparatus. The transmission apparatus may include a processor and a transceiver, and optionally further includes a memory. When the processor executes a computer program or instructions in the memory, the method according to any one of the implementations of the first aspect to the sixth aspect is performed. The transmission apparatus may be understood as a communication apparatus. The transmission apparatus may be a station or an access point.

[00104] According to a fourteenth aspect, an implementation of this application further provides a computer-readable storage medium. The computer-readable storage medium stores instructions, and the instructions indicate a communication apparatus to perform the method according to any one of the implementations of the first aspect to the sixth aspect.

[00105] According to a fifteenth aspect, an implementation of this application further provides a computer program product. The computer program product includes a computer program. When the computer program runs on a computer, the computer is enabled to perform the method according to any one of the implementations of the first aspect to the sixth aspect.

[00106] According to a sixteenth aspect, this application further provides a processor, configured to perform the method according to any one of the implementations of the first aspect to the sixth aspect. In a process of performing these methods, a process of sending the foregoing information and a process of receiving the foregoing information in the foregoing methods may be understood as a process of outputting the foregoing information by the processor and a process of receiving the foregoing input information by the processor. Specifically, when outputting the information, the processor outputs the information to a transceiver, so that the transceiver transmits

BRIEF DESCRIPTION OF DRAWINGS

[00112] FIG. 1 is a schematic diagram of a network architecture of a communication system according to an embodiment of this application;

[00113] FIG. 2 is a schematic diagram of a structure of a PPDU transmission apparatus according to an embodiment of this application;

[00114] FIG. 3 is a schematic diagram of a structure of a chip according to an embodiment of this application;

[00115] FIG. 4A is a schematic diagram of a structure of an HE SU PPDU including a data field;

[00116] FIG. 4B is a schematic diagram of a structure of an HE MU PPDU including a data field;

[00117] FIG. 4C is a schematic diagram of a structure of an HE NDP;

[00118] FIG. 5 is a schematic diagram of a structure of an EHT PPDU including a data field according to an embodiment of this application;

[00119] FIG. 6 is a schematic flowchart of a PPDU transmission method according to an embodiment of this application;

[00120] FIG. 7 is a schematic diagram of an aggregated PPDU transmission scenario according to an embodiment of this application;

[00121] FIG. 8 is a schematic diagram of another aggregated PPDU transmission scenario according to an embodiment of this application;

[00122] FIG. 9 is a schematic diagram of a structure of an NDP according to an embodiment of this application;

[00123] FIG. 10 is a schematic diagram of still another aggregated PPDU transmission scenario according to an embodiment of this application;

[00124] FIG. 11 is a schematic diagram of a structure of an NDP according to another embodiment of this application;

[00125] FIG. 12 is a schematic diagram of modules of a transmission apparatus according to an embodiment of this application;

[00126] FIG. 13 is a schematic diagram of modules of a transmission apparatus according to an embodiment of this application;

[00127] FIG. 14 is a schematic diagram of modules of a transmission apparatus according to an

and the software module. One of the foregoing functions may be implemented in a form of a hardware structure, a software module, or a combination of the hardware structure and the software module.

[00142] FIG. 2 is a schematic diagram of a structure of a PPDU transmission apparatus 200 according to an embodiment of this application. As shown in FIG. 2, the transmission apparatus 200 may include a processor 201 and a transceiver 205, and optionally further includes a memory 202.

[00143] The transceiver 205 may be referred to as a transceiver unit, a transceiver machine, a transceiver circuit, or the like, and is configured to implement a transceiver function. The transceiver 205 may include a receiver and a transmitter. The receiver may be referred to as a receiver machine, a receiver circuit, or the like, and is configured to implement a receiving function. The transmitter may be referred to as a transmitter machine, a transmitter circuit, or the like, and is configured to implement a sending function.

[00144] The memory 202 may store a computer program, software code, or an instruction 204, where the computer program, the software code, or the instruction 204 may also be referred to as firmware. The processor 201 may control a MAC layer and a PHY layer by running a computer program, software code, or an instruction 203 in the processor 201, or by invoking the computer program, the software code, or the instruction 204 stored in the memory 202, to implement the data transmission method provided in the following embodiments of this application.

[00145] The processor 201 may be a central processing unit (central processing unit, CPU), and the memory 202 may be, for example, a read-only memory (read-only memory, ROM), or a random access memory (random access memory, RAM).

[00146] The processor 201 and the transceiver 205 described in this application may be implemented in an integrated circuit (integrated circuit, IC), an analog IC, a radio frequency integrated circuit RFIC, a mixed-signal IC, an application-specific integrated circuit (application-specific integrated circuit, ASIC), a printed circuit board (printed circuit board, PCB), an electronic device, or the like.

[00147] The transmission apparatus 200 may further include an antenna 206. The modules included in the transmission apparatus 200 are merely examples for description. This is not limited in this application.

[00148] As described above, the transmission apparatus 200 described in the foregoing

information.

[00169] Based on the foregoing background, this application provides structures of some NDPs used for a standard after 802.11ax. In this way, in a scenario in which wireless communication is performed by using the standard (for example, 802.11be) after 802.11ax, a Bfee can perform channel estimation based on an NDP to feed back a beamforming report.

[00170] With reference to the PPDU transmission method provided in embodiments of this application, the following describes a structure of an NDP provided in technical solutions of this application.

[00171] FIG. 6 is a schematic flowchart of a PPDU transmission method according to an embodiment of this application. The method may include the following steps.

[00172] 602: A Bfer generates a PPDU.

[00173] The PPDU is an NDP used for a standard after 802.11ax, and does not include a data field. The NDP is used by a Bfee to perform channel sounding. The channel sounding in this application may also be referred to as channel measurement or channel estimation.

[00174] The NDP may be any NDP that are used for the standard after 802.11ax and that are provided below in this embodiment of this application.

[00175] A first type of NDP provided in this embodiment of this application includes a subfield indicating that the PPDU is the NDP. In this way, the Bfee that receives the NDP can identify the NDP earlier. This helps improve efficiency of reading the NDP by the Bfee.

[00176] A second type of NDP provided in this embodiment of this application includes an EHT-SIG, a number of EHT-SIG symbols is 1, a modulation scheme used for the EHT-SIG is BPSK, and a modulation code rate used for the EHT-SIG is a code rate of 1/2. In this way, in comparison with the EHT-SIG of the PPDU including the data field shown in Table 2, the number of EHT-SIG symbols is smaller, so that overheads required for transmitting the NDP can be reduced.

[00177] A third type of NDP provided in this embodiment of this application includes an AID subfield, and the AID subfield is used to indicate information related to a user of the NDP. In this way, the Bfee that receives the NDP can determine, based on an AID in the EHT-SIG of the NDP, the information related to the user of the NDP, to accurately determine whether the Bfee is a user that needs to perform channel sounding and feed back a beamforming report.

[00178] It should be understood that names of related fields (for example, fields such as an

NSS subfield or a subfield indicating a number of EHT-LTF symbols. The NSTS subfield indicates an NSTS, and can indirectly indicate an NSS and the number of EHT-LTF symbols based on the foregoing two correspondences. Alternatively, the U-SIG includes an NSS subfield, but does not include an NSTS subfield or a subfield indicating a number of EHT-LTF symbols. The NSS subfield indicates an NSS, and can indirectly indicate an NSTS and the number of EHT-LTF symbols based on the foregoing two correspondences.

[00210] In still another embodiment, the U-SIG includes a subfield indicating a number of EHT-LTF symbols, but does not include an NSTS subfield or an NSS subfield. The subfield indicating the number of EHT-LTF symbols indicates the number of EHT-LTF symbols, and indicates at least one of an NSS and an NSTS based on the foregoing correspondences.

[00211] In an optional embodiment, content included in the U-SIG of the first type of NDP in embodiments of this application is shown in Table 3. Specifically, the U-SIG includes a physical layer version identifier (version identifier) indication subfield, an uplink/a downlink (uplink/downlink, UL/DL) indication subfield, a basic service set color (basic service set color, BSS color) subfield, a transmit opportunity (transmit opportunity, TXOP) subfield, a bandwidth (bandwidth) indication subfield, a PPDU format (PPDU format) subfield, an NDP indication subfield, a spatial reuse (spatial reuse) indication subfield, a guard interval (Guard, GI Interval) and EHT-LTF size indication subfield, a number of EHT-LTF symbols, midamble periodicity and doppler (number of EHT-LTF symbols, midamble periodicity and doppler) subfield, a number of spatial streams (number of spatial streams, NSS) subfield, a CRC, and a tail bit. The U-SIG further includes five bits as reserved bits, used to carry other information that needs to be carried. It should be understood that, based on the correspondence between an NSTS and an NSS, the NSS subfield in Table 3 may be replaced with an NSTS subfield.

Table 3

Bit	Field
B0-B2 (U-SIG-1)	Physical layer version identifier (version identifier)
B3	Uplink/downlink (uplink/downlink, UL/DL)
B4-B9	Basic service set color (basic service set color, BSS color)

of NDP provided in this embodiment of this application may further include an L-STF, an L-LTF, an L-SIG, an RL-SIG, a U-SIG, an EHT-STF, an EHT-LTF, and a PE field. The PE field is used to help the Bfee obtain longer processing time. Alternatively, the NDP may not include the PE field. For example, when a processing capability of the Bfee is strong, the NDP may not include the PE field.

[00217] For descriptions of the L-STF, the L-LTF, the L-SIG, the RL-SIG, the EHT-STF, and the EHT-LTF, and descriptions of identifying the PPDU by the Bfee, refer to the related descriptions of the implementation of the structure of the first type of NDP. Details are not described herein again.

[00218] Based on the structure of the second type of NDP provided in this embodiment of this application, this embodiment of this application provides some indication manners for indicating that the PPDU is the NDP, and a related technology used by the Bfee to learn, based on the indication, that the PPDU is the NDP.

[00219] In one indication manner for indicating that the PPDU is the NDP, the U-SIG of the NDP includes a subfield indicating a number of EHT-SIG symbols, and the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is any value greater than or equal to 1. For example, the subfield indicating the number of EHT-SIG symbols may be a subfield indicating a number of EHT-SIG symbols or MU-MIMO users, or may be a number of EHT-SIG symbols subfield.

[00220] Optionally, the Bfee may obtain, based on length indication information in the L-SIG, a sum of lengths of all fields following the L-SIG, and then obtain lengths of the RL-SIG, the EHT-SIG, the EHT-LTF, and the PE field based on the number of EHT-SIG symbols, a number of EHT-LTF symbols, a length of a guard interval, a size of the EHT-LTF, and a packet extension related parameter that are indicated in the U-SIG and the EHT-SIG. Lengths of the RL-SIG, the U-SIG, and the EHT-STF are fixed. In this case, the Bfee may subtract lengths of the RL-SIG, the U-SIG, the EHT-SIG, the EHT-STF, the EHT-LTF, and the PE field from a sum of the lengths of all the fields following the L-SIG that are obtained based on the length indication information in the L-SIG, to obtain a length of the data field, and calculate a number of symbols of the data field. If the Bfee calculates that the length of the data field is less than or equal to 0, the Bfee identifies that the PPDU is the NDP.

[00221] It may be understood that, the subfield indicating the number of EHT-SIG symbols

indicates that the number of EHT-SIG symbols is 1, and the Bfee can calculate that the length of the data field in the PPDU is 0, to determine that the PPDU is the NDP. The subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is greater than 1, and the Bfee can calculate that the length of the data field in the PPDU is less than 0, sto determine that the PPDU is the NDP.

[00222] Further, the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is 1, the U-SIG further includes an MCS subfield, and the MCS subfield indicates that the EHT-SIG is modulated by using the BPSK and the code rate of 1/2. As shown in Table 2, in the PPDU including the data field, a number of information bits of the EHT-SIG is 54. When the EHT-SIG is modulated by using the BPSK and the code rate of 1/2, a number of EHT-SIG symbols obtained through coding is greater than 1.

[00223] In this way, based on that the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is 1 and the MCS subfield indicates that the EHT-SIG is modulated by using the BPSK and the code rate of 1/2, the Bfee may determine that the PPDU is the NDP. The Bfee can identify, without calculating the number of symbols of the data field, that the PPDU is the NDP. In this way, the Bfee can prepare in advance the procedure of calculating the channel state information, to obtain longer processing time, and does not need to determine, after calculating that the length of the data part of the PPDU is 0, that the PPDU is the NDP. The NDP helps improve efficiency of reading the NDP by the Bfee.

[00224] In an optional embodiment, the U-SIG further includes an NDP indication subfield and/or a PPDU format subfield. The NDP indication subfield or the PPDU format subfield in the U-SIG indicates that the PPDU is in an uncompressed mode. When the PPDU is in the uncompressed mode, the subfield indicating the number of EHT-SIG symbols or MU-MIMO users in the U-SIG indicates the number of EHT-SIG symbols. In this way, the subfield indicating the number of EHT-SIG symbols or MU-MIMO users can indicate that the number of EHT-SIG symbols is 1.

[00225] It should be understood that, in another optional embodiment, when the PPDU is in a compressed mode, the EHT-SIG symbol number subfield in the U-SIG indicates that the number of EHT-SIG symbols is 1.

[00226] In another optional embodiment, the EHT-SIG of the NDP includes a common field, but does not include a user-specific field. In this way, the number of EHT-SIG symbols can be

[00255] In an optional embodiment, a number of EHT-LTF symbols is greater than a number of space-time streams. In this way, in an aggregated PPDU transmission scenario, when a plurality of NDPs whose structures are the same as the structure of the third type of NDP are transmitted on different channels, even if spatial streams on the channels are different, quantities of EHT-LTF symbols of the NDPs transmitted on the channels may be the same. This helps align symbols of fields of the NDPs, to avoid out-of-band interference between different frequency bands.

[00256] In the foregoing embodiments provided in this application, the method provided in embodiments of this application is separately described from perspectives of the access point and the station. To implement the functions in the foregoing method provided in embodiments of this application, the access point and the station may include a hardware structure and 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. One of the foregoing functions may be performed in a form of a hardware structure, a software module, or a combination of the hardware structure and the software module.

[00257] FIG. 12 is a schematic diagram of modules of a transmission apparatus1200 according to an embodiment of this application. The transmission apparatus 1200 includes a processing unit 1201 and a sending unit 1202.

[00258] The processing unit 1201 is configured to generate a PPDU, where the PPDU includes a universal signal field U-SIG, and the U-SIG includes a subfield indicating that the PPDU is a null data packet NDP.

[00259] The sending unit 1202 is configured to send the PPDU.

[00260] In this way, a Bfee that receives the NDP can determine, based on the subfield, in the U-SIG, indicating that the PPDU is the NDP, that the PPDU is the NDP, so that the Bfee can prepare in advance a procedure of calculating channel state information, to obtain longer processing time, and does not need to determine, after calculating that a length of a data part of the PPDU is 0, that the PPDU is the NDP. The NDP helps improve efficiency of receiving the NDP by the Bfee.

[00261] The transmission apparatus 1200 may be understood as a Bfer. The transmission apparatus 1200 may be, for example, an access point or a station. Alternatively, the transmission apparatus is deployed at an access point or a station. The processing unit 1201 of the transmission apparatus 1200 may be a processor, and the sending unit 1202 of the transmission apparatus 1200

may be a transceiver.

[00262] In some embodiments, the PPDU further includes an extremely high throughput-short training field EHT-STF adjacent to and following the U-SIG.

[00263] In some embodiments, the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a number of EHT-SIG symbols, in the U-SIG.

[00264] In some embodiments, the U-SIG further includes a number of spatial streams subfield and/or a subfield indicating a number of extremely high throughput-long training field (EHT-LTF) symbols, and the number of spatial streams subfield and/or the subfield indicating the number of EHT-LTF symbols indicate/indicates a number of spatial streams and the number of EHT-LTF symbols.

[00265] FIG. 13 is a schematic diagram of modules of a transmission apparatus according to an embodiment of this application. The transmission apparatus 1300 includes a processing unit 1301 and a sending unit 1302.

[00266] The processing unit 1301 is configured to generate a PPDU, where the PPDU is an NDP, the PPDU includes an extremely high throughput-signal field EHT-SIG, a number of EHT-SIG symbols is 1, and the EHT-SIG is modulated by using BPSK and a code rate of 1/2.

[00267] The sending unit 1302 is configured to send the PPDU.

[00268] In this way, the number of EHT-SIG symbols can be reduced, so that overheads required for transmitting the NDP can be reduced.

[00269] The transmission apparatus 1300 may be understood as a Bfer. The transmission apparatus 1300 may be, for example, an access point or a station. Alternatively, the transmission apparatus is deployed at an access point or a station. The processing unit 1301 of the transmission apparatus 1300 may be a processor, and the sending unit 1302 of the transmission apparatus 1300 may be a transceiver.

[00270] In some embodiments, the PPDU further includes a universal signal field U-SIG, the U-SIG includes a subfield indicating the number of EHT-SIG symbols, and the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is any value greater than or equal to 1.

[00271] In some embodiments, the subfield indicating the number of EHT-SIG symbols indicates that the number of EHT-SIG symbols is 1, the U-SIG further includes a modulation and

[00283] In some embodiments, the PPDU further includes a U-SIG and an EHT-LTF, the U-SIG includes a number of space-time streams subfield that indicates a number of space-time streams, and a number of EHT-LTF symbols is greater than the number of space-time streams.

[00284] FIG. 15 is a schematic diagram of modules of a transmission apparatus according to an embodiment of this application. The transmission apparatus 1500 includes a receiving unit 1501 and a processing unit 1502.

[00285] The receiving unit 1501 is configured to receive a PPDU, where the PPDU is an NDP, the PPDU includes a universal signal field U-SIG, and the U-SIG includes a subfield indicating that the PPDU is the null data packet NDP.

[00286] The processing unit 1502 is configured to perform channel estimation by using the NDP.

[00287] A Bfee that receives the NDP can determine, based on the subfield, in the U-SIG, indicating that the PPDU is the NDP, that the PPDU is the NDP, so that the Bfee can prepare in advance a procedure of calculating channel state information, to obtain longer processing time, and does not need to determine, after calculating that a length of a data part of the PPDU is 0, that the PPDU is the NDP. The NDP helps improve efficiency of receiving the NDP by the Bfee.

[00288] The transmission apparatus 1500 may be understood as the Bfee. The transmission apparatus 1500 may be, for example, a station or an access point. Alternatively, the transmission apparatus 1500 is deployed at a station or an access point. The processing unit 1502 of the transmission apparatus 1500 may be a processor, and the receiving unit 1501 of the transmission apparatus 1500 may be a transceiver.

[00289] In some embodiments, the PPDU further includes an extremely high throughput-short training field EHT-STF adjacent to and following the U-SIG.

[00290] In some embodiments, the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a number of EHT-SIG symbols, in the U-SIG.

[00291] In some embodiments, the U-SIG further includes a number of spatial streams subfield and/or a subfield indicating a number of extremely high throughput-long training field (EHT-LTF) symbols, and the number of spatial streams subfield and/or the subfield indicating the number of EHT-LTF symbols indicate/indicates a number of spatial streams and the number of EHT-LTF symbols.

[00292] FIG. 16 is a schematic diagram of modules of a transmission apparatus according to an

symbols is 1, and the EHT-SIG is modulated by using BPSK and a code rate of 1/2.

[00303] The processing unit 1702 is configured to perform channel estimation by using the NDP.

[00304] In this way, a Bfee can determine, based on an AID in the EHT-SIG of the NDP, information related to a user of the NDP. In this way, the Bfee can accurately determine whether the Bfee is a user that needs to perform channel sounding and feed back a beamforming report.

[00305] The transmission apparatus 1600 may be understood as the Bfee. The transmission apparatus 1700 may be, for example, a station or an access point. Alternatively, the transmission apparatus 1700 is deployed at a station or an access point. The processing unit 1702 of the transmission apparatus 1700 may be a processor, and the receiving unit 1701 of the transmission apparatus 1700 may be a transceiver.

[00306] In some embodiments, if the user of the NDP is one station, the AID indicated by an AID subfield is an AID of the station.

[00307] In some embodiments, if the user of the NDP is a plurality of stations, the AID indicated by the user field is 0, indicating that the NDP is sent through broadcast.

[00308] In some embodiments, if the user of the NDP is an access point, the AID indicated by the AID subfield is a specified value.

[00309] In some embodiments, the PPDU further includes a U-SIG, the U-SIG includes a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP.

[00310] In some embodiments, the PPDU further includes a U-SIG and an EHT-LTF, the U-SIG includes a number of space-time streams subfield that indicates a number of space-time streams, and a number of EHT-LTF symbols is greater than the number of space-time streams.

[00311] For related content of the foregoing embodiments of the transmission apparatuses, refer to related content of the foregoing method embodiments. Details are not described herein again.

[00312] This application further provides a computer-readable storage medium. The computer-readable storage medium stores a computer program. When the computer-readable storage medium is executed by a computer, a function of any one of the foregoing method embodiments is implemented.

[00313] This application further provides a computer program product. When the computer program product is executed by a computer, a function of any one of the foregoing method embodiments is implemented.

CLAIMS

1. A PPDU transmission method, comprising:

generating a physical layer protocol data unit (PPDU), wherein the PPDU is a null data packet (NDP), the PPDU comprises an extremely high throughput-signal (EHT-SIG) field, a symbol number of the EHT-SIG field is 1, and the EHT-SIG field is modulated by using binary phase shift keying (BPSK) and a code rate of 1/2; and

sending the PPDU.

2. The method according to claim 1, wherein the PPDU further comprises a universal signal (U-SIG) field, the U-SIG field comprises a subfield indicating the symbol number of the EHT-SIG field, and the symbol number of the EHT-SIG field is 1.

3. The method according to claim 2, wherein the U-SIG field further comprises a modulation and coding scheme (MCS) subfield, and the MCS subfield indicates that the EHT-SIG field is modulated by using the BPSK and the code rate of 1/2.

4. The method according to claim 2 or 3, wherein an NDP indication subfield or a PPDU format subfield in the U-SIG indicates that the PPDU is in an uncompressed mode.

5. The method according to any one of claims 1 to 4, wherein the EHT-SIG field further comprises: a subfield indicating a number of space streams, and subfield indicating the symbol number of the EHT-SIG field.

6. A PPDU transmission method, comprising:

receiving a physical layer protocol data unit (PPDU), the PPDU comprises an extremely high throughput-signal (EHT-SIG) field; and

identifying, that the PPDU is a null data packet (NDP) according to a symbol number of the EHT-SIG field is 1, and the EHT-SIG field is modulated by using binary phase shift keying (BPSK) and a code rate of 1/2; and

performing channel estimation by using the NDP.

7. The method according to claim 6, wherein the PPDU further comprises a universal signal, (U-SIG) field, the U-SIG field comprises a subfield indicating the symbol number of EHT-SIG field, the symbol number of EHT-SIG field is 1.

8. The method according to claim 6 or 7, wherein the method further comprises:

identifying, that the PPDU is in an uncompressed mode according to an indication of an NDP

indication subfield or a PPDU format subfield in the U-SIG field.

9. The method according to claim 6 or 7, the U-SIG field further comprises a modulation and coding scheme (MCS) subfield, and the MCS subfield indicates that the EHT-SIG field is modulated by using the BPSK and the code rate of 1/2.

10. The method according to any one of claims 6 to 9, wherein the EHT-SIG field further comprises: a subfield indicating a number of space streams, and a subfield indicating a symbol number of the EHT-LTF field.

11. A PPDU transmission method, comprising:

generating a physical layer protocol data unit (PPDU), wherein the PPDU comprises a universal signal (U-SIG) field, and the U-SIG field comprises a subfield indicating that the PPDU is a null data packet (NDP); and

sending the PPDU.

12. The method according to claim 11, wherein the PPDU further comprises an extremely high throughput-short training (EHT-STF) field adjacent to and following the U-SIG field.

13. The method according to claim 11 or 12, wherein the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield and a subfield indicating a symbol number of the EHT-SIGfield.

14. The method according to any one of claims 11 to 13, wherein the U-SIG field further comprises a number of spatial streams subfield and a subfield indicating a symbol number of extremely high throughput-long training (EHT-LTF) field, and the number of spatial streams subfield indicates a number of spatial streams.

15. A PPDU transmission method, comprising:

receiving a physical layer protocol data unit (PPDU), the PPDU comprises a universal signal (U-SIG) field, and the U-SIG comprises a subfield indicating that the PPDU is a NDP; and

identifying, the PPDU is a null data packet (NDP) according to the U-SIG field; and

performing channel estimation by using the NDP.

16. The method according to claim 15, wherein the PPDU further comprises an extremely high throughput-short training (EHT-STF) field adjacent to and following the U-SIG field.

17. The method according to claim 15 or 16, wherein the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a symbol number of the EHT-SIG field.

18. The method according to claims 15 to 17, wherein the U-SIG field further comprises a number of spatial streams subfield and a subfield indicating a symbol number of extremely high throughput-long training (EHT-LTF) field, and the number of spatial streams subfield indicates a number of spatial streams.

19. A PPDU transmission method, comprising:

generating a physical layer protocol data unit (PPDU), wherein the PPDU is a null data packet (NDP), the PPDU comprises an extremely high throughput-signal (EHT-SIG) field, the EHT-SIG comprises an AID subfield indicating an association identifier (AID), and the AID is used to indicate information related to a user of the NDP; and

sending the PPDU.

20. The method according to claim 19, wherein if the user of the NDP is one station, the AID indicated by the AID subfield is an AID of the station;

if the user of the NDP is a plurality of stations, the AID indicated by the user field is 0, indicating that the NDP is sent through broadcast; or

if the user of the NDP is an access point, the AID indicated by the AID subfield is a specified value.

21. The method according to claim 19 or 20, wherein the PPDU further comprises a U-SIG field, the U-SIG field comprises a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP.

22. The method according to any one of claims 19 to 21, wherein the PPDU further comprises a U-SIG field and an EHT-LTF field, the U-SIG field comprises a number of space streams subfield that indicates a number of space streams, and a symbol number of the EHT-LTF fields is greater than the number of space streams.

23. A PPDU transmission method, comprising:

receiving a physical layer protocol data unit (PPDU), , the PPDU comprises an extremely high throughput-signal (EHT-SIG) field, the EHT-SIG comprises an AID subfield indicating an association identifier (AID), and the AID is used to indicate information related to a user of the NDP; and

identifying, the PPDU is a null data packet (NDP) acoording to the AID; and

performing channel estimation by using the NDP.

24. The method according to claim 23, wherein if the user of the NDP is one station, the AID

indicated by the AID subfield is an AID of the station;

if the user of the NDP is a plurality of stations, the AID indicated by the user field is 0, indicating that the NDP is sent through broadcast; or

if the user of the NDP is an access point, the AID indicated by the AID subfield is a specified value.

25. The method according to claim 23 or 24, wherein the PPDU further comprises a U-SIG field, the U-SIG field comprises a format subfield and/or a compressed subfield, and the format subfield or the compressed subfield indicates that the PPDU is the NDP.

26. The method according to any one of claims 23 to 25, wherein the PPDU further comprises a U-SIG field and an EHT-LTF field, the U-SIG field comprises a number of space streams subfield that indicates a number of space streams, and a symbol number of the EHT-LTF fields is greater than the number of space streams.

27. A PPDU transmission apparatus, comprising a processing unit and a transceiver unit, wherein

the processing unit is configured to generate a physical layer protocol data unit (PPDU), wherein the PPDU is a null data packet (NDP), the PPDU comprises an extremely high throughput-signal (EHT-SIG) field, a number of EHT-SIG field symbols is 1, and the EHT-SIG field is modulated by using binary phase shift keying (BPSK) and a code rate of 1/2; and

the transceiver unit is configured to send the PPDU.

28. The transmission apparatus according to claim 27, wherein the PPDU further comprises a universal signal (U-SIG) field, the U-SIG field comprises a subfield indicating the symbol number of the EHT-SIG field, and the symbol number of the EHT-SIG field is 1.

29. The transmission apparatus according to claim 28, wherein the U-SIG field further comprises a modulation and coding scheme (MCS) subfield, and the MCS subfield indicates that the EHT-SIG field is modulated by using the BPSK and the code rate of 1/2.

30. The transmission apparatus according to claim 28 or 29, wherein an NDP indication subfield or a PPDU format subfield in the U-SIG indicates that the PPDU is in an uncompressed mode.

31. The transmission apparatus according to any one of claims 27 to 30, wherein the EHT-SIG field further comprises: a subfield indicating a number of space streams, and a subfield indicating a symbol number of the EHT-LTF field.

32. A PPDU transmission apparatus, comprising a transceiver unit and a processing unit, wherein

the transceiver unit is configured to receive a physical layer protocol data unit (PPDU), the PPDU comprises an extremely high throughput-signal (EHT-SIG) field; and

the processing unit is configured to identify the PPDU is a null data packet (NDP) according to a symbol number of EHT-SIG field is 1, and the EHT-SIG field is modulated by using binary phase shift keying (BPSK) and a code rate of 1/2, and perform channel estimation by using the NDP.

33. The transmission apparatus according to claim 32, wherein the PPDU further comprises a universal signal (U-SIG) field, the U-SIG field comprises a subfield indicating the symbol number of the EHT-SIG field, and the symbol number of the EHT-SIG field is 1.

34. The transmission apparatus according to claim 32 or 33, wherein the U-SIG field further comprises a modulation and coding scheme (MCS) subfield, and the MCS subfield indicates that the EHT-SIG field is modulated by using the BPSK and the code rate of 1/2.

35. The transmission apparatus according to any one of claims 32 to 34, wherein the EHT-SIG field further comprises: a subfield indicating a number of space streams, and a subfield indicating a symbol number of the EHT-LTF field.

36. A PPDU transmission apparatus, comprising a processing unit and a transceiver unit, wherein

the processing unit is configured to generate a physical layer protocol data unit (PPDU), wherein the PPDU comprises a universal signal (U-SIG) field, and the U-SIG comprises a subfield indicating that the PPDU is a null data packet (NDP); and

the transceiver unit is configured to send the PPDU.

37. The transmission apparatus according to claim 36, wherein the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a symbol number of EHT-SIG field.

38. The transmission apparatus according to claim 36 or 37, wherein the U-SIG field further comprises a number of spatial streams subfield and a subfield indicating a symbol number of extremely high throughput-long training (EHT-LTF) field, and the number of spatial streams subfield indicates a number of spatial streams.

39. A PPDU transmission apparatus, comprising a processing unit and a transceiver unit,

wherein

the transceiver unit is configured to receive a physical layer protocol data unit (PPDU), , the PPDU comprises a universal signal (U-SIG) field, and the U-SIG field comprises a subfield indicating that the PPDU is a null data packet NDP; and

the processing unit is configured to identify the PPDU is a null data packet (NDP) according to the U-SIG field, andperform channel estimation by using the NDP.

40. The transmission apparatus according to claim 39, wherein the subfield indicating that the PPDU is the NDP is an NDP indication subfield, a PPDU format subfield, or a subfield indicating a symbol number of EHT-SIG field.

41. The transmission apparatus according to claim 39 or 40, wherein the U-SIG field further comprises a number of spatial streams subfield and a subfield indicating a symbol number of extremely high throughput-long training (EHT-LTF) field, and the number of spatial streams subfield indicates a number of space streams.

42. A PPDU transmission apparatus, comprising a processor and a transceiver, wherein when the processor executes a computer program or instructions in a memory, the method according to any one of claims 1 to 5 is implemented, the method according to any one of claims 6 to10 is implemented, the method according to any one of claims 11 to 14 is implemented, the method according to any one of claims 15 to 18 is implemented, the method according to any one of claims 19 to 22 is implemented, or the method according to any one of claims 23 to 26 is implemented.

43. A PPDU transmission apparatus, comprising a processor, wherein the processor is coupled to a memory, and is configured to: read instructions in the memory, and implement, according to the instructions, the method according to any one of claims 1 to 5, the method according to any one of claims 6 to 10, the method according to any one of claims 11to 14, the method according to any one of claims 15 to 18, the method according to any one of claims 19 to 22, or the method according to any one of claims 23 to 26.

44. A PPDU transmission apparatus, configured to implement the method according to any one of claims 1 to 5, the method according to any one of claims 6 to 10, the method according to any one of claims 11 to 14, the method according to any one of claims 15 to 18, the method according to any one of claims 19 to 22, or the method according to any one of claims 23 to 26.

45. A computer-readable storage medium, wherein the computer-readable storage medium stores computer instructions; and when the computer instructions are executed by a processor, the

method according to any one of claims 1 to 5 is implemented, the method according to any one of claims 6 to 10 is implemented, the method according to any one of claims 11 to 14 is implemented, the method according to any one of claims 15 to 18 is implemented, the method according to any one of claims 19 to 22 is implemented, or the method according to any one of claims 23 to 26 is implemented.

46. A computer program product, wherein when the computer program product is executed on a computer, the method according to any one of claims 1 to 5 is implemented, the method according to any one of claims 6 to 10 is implemented, the method according to any one of claims 11 to 14 is implemented, the method according to any one of claims 15 to 18 is implemented, the method according to any one of claims 19 to 22 is implemented, or the method according to any one of claims 23 to 26 is implemented.