COMMUNICATION METHOD AND COMMUNICATION APPARATUS

[0001] This application claims priority to Chinese Patent Application No. 202410312103.5, filed with the China National Intellectual Property Administration on March 19, 2024 and entitled "COMMUNICATION METHOD AND COMMUNICATION APPARATUS", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the communication field, and more specifically, to a communication method and a communication apparatus.

BACKGROUND

[0003] In some communication scenarios, radio data such as channel information needs to be collected for subsequent processing. Taking Artificial intelligence (artificial intelligence, AI) as an example, various wireless AI models have corresponding inputs and outputs. For example, an input into a channel information compression model is an original radio channel, and an output is a compressed bit sequence. In another example, an input into a channel information reconstruction model is a compressed bit sequence, and an output is a reconstructed radio channel. Wireless AI models need to collect data for model training, inference, and the like. Therefore, how to expand the application scope of the radio data is a problem worth considering.

SUMMARY

[0004] This application provides a communication method and a communication apparatus. By processing a signal from which channel information is obtained, the application scope of the channel information can be expanded.

[0005] According to a first aspect, a communication method is provided. The method is applied to a communication device side (for example, a terminal device side or a network device side). In other words, the method may be performed by a communication device, or may be performed by a component (for example, a chip, a system on chip, or a circuit) of the communication device. This is not limited in this application.

[0006] The method may include: sending a signal; and receiving channel information. The channel information is obtained based on the signal, the signal has undergone first processing

and/or second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal.

[0007] Based on the foregoing technical solution, the first processing and/or the second processing is performed on the signal, so that the channel information determined based on the signal can be applied to more scenarios, thereby expanding the application scope of the channel information. Specifically, the signal is designed to undergo the first processing and/or the second processing, the first processing and the second processing may be designed based on an actual communication requirement, so that the channel information obtained based on the signal meets the actual communication requirement. For example, if the channel information is used as an input into or an output of a model (for example, an AI model), to expand the application scope of the channel information, the first processing and the second processing may be designed, so that the channel information obtained based on the signal is related to a location (for example, an antenna location) or is unrelated to a response of a receiving end and/or a sending end, or a relationship is almost negligible. In this way, the channel information can be applied to more models, for example, a model involving a location and the channel information, thereby expanding the application scope of the channel information.

[0008] With reference to the first aspect, in some implementations of the first aspect, the first processing includes: processing the sending parameter of the signal based on reference information.

[0009] Based on the foregoing technical solution, the sending parameter of the signal may be processed based on the reference information, so that the first processing on the signal can be implemented in a simple and easy manner.

[0010] With reference to the first aspect, in some implementations of the first aspect, the second processing includes: processing the receiving parameter of the signal and/or the channel information corresponding to the signal based on reference information.

[0011] Based on the foregoing technical solution, the receiving parameter of the signal and/or the channel information corresponding to the signal may be processed based on the reference information, so that the second processing on the signal can be implemented in a simple and easy manner.

[0012] With reference to the first aspect, in some implementations of the first aspect, the method further includes: sending and/or receiving first indication information. The first indication information indicates the reference information.

[0013] With reference to the first aspect, in some implementations of the first aspect, the signal has undergone the first processing and has not undergone the second processing, and the method further includes: sending second indication information. The second indication information

indicates the second processing, and the second processing is determined based on the channel information and the reference information.

[0014] Based on the foregoing technical solution, if the signal has undergone the first processing and has not undergone the second processing, the second processing may be further determined based on the channel information obtained based on the signal and the reference information (for example, a function of the second processing is determined), so that the second processing can be performed on the receiving parameter of the signal and/or the channel information corresponding to the signal when the signal is subsequently received.

[0015] With reference to the first aspect, in some implementations of the first aspect, the signal has undergone the second processing and has not undergone the first processing, and the method further includes: determining the first processing based on the channel information and the reference information; or receiving third indication information, where the third indication information indicates the first processing, and the first processing is determined based on the channel information and the reference information.

[0016] Based on the foregoing technical solution, if the signal has undergone the second processing and has not undergone the first processing, the first processing may be further determined based on the channel information obtained based on the signal and the reference information (for example, a function of the first processing is determined), so that the first processing can be performed on the sending parameter of the signal when the signal is subsequently sent.

[0017] With reference to the first aspect, in some implementations of the first aspect, the reference information includes at least one of the following: a reference transmit antenna, a reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival, and a reference angle of departure.

[0018] With reference to the first aspect, in some implementations of the first aspect, the method further includes: managing a model based on radio data. The radio data includes the channel information.

[0019] For example, the model is associated with the channel information. For example, an input into or an output of the model includes the channel information. For another example, an input into or an output of the model is obtained based on the channel information.

[0020] Based on the foregoing technical solution, the model may be managed based on the radio data, for example, the channel information. Because the signal used to obtain the channel information has undergone the first processing and/or the second processing, the first processing and/or the second processing may be performed to decouple the radio data (for example, the channel information obtained based on the signal) from an apparatus (for example, the sending

end and/or the receiving end), thereby expanding the application scope of the radio data.

[0021] With reference to the first aspect, in some implementations of the first aspect, an error between the channel information and channel information predicted by the model is greater than or equal to a preset threshold.

[0022] Based on the foregoing technical solution, data may be selectively collected. For example, data with poor model prediction quality is collected. For example, when the error between the channel information obtained based on the signal and the channel information predicted by the model is greater than or equal to the preset threshold, the channel information may be collected, and the model is managed based on the channel information. In this way, availability of the channel information can be improved.

[0023] With reference to the first aspect, in some implementations of the first aspect, the radio data further includes location information, and the location information includes location information associated with a receiving apparatus of the signal and/or location information associated with a sending apparatus of the signal.

[0024] With reference to the first aspect, in some implementations of the first aspect, the method further includes: receiving fourth indication information. The fourth indication information indicates the location information associated with the receiving apparatus.

[0025] With reference to the first aspect, in some implementations of the first aspect, the method further includes: sending radio data. The radio data includes the channel information and/or the location information associated with the sending apparatus of the signal, and the radio data is used to manage a model.

[0026] With reference to the first aspect, in some implementations of the first aspect, an input into the model includes the location information or the channel information, and/or a target output of the model includes the location information or the channel information; and the location information includes the location information associated with the receiving apparatus of the signal and/or the location information associated with the sending apparatus of the signal.

[0027] In an example, the input into the model includes the location information, and the target output includes the channel information.

[0028] In another example, the input into the model includes the channel information, and the target output includes the location information.

[0029] In another example, the input into the model includes the channel information, and the target output includes the channel information.

[0030] Based on the foregoing technical solution, the input into or the output of the model may be obtained in the foregoing manner. For example, the first processing and/or the second processing is performed on the signal, and the channel information is determined based on the

signal. The channel information may be used as an input into or an output of the model. Because the first processing and/or the second processing is performed on the signal, the application scope of the channel information obtained based on the signal may be expanded.

[0031] According to a second aspect, a communication method is provided. The method is applied to a communication device side (for example, a terminal device side or a network device side). In other words, the method may be performed by a communication device, or may be performed by a component (for example, a chip, a system on chip, or a circuit) of the communication device. This is not limited in this application.

[0032] The method may include: receiving a signal; and obtaining channel information based on the signal. The signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal.

[0033] With reference to the second aspect, in some implementations of the second aspect, the first processing includes: processing the sending parameter of the signal based on reference information.

[0034] With reference to the second aspect, in some implementations of the second aspect, the second processing includes: processing the receiving parameter of the signal and/or the channel information corresponding to the signal based on reference information.

[0035] With reference to the second aspect, in some implementations of the second aspect, the method further includes: sending and/or receiving first indication information. The first indication information indicates the reference information.

[0036] With reference to the second aspect, in some implementations of the second aspect, the signal has undergone the first processing and has not undergone the second processing, and the method further includes: receiving second indication information, where the second indication information indicates the second processing, and the second processing is determined based on the channel information and the reference information; or determining the second processing based on the channel information and the reference information.

[0037] With reference to the second aspect, in some implementations of the second aspect, the signal has undergone the second processing and has not undergone the first processing, and the method further includes: sending third indication information. The third indication information indicates the first processing, and the first processing is determined based on the channel information and the reference information.

[0038] With reference to the second aspect, in some implementations of the second aspect, the reference information includes at least one of the following: a reference transmit antenna, a

reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival, and a reference angle of departure.

[0039] With reference to the second aspect, in some implementations of the second aspect, the method further includes: managing a model based on radio data. The radio data includes the channel information.

[0040] With reference to the second aspect, in some implementations of the second aspect, an error between the channel information and channel information predicted by the model is greater than or equal to a preset threshold.

[0041] With reference to the second aspect, in some implementations of the second aspect, the radio data further includes location information, and the location information includes location information associated with a receiving apparatus of the signal and/or location information associated with a sending apparatus of the signal.

[0042] With reference to the second aspect, in some implementations of the second aspect, the method further includes: receiving fifth indication information. The fifth indication information indicates the location information associated with the sending apparatus.

[0043] With reference to the second aspect, in some implementations of the second aspect, the method further includes: sending radio data. The radio data includes the channel information and/or location information associated with a receiving apparatus of the signal, and the radio data is used to manage a model.

[0044] With reference to the second aspect, in some implementations of the second aspect, an input into the model includes the location information or the channel information, and/or a target output of the model includes the location information or the channel information; and the location information includes the location information associated with the receiving apparatus of the signal and/or the location information associated with the sending apparatus of the signal.

[0045] In an example, the input into the model includes the location information, and the target output includes the channel information.

[0046] In another example, the input into the model includes the channel information, and the target output includes the location information.

[0047] In another example, the input into the model includes the channel information, and the target output includes the channel information.

[0048] According to a third aspect, a communication method is provided. The method is applied to a communication device side (for example, a terminal device side, a network device side, or an AI node side). In other words, the method may be performed by a communication device, or may be performed by a component (for example, a chip, a system on chip, or a circuit) of the communication device. This is not limited in this application.

[0049] The method may include: obtaining radio data, where the radio data includes channel information and/or location information, the channel information is obtained based on a signal, the signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal, and the location information includes location information associated with a receiving apparatus of the signal and/or location information associated with a sending apparatus of the signal; and managing a model based on the radio data.

[0050] With reference to the third aspect, in some implementations of the third aspect, the first processing includes: processing the sending parameter of the signal based on reference information.

[0051] With reference to the third aspect, in some implementations of the third aspect, the second processing includes: processing the receiving parameter of the signal and/or the channel information corresponding to the signal based on reference information.

[0052] With reference to the third aspect, in some implementations of the third aspect, the method further includes: sending the signal to the receiving apparatus; and the obtaining the radio data includes: receiving the channel information from the receiving apparatus.

[0053] With reference to the third aspect, in some implementations of the third aspect, the obtaining the radio data further includes: receiving fourth indication information. The fourth indication information indicates the location information associated with the receiving apparatus.

[0054] With reference to the third aspect, in some implementations of the third aspect, the method further includes: receiving the signal; and the obtaining the radio data includes: obtaining the channel information based on the signal.

[0055] With reference to the third aspect, in some implementations of the third aspect, the obtaining the radio data further includes: receiving fifth indication information. The fifth indication information indicates the location information associated with the sending apparatus.

[0056] With reference to the third aspect, in some implementations of the third aspect, an error between the channel information and channel information predicted by the model is greater than or equal to a preset threshold.

[0057] With reference to the third aspect, in some implementations of the third aspect, the managing the model based on the radio data includes: managing the model based on error data, or based on the location information and error data. The error data is determined based on the channel information and the channel information predicted by the model.

[0058] With reference to the third aspect, in some implementations of the third aspect, the signal has undergone the first processing and has not undergone the second processing, and the method further includes: determining the second processing based on the channel information and

the reference information; and/or sending second indication information to the receiving apparatus, or receiving second indication information, where the second indication information indicates the second processing, and the second processing is determined based on the channel information and the reference information.

[0059] With reference to the third aspect, in some implementations of the third aspect, the signal has undergone the second processing and has not undergone the first processing, and the method further includes: determining the first processing based on the channel information and the reference information; and/or sending third indication information to the sending apparatus, or receiving third indication information, where the third indication information indicates the first processing, and the first processing is determined based on the channel information and the reference information.

[0060] With reference to the third aspect, in some implementations of the third aspect, the reference information includes at least one of the following: a reference transmit antenna, a reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival, and a reference angle of departure.

[0061] With reference to the third aspect, in some implementations of the third aspect, an input into the model includes the location information or the channel information, and/or a target output of the model includes the location information or the channel information.

[0062] In an example, the input into the model includes the location information, and the target output includes the channel information.

[0063] In another example, the input into the model includes the channel information, and the target output includes the location information.

[0064] In another example, the input into the model includes the channel information, and the target output includes the channel information.

[0065] According to a fourth aspect, a communication method is provided. The method is applied to a communication device side (for example, a terminal device side, a network device side, or an AI node side). In other words, the method may be performed by a communication device, or may be performed by a component (for example, a chip, a system on chip, or a circuit) of the communication device. This is not limited in this application.

[0066] The method may include: obtaining channel information, where the channel information is obtained based on a signal, the signal has undergone first processing and has not undergone second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal; and determining the second processing based on the channel information and reference information.

[0067] With reference to the fourth aspect, in some implementations of the fourth aspect, the method further includes: sending second indication information. The second indication information indicates the second processing.

[0068] According to a fifth aspect, a communication method is provided. The method is applied to a communication device side (for example, a terminal device side, a network device side, or an AI node side). In other words, the method may be performed by a communication device, or may be performed by a component (for example, a chip, a system on chip, or a circuit) of the communication device. This is not limited in this application.

[0069] The method may include: obtaining channel information, where the channel information is obtained based on a signal, the signal has undergone second processing and has not undergone first processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal; and determining the first processing based on the channel information and reference information.

[0070] With reference to the fifth aspect, in some implementations of the fifth aspect, the method further includes: sending third indication information. The third indication information indicates the first processing.

[0071] With reference to the fourth aspect or the fifth aspect, in some implementations, the first processing includes: processing the sending parameter of the signal based on the reference information.

[0072] With reference to the fourth aspect or the fifth aspect, in some implementations, the second processing includes: processing the receiving parameter of the signal and/or the channel information corresponding to the signal based on the reference information.

[0073] With reference to the fourth aspect or the fifth aspect, in some implementations, the method further includes: sending and/or receiving first indication information. The first indication information indicates the reference information.

[0074] With reference to the fourth aspect or the fifth aspect, in some implementations, the reference information includes at least one of the following: a reference transmit antenna, a reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival, and a reference angle of departure.

[0075] For beneficial effects and possible designs of the second aspect and the fifth aspect, refer to the related descriptions in the first aspect. Details are not described herein again.

[0076] According to a sixth aspect, a communication apparatus is provided. The apparatus is configured to perform the method in any possible implementation of the first aspect to the fifth aspect. Specifically, the apparatus may include units and/or modules, for example, a processing

unit and/or a communication unit, configured to perform the method in any possible implementation of the first aspect to the fifth aspect.

[0077] In an implementation, the apparatus is a communication device (for example, a terminal device, a network device, or an AI node). When the apparatus is a communication device, the communication unit may be a transceiver or an input/output interface, and the processing unit may be at least one processor. Optionally, the transceiver may be a transceiver circuit. Optionally, the input/output interface may be an input/output circuit.

[0078] In another implementation, the apparatus is a chip, a system on chip, or a circuit used in the communication device (for example, a terminal device, a network device, or an AI node). When the apparatus is a chip, a system on chip, or a circuit used in a communication device, the communication unit may be an input/output interface, an interface circuit, an output circuit, an input circuit, a pin, a related circuit, or the like of the chip, the system on chip, or the circuit, and a processing unit may be at least one processor, the processing circuit, a logic circuit, or the like.

[0079] According to a seventh aspect, a communication apparatus is provided. The apparatus includes at least one processor, configured to execute a computer program or instructions, to perform the method in any possible implementation of the first aspect to the fifth aspect. Optionally, the apparatus further includes a memory, configured to store the computer program or the instructions. Optionally, the apparatus further includes a communication interface, and the processor reads the computer program or the instructions through the communication interface.

[0080] In an implementation, the apparatus is a communication device (for example, a terminal device, a network device, or an AI node).

[0081] In another implementation, the apparatus is a chip, a system on chip, or a circuit used in the communication device (for example, a terminal device, a network device, or an AI node).

[0082] According to an eighth aspect, a processor is provided, configured to perform the method provided in the first aspect to the fifth aspect.

[0083] Operations such as sending and obtaining/receiving related to the processor may be understood as operations such as outputting, receiving, and inputting of the processor or sending and receiving operations performed by a radio frequency circuit and an antenna, unless otherwise specified, or provided that the operations do not contradict actual functions or internal logic of the operations in related descriptions. This is not limited in this application.

[0084] Optionally, the apparatus further includes a memory, configured to store a program. Correspondingly, at least one processor is configured to execute a computer program or instructions stored in the memory.

[0085] Optionally, the apparatus further includes a communication interface. The communication interface is coupled to the processor, and may be configured to: input information

into the processor, or output information in the processor.

[0086] According to a ninth aspect, a computer-readable storage medium is provided. The computer-readable medium stores program code to be executed by an apparatus, and the program code is used to perform the method in any possible implementation of the first aspect to the fifth aspect.

[0087] According to a tenth aspect, a computer program product including instructions is provided. When the computer program product runs on a computer, the computer is enabled to perform the method in any possible implementation of the first aspect to the fifth aspect.

[0088] According to an eleventh aspect, a chip is provided. The chip includes a processor and a communication interface. The processor reads, through the communication interface, instructions stored in a memory, to perform the method according to any implementation of any one of the first aspect to the fifth aspect.

[0089] Optionally, in an implementation, the chip further includes the memory. The memory stores a computer program or instructions. The processor is configured to execute the computer program or the instructions stored in the memory. When the computer program or the instructions are executed, the processor is configured to perform the method according to any implementation of any one of the first aspect to the fifth aspect.

[0090] According to a twelfth aspect, a computer program product including instructions is provided. When the computer program product is run on a computer, the computer is enabled to perform the method according to any one of the implementations of the first aspect.

[0091] According to a thirteenth aspect, a communication system is provided, including one or more of a first apparatus, a second apparatus, a third apparatus, a fourth apparatus, and a fifth apparatus. The first apparatus is configured to implement the method according to any one of the first aspect and the possible implementations of the first aspect, the second apparatus is configured to implement the method according to any one of the second aspect and the possible implementations of the second aspect, the third apparatus is configured to implement the method according to any one of the third aspect and the possible implementations of the third aspect, the fourth apparatus is configured to implement the method according to any one of the fourth aspect and the possible implementations of the fourth aspect, and the fifth apparatus is configured to implement the method according to any one of the fifth aspect and the possible implementations of the fifth aspect.

BRIEF DESCRIPTION OF DRAWINGS

[0092] FIG. 1 is a diagram of a wireless communication system applicable to an embodiment

of this application;

[0093] FIG. 2 is a diagram of a path loss map model;

[0094] FIG. 3 is a diagram of a communication method 300 according to an embodiment of this application;

[0095] FIG. 4 is a diagram of first processing and second processing applicable to an embodiment of this application;

[0096] FIG. 5 is a diagram of a radio map model applicable to an embodiment of this application;

[0097] FIG. 6 is a diagram of a communication method 600 according to an embodiment of this application;

[0098] FIG. 7 is a diagram of a communication method 700 according to an embodiment of this application;

[0099] FIG. 8 is a diagram of a communication method 800 according to an embodiment of this application;

[00100] FIG. 9 is a diagram of a communication method 900 according to an embodiment of this application;

[00101] FIG. 10 is a diagram of a communication method 1000 according to an embodiment of this application;

[00102] FIG. 11 is a diagram of a communication apparatus 1100 according to an embodiment of this application;

[00103] FIG. 12 is a diagram of another communication apparatus 1200 according to an embodiment of this application;

[00104] FIG. 13 is a diagram of another communication apparatus 1300 according to an embodiment of this application;

[00105] FIG. 14 is a diagram of another communication apparatus 1400 according to an embodiment of this application; and

[00106] FIG. 15 is a diagram of a system on chip 1500 according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

[00107] The following describes technical solutions of this application with reference to accompanying drawings.

[00108] The technical solutions provided in this application may be applied to various communication systems, for example, a 5th generation (5th generation, 5G) or new radio (new

radio, NR) system, a long term evolution (long term evolution, LTE) system, an LTE frequency division duplex (frequency division duplex, FDD) system, and an LTE time division duplex (time division duplex, TDD) system. The technical solutions provided in this application may be further applied to a future communication system, for example, a 6th generation (6th generation, 6G) mobile communication system. The technical solutions provided in this application may be further applied to device-to-device (device-to-device, D2D) communication, vehicle-to-everything (vehicle-to-everything, V2X) communication, machine to machine (machine to machine, M2M) communication, machine type communication (machine type communication, MTC), and an internet of things (internet of things, IoT) communication system. The technical solutions provided in this application may be further applied to a low-frequency scenario, a high-frequency scenario, terahertz, optical communication, a licensed (licensed) frequency band, an unlicensed (unlicensed) frequency band, or the like. The technical solutions provided in this application may be further applied to non-terrestrial network (non-terrestrial network, NTN) systems such as an inter-satellite communication system and a satellite communication system. In an example, the satellite communication system includes a satellite base station and a terminal device. The satellite base station provides a communication service for the terminal device. The satellite base station may also communicate with a base station. A satellite may serve as a base station, or may serve as a terminal device. The satellite may be an uncrewed aerial vehicle, a hot air balloon, a low earth orbit satellite, a medium earth orbit satellite, a high earth orbit satellite, or the like. The satellite may alternatively be a non-terrestrial base station, a non-terrestrial device, or the like.

[00109] A device in the communication system may send a signal to another device or receive a signal from another device. The signal may include information, signaling, data, or the like. The device may be alternatively replaced with an entity, a network entity, a network element, a communication device, a communication module, a node, a communication node, or the like. In this disclosure, the device is used as an example for description. For example, the communication system may include at least one terminal device and at least one network device. The network device may send a downlink signal to the terminal device, and/or the terminal device may send an uplink signal to the network device.

[00110] A terminal device in embodiments of this application includes various devices having a wireless communication function, and the terminal device may be configured to be connected to a person, an object, a machine, and the like. The terminal device may be widely applied to various scenarios, for example, cellular communication, D2D, V2X, peer-to-peer (peer to peer, P2P), M2M, MTC, IoT, virtual reality (virtual reality, VR), augmented reality (augmented reality, AR), industrial control, autonomous driving, telemedicine, smart grid, smart furniture, smart office, smart wear, smart transportation, uncrewed aerial vehicle in smart city, robot, remote sensing,

passive sensing, positioning, navigation and tracking, and autonomous delivery. The terminal device may be a terminal in any one of the foregoing scenarios, such as an MTC terminal or an IoT terminal. The terminal device may be a user equipment (user equipment, UE) in a 3rd generation partnership project (3rd generation partnership project, 3GPP) standard, a terminal (terminal), a fixed device, a mobile station (mobile station) device or a mobile device, a subscriber unit (subscriber unit), a handheld device, a vehicle-mounted device, a wearable device, a cellular phone (cellular phone), a smartphone (smartphone), a SIP phone, a wireless data card, a personal digital assistant (personal digital assistant, PDA), a computer, a tablet computer, a notebook computer, a wireless modem, a handset (handset), a laptop computer (laptop computer), a computer having a wireless transceiver function, a smart book, a vehicle, a satellite, a global positioning system (global positioning system, GPS) device, a target tracking device, an aircraft (for example, an uncrewed aerial vehicle, a helicopter, a multi-helicopter, a quadcopter, or an airplane), a ship, a remote control device, a smart home device, an industrial device, an apparatus built in the foregoing device (for example, a communication module, a modem, or a chip in the foregoing device), or another processing device connected to a wireless modem. For ease of description, an example in which the terminal device is a terminal or a user is used for description below.

[00111] It should be understood that, in some scenarios, the UE may be further configured to serve as a base station. For example, the UE may act as a scheduling entity, and provides a sidelink signal between UEs in a V2X scenario, a D2D scenario, a P2P scenario, or the like.

[00112] In embodiments of this application, an apparatus configured to implement a function of a terminal device, that is, a terminal apparatus, may be a terminal device, or may be an apparatus that can support a terminal device in implementing the function, for example, a system on chip or a chip. The apparatus may be installed in the terminal device. In embodiments of this application, the system on chip may include a chip, or may include a chip and another discrete device.

[00113] In embodiments of this application, a network device may be a device for communicating with the terminal device. The network device may also be referred to as an access network device or a radio access network device. For example, the network device may be a base station. The network device in embodiments of this application may be a radio access network (radio access network, RAN) node (or device) that connects the terminal device to a wireless network. The base station may cover any of the following names in a broad sense, or may be replaced with the following names, for example, a NodeB (NodeB), an evolved NodeB (evolved NodeB, eNB), a next generation NodeB (next generation NodeB, gNB), a relay station, an access point, a transmitting and receiving point (transmitting and receiving point, TRP), a transmitting point, a primary station, a secondary station, a multi-standard radio (motor slide retainer, MSR)

node, a home base station, a network controller, an access node, a radio node, an access point (access point, AP), a transmission node, a transceiver node, a baseband unit (baseband unit, BBU), a remote radio unit (remote radio unit, RRU), an active antenna unit (active antenna unit, AAU), a remote radio head (remote radio head, RRH), a central unit (central unit, CU), a distributed unit (distributed unit, DU), or a positioning node. In a possible design, a processing unit for implementing a baseband function in the BBU is referred to as a base band high (base band high, BBH) unit, and a processing unit for implementing a baseband function in the RRU/AAU/RRH is referred to as a base band low (base band low, BBL) unit. The base station may be a macro base station, a micro base station, a relay node, a donor node, or the like, or a combination thereof. The base station may alternatively be a communication module, a modem, or a chip arranged in the foregoing device or apparatus. The base station may alternatively be a mobile switching center, a device that bears a base station function in D2D, V2X, and M2M communication, a network side device in a 6G network, a device that bears a base station function in a future communication system, or the like. The base station may support networks using a same access technology or different access technologies. Embodiments of this application impose no limitation on a specific technology and a specific device form used by the network device.

[00114] In some deployments, the network device mentioned in embodiments of this application may be a device including a CU or a DU, a device including a CU and a DU, or a device including a control plane CU node (a central unit-control plane (central unit-control plane, CU-CP)), a user plane CU node (a central unit-user plane (central unit-user plane, CU-UP)), and a DU node. For example, the network device may include a gNB-CU-CP, a gNB-CU-UP, and a gNB-DU.

[00115] In some deployments, a plurality of RAN nodes cooperatively assist the terminal in implementing radio access, and different RAN nodes separately implement some functions of the base station. For example, the RAN node may be a CU, a DU, a CU-CP, a CU-UP, or a radio unit (radio unit, RU). The CU and the DU may be separately disposed, or may be included in a same network element, for example, in a BBU. The RU may be included in a radio frequency device or a radio frequency unit, for example, included in an RRU, an AAU, or an RRH.

[00116] In different systems, the CU (or the CU-CP and the CU-UP), the DU, or the RU may also have different names, but a person skilled in the art may understand meanings thereof. For example, the radio access network may also be an open radio access network (open radio access network, O-RAN) architecture. In an ORAN system, the CU may also be referred to as an open CU (open CU, O-CU), the DU may also be referred to as an open DU (open DU, O-DU), the CU-CP may also be referred to as an open CU-CP (open CU-CP, O-CU-CP), the CU-UP may also be referred to as an open CU-UP (open CU-UP, O-CU-UP), and the RU may also be referred to as an

open RU (open RU, O-RU). Any of the CU (or the CU-CP or the CU-UP), the DU, and the RU in this application may be implemented by a software module, a hardware module, or a combination of the software module and the hardware module.

[00117] The base station may be fixed or mobile. For example, a helicopter or an uncrewed aerial vehicle may be configured as a mobile base station, and one or more cells may move based on a location of the mobile base station. In other examples, a helicopter or an uncrewed aerial vehicle may be configured as a device for communicating with another base station.

[00118] In embodiments of this application, an apparatus configured to implement a function of the network device may be the network device, or may be an apparatus that can support the network device in implementing the function, for example, a system on chip or a chip. The apparatus may be installed in the network device. In embodiments of this application, the system on chip may include a chip, or may include a chip and another discrete device. In embodiments of this application, an example in which the apparatus configured to implement the function of the network device is the network device is merely used for description, and imposes no limitation on the solutions in embodiments of this application.

[00119] The network device and the terminal device may be deployed on land, including an indoor or outdoor device, a handheld device, or a vehicle-mounted device; may be deployed on a water surface; or may be deployed on an airplane, a balloon, and a satellite in air. A scenario in which the network device and the terminal device are located is not limited in embodiments of this application. In addition, the terminal device and the network device may be hardware devices, or may be software functions run on dedicated hardware or software functions run on general-purpose hardware, for example, virtual functions instantiated on a platform (for example, a cloud platform), or an entity including a dedicated or general-purpose hardware device and a software function. This application imposes no limitation on specific forms of the terminal device and the network device.

[00120] In addition, to support an artificial intelligence (artificial intelligence, AI) technology in a wireless network, an AI node may be further introduced in the network.

[00121] Optionally, the AI node may be deployed at one or more of the following locations in the communication system: an access network device, a terminal device, a core network device, or the like. Alternatively, the AI node may be independently deployed, for example, deployed at a location other than any one of the foregoing devices, for example, a host or a cloud server in an over the top (over the top, OTT) system. The AI node may communicate with another device in the communication system. For example, the another device may be one or more of the following: a network device, a terminal device, a network element of a core network, and the like.

[00122] It may be understood that a quantity of AI nodes is not limited in this application. For

example, when there are a plurality of AI nodes, the plurality of AI nodes may be classified based on functions. For example, different AI nodes are responsible for different functions.

[00123] It may be further understood that, the AI nodes may be independent devices, may be integrated into a same device to implement different functions, may be network elements in a hardware device, may be software functions running on dedicated hardware, or may be virtualized functions instantiated on a platform (for example, a cloud platform). A specific form of the AI node is not limited in this application.

[00124] The AI node may be an AI network element or an AI module.

[00125] First, a communication system to which embodiments of this application are applicable is briefly described below.

[00126] FIG. 1 is a diagram of a wireless communication system applicable to an embodiment of this application.

[00127] As shown in FIG. 1, the wireless communication system includes a radio access network 100. The radio access network 100 may be a next-generation (for example, 6G or higher-version) radio access network, or a conventional (for example, 5G, 4G, 3G, or 2G) radio access network. One or more terminal devices (120a to 120j, collectively referred to as 120) may be connected to each other or connected to one or more network devices (110a and 110b, collectively referred to as 110) in the radio access network 100. Network elements in the wireless communication system are connected through an interface (for example, NG or Xn) or an air interface. In addition, one or more AI modules may be disposed in each network element in the wireless communication system. AI modules deployed in different network elements may be the same or different.

[00128] FIG. 1 is merely a diagram. The wireless communication system may further include another device, for example, may further include a core network device, a wireless relay device, and/or a wireless backhaul device, which are not shown in FIG. 1.

[00129] To facilitate better understanding of the technical solutions of this application, some related technologies involved in the technical solutions of this application are described.

[00130] 1. Artificial intelligence enables machines to learn and accumulate experience, to resolve problems such as natural language understanding, image recognition, and chess playing that can be resolved by humans through experience. The artificial intelligence may be understood as intelligence represented by machines manufactured by people. Usually, the artificial intelligence is a technology that presents human intelligence by using a computer program. An objective of the artificial intelligence includes understanding intelligence by building symbolic reasoning or computer programs for reasoning.

[00131] 2. Machine learning (machine learning, ML) is an implementation of artificial

intelligence. The machine learning is a method for enabling machines to learn, so that the machines can implement functions that cannot be implemented through direct programming. In practice, the machine learning is a method for training a model by using data and then performing prediction by using the model. There are many machine learning methods, such as a neural network (neural network, NN), a decision tree, and a support vector machine. A machine learning theory is mainly to design and analyze some algorithms that enable computers to learn automatically. A machine learning algorithm is an algorithm that automatically analyzes data to obtain a rule and uses the rule to predict unknown data.

[00132] 3. An AI model is an algorithm or a computer program that can implement an AI function. The AI model represents a mapping relationship between an input and an output of the model. In other words, the AI model is a function model that maps an input in a dimension to an output in a dimension. A parameter of the function model may be obtained through machine learning training. For example, $f(x)=ax^2+b$ is a quadratic function model, and may be considered as an AI model. a and b are parameters of the AI model, and a and b may be obtained through machine learning training. For example, the AI model mentioned in the following embodiments of this application is not limited to a neural network, a linear regression model, a decision tree model, a support vector machine (support vector machine, SVM), a Bayesian network, a Q-learning model, or another machine learning (machine learning, ML) model.

[00133] The AI model may be implemented by a hardware circuit, software, or a combination of software and hardware. This is not limited. A non-limiting example of the software includes program code, a program, a subprogram, instructions, an instruction set, code, a code segment, a software module, an application program, a software application program, or the like.

[00134] 4. A dataset includes data used for model training, model verification, or model testing in machine learning. An amount and quality of the data affect the effective of machine learning.

[00135] The dataset may include a training dataset and inference data.

[00136] (1) The training dataset, also referred to as training data, may be used for training of an AI model. The training dataset may include an input into the AI model, or include an input and a target output of the AI model. The training dataset includes one or more pieces of training data. The training data may include a training sample input into the AI model, and may also include the target output of the AI model. The target output may also be referred to as a label, a sample label, or a label sample. The tag is ground truth (ground truth). In the machine learning field, the ground truth (ground truth) is usually considered as accurate data or true data.

[00137] Model training is essentially learning of some features from training data. In a process of training an AI model (for example, a neural network model), because it is expected that an output of the AI model is as close as possible to a value that actually needs to be predicted, a

predicted value of a current network may be compared with an actually expected target value, and then a weight vector of each layer of the AI model is updated based on a difference between the predicted value and the target value (certainly, there is usually an initialization process before a first update, that is, a parameter is preconfigured for each layer of the AI model). For example, if the predicted value of the network is larger, the weight vector is adjusted to make the predicted value be smaller and adjustment is continuously performed until the AI model can predict the target value that is actually expected or a value that is very close to the target value that is actually expected. Therefore, "how to obtain, through comparison, a difference between the predicted value and the target value" needs to be predefined. This is a loss function (loss function) or an objective function (objective function). The loss function and the objective function are important equations used to measure the difference between the predicted value and the target value. The loss function is used as an example. A larger output value (loss) of the loss function indicates a greater difference. In this case, training of the AI model is a process of minimizing the loss as much as possible, so that a value of the loss function is less than a threshold, or the value of the loss function meets a target requirement. For example, the AI model is a neural network, and adjusting a model parameter of the neural network includes adjusting at least one of the following parameters: a quantity of layers of the neural network, a width of the neural network, a weight of a neuron, or a parameter in an activation function of a neuron.

[00138] (2) The inference data may be used as an input into a trained AI model for inference by the AI model. In a model inference process, the inference data may be input into the AI model to obtain a corresponding output, namely, an inference result.

[00139] Radio data collected in this embodiment of this application may be used for model training, model inference, model performance monitoring, or the like. This is not limited herein.

[00140] 5. A model application is to resolve a practical problem by using a trained model.

[00141] 6. Antenna: A plurality of antennas (virtual antennas or physical antennas) may be configured for each communication device, for example, the network device 110 or the terminal device 120 in FIG. 1, and the communication devices may communicate with each other by using a multi-antenna technology. The plurality of antennas may include at least one transmit antenna (or referred to as a sending antenna) configured to send a signal and at least one receive antenna configured to receive a signal.

[00142] 7. A signal is a symbol, data, a message, or the like transmitted via a medium (for example, an electromagnetic wave, a light wave, or a sound wave), and the signal may be decoded and understood by a receiving end. The signal may be an analog signal, a digital signal, or the like.

[00143] In an example, the signal is a reference signal (reference signal, RS). The reference signal may also be referred to as a pilot (pilot), a reference sequence, or the like, and is a known

signal. For example, the reference signal may be a signal provided by a sending apparatus for a receiving apparatus for channel estimation, channel sounding, data demodulation, or the like.

[00144] In this application, in an example, the reference signal (reference signal, RS) may be any one of the following: a channel state information-reference signal (channel state information-reference signal, CSI-RS), a sounding reference signal (sounding reference signal, SRS), a demodulation reference signal (demodulation reference signal, DMRS), a phase tracking reference signal (phase tracking reference signal, PT-RS), a cell reference signal (cell reference signal, CRS), and the like.

[00145] It should be understood that the foregoing enumerated reference signals are merely examples, and should not impose any limitation on this application. This application does not exclude a possibility of defining another reference signal in a future protocol to implement a same or similar function.

[00146] 8. Channel information indicates information that can reflect a channel feature and channel quality.

[00147] In an example, the channel information is at least one of the following: channel state information (channel state information, CSI), channel time-varying information, channel frequency offset information, or the like. The following mainly uses an example in which the channel information is CSI for description. It may be understood that any information that can reflect a channel feature and channel quality is applicable to this embodiment of this application.

[00148] For example, a network side obtains downlink CSI by performing uplink feedback by a terminal device. Specifically, the network side sends a downlink reference signal to the terminal device, and the terminal device receives the downlink reference signal. Because the terminal device has known sending information of the downlink reference signal, the terminal device may estimate (or measure), based on the received downlink reference signal, a downlink channel through which the downlink reference signal passes. Then, the terminal device may obtain, based on the measurement, a downlink channel matrix to generate CSI, and feed back the CSI to the network side.

[00149] In an example, the CSI includes at least one of the following: a channel quality indication (channel quality indication, CQI), a precoding matrix indicator (precoding matrix indicator, PMI), a rank indicator (rank indicator, RI), a CSI-RS resource indicator (CSI-RS resource indicator, CRI), a layer indicator (layer indicator, LI), reference signal received power (reference signal received power, RSRP), a signal to interference plus noise ratio (signal to interference plus noise ratio, SINR), or the like. The signal to interference plus noise ratio may also be referred to as a signal-to-interference-plus-noise ratio.

[00150] Currently, a large amount of research has been performed on introducing a model (for

example, an AI model or an ML model) into a wireless air interface. For example, the model may be used to predict a path loss of a user based on a user location. Specifically, an input into the model is the user location, and an output is a path loss value. In an example, the model may also be referred to as a path loss map model.

[00151] FIG. 2 is a diagram of a path loss map model. As shown in FIG. 2, after a location is input into the path loss map model, an output, namely, a path loss value, may be obtained. The path loss map model is used as an example. Data may be collected to perform training, performance evaluation, fine-tuning, calibration, and the like on the path loss map model. The collected data includes a location of a user and a corresponding path loss value, and the path loss value may be determined based on, for example, a receive power. This is not limited herein. However, a path loss value included in data collected by each user is not only related to the location of the user, but also is related to another parameter, for example, is further related to a device capability of the user. In other words, different users may collect different data at a same location. In this way, an application scope of the data is affected.

[00152] In view of this, this application provides a solution. A reference signal is processed, so that reference signals transmitted at a same location (for example, a same antenna location) are as identical as possible. In this way, channel information corresponding to a same location (for example, a same antenna location) may also be the same as possible. When the channel information corresponding to the location is used for model management, the channel information may be decoupled from a user, thereby expanding the application scope of the channel information.

[00153] Before the solutions of this application are described, the following several points are described.

[00154] (1) In this application, an "indication" may include a direct indication, an indirect indication, an explicit indication, or an implicit indication. When a piece of indication information is described as indicating A, it may be understood as that the indication information carries A, directly indicates A, or indirectly indicates A.

[00155] In this application, information indicated by the indication information is referred to as to-be-indicated information. In a specific implementation process, there are many manners of indicating the to-be-indicated information. For example, the manners include but are not limited to a manner in which the to-be-indicated information, for example, the to-be-indicated information or an index of the to-be-indicated information, may be directly indicated. Alternatively, the to-be-indicated information may be indirectly indicated by indicating other information, and there is an association relationship between the other information and the to-be-indicated information. Alternatively, only a part of the to-be-indicated information may be indicated, and the other part of the to-be-indicated information is known or pre-agreed on. For example, specific information

may alternatively be indicated by using an arrangement sequence of a plurality of pieces of information that is pre-agreed on (for example, stipulated in a protocol), to reduce indication overheads to some extent. In addition, the to-be-indicated information may be sent together as a whole, or may be divided into a plurality of pieces of sub-information and sent separately. In addition, sending periodicities and/or sending occasions of these pieces of sub-information may be the same or different.

[00156] (2) In this application, "sending" and "receiving" indicate directions of signal transmission. For example, "sending information to XX" may be understood as that a destination of the information is XX, and may include direct sending through an air interface, or include indirect sending by another unit or module through an air interface. "Receiving information from YY" may be understood as that a source of the information is YY, and may include direct receiving from YY through an air interface, or may include indirect receiving from YY via another unit or module through an air interface. The "sending" may also be understood as "outputting" of a chip interface, and the "receiving" may also be understood as "inputting" into the chip interface. In other words, sending and receiving may be performed between devices, for example, performed between a network device and a terminal device, or may be performed within a device. For example, sending or receiving is performed between components, modules, chips, software modules, or hardware modules within a device through a bus, a trace, or an interface. In addition, unless otherwise specified, "transmission" includes receiving and/or sending. For example, transmitting a signal may include receiving a signal and/or sending a signal.

[00157] (3) In this application, that information C is used to determine information D includes that the information D is determined based only on the information C, and also includes that the information D is determined based on the information C and other information. In addition, that information C is used to determine information D may further include an indirect determining case, for example, a case in which the information D is determined based on information E, and the information E is determined based on the information C.

[00158] (4) Terms "include", "have", and any variants thereof are intended to cover the non-exclusive inclusion. For example, a process, method, system, product, or device that includes a series of steps or units is not necessarily limited to those expressly listed steps or units, but may include other steps or units not expressly listed or inherent to the process, method, product, or device.

[00159] (5) In embodiments of this application, unless otherwise specified or if there is a logic conflict, terms and/or descriptions in different embodiments are consistent and may be mutually referenced, and technical features in different embodiments may be combined into a new embodiment based on an internal logical relationship thereof.

[00160] (6) In this application, "first" and "second" are merely for ease of description, and are used to distinguish between objects, but are not intended to limit the scope of embodiments of this application. The terms are not intended to describe an order or a sequence of features. It should be understood that objects described in such a way are interchangeable in an appropriate circumstance, so that a solution other than embodiments of this application can be described.

[00161] (7) In this application, "predefining" may indicate predefining in a standard protocol, or may indicate that devices pre-agree or pre-negotiate.

[00162] The method provided in embodiments of this application is described in detail below with reference to the accompanying drawings. Embodiments provided in this application may be applied to the communication system shown in FIG. 1. This is not limited.

[00163] FIG. 3 is a diagram of a communication method 300 according to an embodiment of this application. The method 300 shown in FIG. 3 may include the following steps.

[00164] 310: A first apparatus sends a signal. Correspondingly, a second apparatus receives the signal.

[00165] In an example, the signal is a reference signal. For the signal, refer to the foregoing term explanation. Details are not described herein again.

[00166] In a possible case, the first apparatus is a network device or a component (for example, a chip, a system on chip, or a circuit) of the network device, and the second apparatus is a terminal device or a component (for example, a chip, a system on chip, or a circuit) of the terminal device. In this case, the signal is a downlink signal.

[00167] In another possible case, the first apparatus is a terminal device or a component (for example, a chip, a system on chip, or a circuit) of the terminal device, and the second apparatus is a network device or a component (for example, a chip, a system on chip, or a circuit) of the network device. In this case, the signal is an uplink signal.

[00168] In another possible case, the first apparatus and the second apparatus each are a terminal device or a component (for example, a chip, a system on chip, or a circuit) of the terminal device. In this case, the signal is a sidelink signal.

[00169] In another possible case, the first apparatus and the second apparatus each are a network device or a component (for example, a chip, a system on chip, or a circuit) of the network device.

[00170] It may be understood that specific forms of the first apparatus and the second apparatus do not limit the protection scope of this embodiment of this application.

[00171] 320: The second apparatus obtains channel information based on the signal.

[00172] In a possible implementation, the second apparatus performs channel measurement or channel estimation based on the signal, to obtain the channel information. For the channel information, refer to the descriptions in the foregoing term explanation part. Details are not

described herein again.

[00173] The signal has undergone first processing and/or second processing. The following separately describes the first processing and the second processing.

[00174] (1) First processing

[00175] The first processing may also be referred to as pre-processing, and may indicate processing performed by the first apparatus on the signal, or may indicate processing on a sending parameter of the signal. For example, the first processing indicates processing performed by the first apparatus on the sending parameter of the signal, and that the signal has undergone the first processing indicates that the first apparatus has processed the sending parameter of the signal.

[00176] The sending parameter of the signal indicates a parameter used when the signal is sent, or is referred to as a parameter related to sending the signal. The sending parameter of the signal may include a parameter of the signal and a parameter other than the signal. In an example, the sending parameter of the signal includes at least one of the following: a transmit antenna of the signal, a transmit antenna spatial correlation parameter, a transmit power of the signal, and a value of the signal.

[00177] In an example, the sending parameter of the signal includes the transmit antenna of the signal. In this case, the first processing indicates that the first apparatus processes the transmit antenna of the signal. For example, that the first apparatus processes the transmit antenna of the signal includes: The first apparatus adjusts the transmit antenna of the signal to an omnidirectional antenna.

[00178] In another example, the sending parameter of the signal includes the transmit antenna spatial correlation parameter of the signal. In this case, the first processing indicates that the first apparatus processes the transmit antenna spatial correlation parameter of the signal. In an example, the transmit antenna spatial correlation parameter of the signal includes an angle of departure (angle of departure, AOD). For example, that the first apparatus processes the transmit antenna spatial correlation parameter of the signal includes: The first apparatus sends the signal at a predefined AOD.

[00179] In another example, the sending parameter of the signal includes the transmit power of the signal. In this case, the first processing indicates that the first apparatus processes the transmit power of the signal. For example, that the first apparatus processes the transmit power of the signal includes: The transmit power of the signal sent by the first apparatus meets a predetermined condition. For example, the transmit power of the signal is greater than or equal to a threshold. For another example, the transmit power of the signal is within a preset range.

[00180] In another example, the sending parameter of the signal includes the value of the signal. In this case, the first processing indicates that the first apparatus processes the value of the signal.

For example, that the first apparatus processes the value of the signal includes: The first apparatus adjusts the value of the signal based on that the transmit antenna of the signal is an omnidirectional antenna; or the first apparatus adjusts the value of the signal, so that an equivalent transmit antenna of the signal is an omnidirectional antenna.

[00181] The foregoing provides several examples for description, and this embodiment of this application is not limited thereto. For example, the foregoing information may also be used in combination. For another example, the omnidirectional antenna may also be another antenna.

[00182] Optionally, the first processing includes: processing the sending parameter of the signal based on reference information (or referred to as reference data, or referred to as a reference parameter). For example, the first apparatus processes (or referred to as "adjusts" or "compensates for") the sending parameter of the signal based on the reference information. Based on this, when sending the signal, each first apparatus may process the sending parameter of the signal based on the reference information, so that responses of first apparatuses are the same. In other words, signals sent over an air interface are the same for different first apparatuses.

[00183] In an example, if the responses of the first apparatuses are the same, it may indicate that responses of first apparatuses at a same location are the same. A same location may indicate a same antenna location and/or a same apparatus location. For example, if location coordinates (the location coordinates may be represented by using, for example, a three-dimensional coordinate system) of a plurality of antennas are the same, it may be considered that the plurality of antennas are at a same location. For another example, if geographical locations (for example, the geographical locations may be represented by using, for example, a coordinate system such as a latitude and a longitude) of a plurality of apparatuses are the same, it may be considered that the plurality of apparatuses are at a same location.

[00184] Reference information of different first apparatuses at a same location may be the same, and reference information of different first apparatuses at different locations may be the same or different. This is not limited herein.

[00185] The reference information indicates information for reference when the sending parameter of the signal is processed. Optionally, the reference information includes at least one of the following: a reference transmit antenna, a reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival (angle of arrival, AOA), and a reference AOD. The reference transmit antenna is, for example, an omnidirectional antenna; or the reference transmit antenna is an anchor antenna, that is, an antenna serves as an anchor. The reference receive antenna is, for example, an omnidirectional antenna; or the reference receive antenna is an anchor antenna, that is, an antenna serves as an anchor.

[00186] It may be understood that the reference transmit antenna is used as an example. The

reference transmit antenna is named for differentiation, and may also be referred to as a transmit antenna, a target transmit antenna, or the like. Naming of the reference transmit antenna does not limit the protection scope of this embodiment of this application. Other reference information is similar, and details are not described herein again.

[00187] The following describes several examples based on the reference information.

[00188] Example 1: The reference information includes the reference transmit antenna.

[00189] In this example, the first apparatus may process the sending parameter of the signal based on the reference transmit antenna. That the first apparatus processes the sending parameter of the signal based on the reference transmit antenna may include: The first apparatus sends the signal based on the reference transmit antenna; or the first apparatus adjusts the value of the signal based on the reference transmit antenna.

[00190] Example 2: The reference information includes the reference receive antenna.

[00191] In this example, the first apparatus may process the sending parameter of the signal based on the reference receive antenna. That the first apparatus processes the sending parameter of the signal based on the reference receive antenna may include: The first apparatus sends the signal based on a transmit antenna corresponding to the reference receive antenna; or the first apparatus adjusts the value of the signal based on a transmit antenna corresponding to the reference receive antenna.

[00192] Example 3: The reference information includes the reference AOD.

[00193] In this example, the first apparatus may process the sending parameter of the signal based on the reference AOD. That the first apparatus processes the sending parameter of the signal based on the reference AOD may include: The first apparatus sends the signal based on the reference AOD. In other words, the first apparatus sends the signal at the reference AOD.

[00194] Example 4: The reference information includes the reference AOA.

[00195] In this example, the first apparatus may process the sending parameter of the signal based on the reference AOA. That the first apparatus processes the sending parameter of the signal based on the reference AOA may include: The first apparatus sends the signal based on an AOD corresponding to the reference AOA. In other words, the first apparatus sends the signal at an AOD corresponding to the reference AOA.

[00196] For example, there is an association relationship between an AOA and an AOD. In this way, the first apparatus determines, based on the AOA and the association relationship, the AOD associated with the AOA (or the AOD corresponding to the AOA). The association relationship between an AOA and an AOD may exist, for example, stored or transmitted, in a form of a table, a function, a text, or a character string.

[00197] Example 5: The reference information includes the reference location.

[00198] The reference location may include at least one of the following: a location of a reference device, a location of a reference transmit antenna, or a location of a reference receive antenna.

[00199] For example, the first apparatus may process the sending parameter of the signal based on the location of the reference device. That the first apparatus processes the sending parameter of the signal based on the location of the reference device (for brevity, the location of the reference device is referred to as a location #1 in the following) may include: A sending parameter used when the first apparatus sends the signal is the same as a sending parameter used when the first apparatus sends the signal at the location #1. For example, a transmit antenna used when the first apparatus sends the signal is the same as a transmit antenna used when the first apparatus sends the signal at the location #1.

[00200] For another example, the first apparatus may process the sending parameter of the signal based on the location of the reference transmit antenna. That the first apparatus processes the sending parameter of the signal based on the location of the reference transmit antenna (for brevity, the location of the reference transmit antenna is referred to as a location #2 in the following) may include: A transmit antenna used when the first apparatus sends the signal is the same as a transmit antenna at the location #2; or the first apparatus adjusts the transmit antenna of the signal based on the transmit antenna at the location #2.

[00201] For another example, the first apparatus may process the sending parameter of the signal based on the location of the reference receive antenna. That the first apparatus processes the sending parameter of the signal based on the location of the reference receive antenna (for brevity, the location of the reference receive antenna is referred to as a location #3 in the following) may include: A transmit antenna used when the first apparatus sends the signal is the same as a transmit antenna corresponding to a receive antenna at the location #3; or the first apparatus adjusts the transmit antenna of the signal based on the transmit antenna corresponding to the receive antenna at the location #3.

[00202] Example 6: The reference information includes channel information corresponding to the reference location.

[00203] The reference channel information may be, for example, the channel information corresponding to the reference location, or may be channel information.

[00204] In this example, the first apparatus may process the sending parameter of the signal based on the reference channel information. That the first apparatus processes the sending parameter of the signal based on the reference channel information may include: The first apparatus sends the signal based on the sending parameter, of the signal, corresponding to the reference channel information; or the first apparatus adjusts the sending parameter of the signal

based on the sending parameter, of the signal, corresponding to the reference channel information.

[00205] Example 7: The reference information includes the response of the reference device.

[00206] In this example, the first apparatus may process the sending parameter of the signal based on the response of the reference device. That the first apparatus processes the sending parameter of the signal based on the response of the reference device may include: The first apparatus processes the sending parameter of the signal, so that a response of the first apparatus is the same as the response of the reference device.

[00207] The foregoing examples are examples for description, and impose no limitation thereto. For example, the foregoing reference information may be used separately, or may be used in combination. For example, at least two pieces of reference information are used in combination. For example, the reference information includes the reference location and the channel information of the reference location. For another example, the reference information includes the reference AOA and the reference AOD.

[00208] The first apparatus may determine the reference information in the following manner.

[00209] In a possible implementation, the first apparatus receives first indication information. The first indication information indicates the reference information. For example, the second apparatus or another apparatus (for example, an apparatus different from the second apparatus and the first apparatus) sends the first indication information to the first apparatus.

[00210] In another possible implementation, the first apparatus determines the reference information. For example, the reference information is predefined. For another example, the first apparatus configures the reference information. Further, optionally, the first apparatus sends the first indication information to the second apparatus. The first indication information indicates the reference information.

[00211] Optionally, the method 300 further includes: The first apparatus obtains the first processing. That the first apparatus obtains the first processing may be understood as that the first apparatus obtains related information of the first processing. For example, the first apparatus obtains a function of the first processing, or the first apparatus obtains a specific processing manner of the first processing.

[00212] In a first possible implementation, the first apparatus receives third indication information. The third indication information indicates the first processing.

[00213] For example, the third indication information indicates related information of the first processing, for example, a function of the first processing or a processing manner of the first processing.

[00214] In an example, the signal has undergone the second processing and has not undergone the first processing. The second apparatus or another apparatus (for example, an apparatus different

from the second apparatus and the first apparatus) determines the function of the first processing based on the channel information and the reference information, and sends the third indication information to the first apparatus. The third indication information indicates the first processing. Specifically, the first apparatus sends the signal, and the second apparatus receives the signal, and obtains the channel information based on the signal, for example, performs channel measurement based on the signal to obtain the channel information. The signal has undergone the second processing and has not undergone the first processing. The second apparatus determines the function of the first processing based on the channel information and the reference information, and sends the third indication information to the first apparatus. Alternatively, the second apparatus sends the channel information to the another apparatus, and the another apparatus determines the function of the first processing based on the channel information and the reference information, and sends the third indication information to the first apparatus.

[00215] The reference information may include the reference channel information, and the reference channel information may be obtained based on the signal that has undergone the first processing and the second processing. The reference channel information may be collected in advance, determined based on historical information, or predicted by a model. This is not limited herein.

[00216] In a second possible implementation, the first apparatus determines the first processing.

[00217] For example, the first apparatus determines the related information of the first processing, for example, the function of the first processing or the processing manner of the first processing.

[00218] In an example, the signal has undergone the second processing and has not undergone the first processing, and the first apparatus determines the function of the first processing based on the channel information and the reference information. Specifically, the first apparatus sends the signal, and the second apparatus receives the signal, and obtains the channel information based on the signal, for example, performs channel measurement based on the signal to obtain the channel information. The signal has undergone the second processing and has not undergone the first processing. The second apparatus sends the channel information to the first apparatus, and the first apparatus determines the function of the first processing based on the channel information and the reference information. For the reference information, refer to the descriptions in the first possible implementation.

[00219] The foregoing describes a related solution of the first processing, and the following describes a solution of the second processing.

[00220] (2) Second processing

[00221] The second processing may also be referred to as post-processing, and may indicate

processing performed by the second apparatus on the signal and/or the channel information corresponding to the signal, or may indicate processing on a receiving parameter of the signal and/or the channel information corresponding to the signal. For example, the second processing indicates processing performed by the second apparatus on the receiving parameter of the signal and/or the channel information corresponding to the signal, and that the signal has undergone the second processing indicates that the second apparatus has processed the receiving parameter of the signal and/or the channel information corresponding to the signal.

[00222] The receiving parameter of the signal indicates a parameter used when the signal is received, or is referred to as a parameter related to receiving the signal. The receiving parameter of the signal may include a parameter of the signal (namely, a parameter of receiving the signal) and/or a parameter other than the parameter of the signal. In an example, the receiving parameter of the signal includes at least one of the following: a receive antenna of the signal, a receive antenna spatial correlation parameter, a receive power of the signal, and a value of the signal (namely, a value of the received signal).

[00223] In an example, the receiving parameter of the signal includes the receive antenna of the signal. In this case, the second processing indicates that the second apparatus processes the receive antenna of the signal. For example, that the second apparatus processes the receive antenna of the signal includes: The second apparatus adjusts the receive antenna of the signal to an omnidirectional antenna.

[00224] In another example, the receiving parameter of the signal includes the receive antenna spatial correlation parameter of the signal. In this case, the second processing indicates that the second apparatus processes the receive antenna spatial correlation parameter of the signal. In an example, the receive antenna spatial correlation parameter of the signal includes an AOA. For example, that the second apparatus processes the receive antenna spatial correlation parameter of the signal includes: The second apparatus receives the signal at a predefined AOA.

[00225] In another example, the receiving parameter of the signal includes the receive power of the signal. In this case, the second processing indicates that the second apparatus processes the receive power of the signal. For example, that the second apparatus processes the receive power of the signal includes: The receive power of the signal sent by the second apparatus meets a predetermined condition. For example, the receive power of the signal is greater than or equal to a threshold. For another example, the receive power of the signal is within a preset range.

[00226] In another example, the receiving parameter of the signal includes the value of the received signal. In this case, the second processing indicates that the second apparatus processes the value of the received signal. For example, that the second apparatus processes the value of the received signal includes: The second apparatus adjusts, based on that the receive antenna of the

signal is an omnidirectional antenna, the value of the received signal; or the second apparatus adjusts the value of the received signal, so that an equivalent receive antenna of receiving the signal is an omnidirectional antenna.

[00227] The foregoing provides several examples for description, and this embodiment of this application is not limited thereto. For example, the foregoing information may also be used in combination. For another example, the omnidirectional antenna may also be another antenna.

[00228] Optionally, the second processing includes: processing (or referred to as "adjusting" or "compensating for") the receiving parameter of the signal and/or the channel information corresponding to the signal based on the reference information (or referred to as the reference data or the reference parameter). For example, the second apparatus processes, based on the reference information, the receiving parameter of the signal and/or the channel information corresponding to the signal. Based on this, when receiving the signal and determining the channel information, each second apparatus may process, based on the reference information, the receiving parameter of the signal and/or the channel information corresponding to the signal, so that responses of second apparatuses are the same, that is, signals received over the air interface are the same for different second apparatuses.

[00229] In an example, if the responses of the second apparatuses are the same, it may indicate that responses of second apparatuses at a same location are the same. For a same location and the reference information, refer to the foregoing related descriptions. Details are not described herein again. The following lists several examples.

[00230] Example 1: The reference information includes the reference receive antenna.

[00231] In this example, the second apparatus may process the receiving parameter of the signal based on the reference receive antenna. That the second apparatus processes the receiving parameter of the signal based on the reference receive antenna may include: The second apparatus receives the signal based on the reference receive antenna; or the second apparatus adjusts, based on the reference receive antenna, the value of the received signal.

[00232] Example 2: The reference information includes the reference transmit antenna.

[00233] In this example, the second apparatus may process the receiving parameter of the signal based on the reference transmit antenna. That the second apparatus processes the receiving parameter of the signal based on the reference transmit antenna may include: The second apparatus receives the signal based on a receive antenna corresponding to the reference transmit antenna; or the second apparatus adjusts, based on the reference transmit antenna, the value of the received signal.

[00234] Example 3: The reference information includes the reference AOA.

[00235] In this example, the second apparatus may process the receiving parameter of the signal

based on the reference AOA. That the second apparatus processes the receiving parameter of the signal based on the reference AOA may include: The second apparatus receives the signal based on the reference AOA. In other words, the second apparatus receives the signal at the reference AOA.

[00236] Example 4: The reference information includes the reference AOD.

[00237] In this example, the second apparatus may process the receiving parameter of the signal based on the reference AOD. That the second apparatus processes the receiving parameter of the signal based on the reference AOD may include: The second apparatus receives the signal based on an AOA corresponding to the reference AOD. In other words, the second apparatus receives the signal at the AOA corresponding to the reference AOD. For example, there is an association relationship between an AOA and an AOD. In this way, the second apparatus determines, based on the AOD and the association relationship, the AOA associated with the AOD (or the AOA corresponding to the AOD).

[00238] Example 5: The reference information includes the reference location.

[00239] The reference location may include at least one of the following: a location of a reference device, a location of a reference transmit antenna, or a location of a reference receive antenna.

[00240] For example, the second apparatus may process the receiving parameter of the signal based on the location of the reference device. That the second apparatus processes the receiving parameter of the signal based on the location (namely, the location #1) of the reference device may include: A receiving parameter used when the second apparatus receives the signal is the same as a receiving parameter used when the second apparatus receives the signal at the location #1. For example, a receive antenna used when the second apparatus receives the signal is the same as a receive antenna used when the second apparatus receives the signal at the location #1.

[00241] For another example, the second apparatus may process the receiving parameter of the signal based on the location of the reference transmit antenna. That the second apparatus processes the receiving parameter of the signal based on the location (namely, the location #2) of the reference transmit antenna may include: A receive antenna used when the second apparatus receives the signal is the same as a receive antenna corresponding to the transmit antenna at the location #2; or the second apparatus adjusts the receive antenna of the signal based on the receive antenna corresponding to the transmit antenna at the location #2.

[00242] For another example, the second apparatus may process the receiving parameter of the signal based on the location of the reference receive antenna. That the second apparatus processes the receiving parameter of the signal based on the location (namely, the location #3) of the reference receive antenna may include: A receive antenna used when the second apparatus receives

the signal is the same as a receive antenna at the location #3; or the second apparatus adjusts the receive antenna of the signal based on the receive antenna at the location #3.

[00243] Example 6: The reference information includes the reference channel information.

[00244] For the reference channel information, refer to the foregoing related descriptions. Details are not described herein again.

[00245] In this example, the second apparatus may process, based on the reference channel information, the receiving parameter of the signal and/or the channel information corresponding to the signal. That the second apparatus processes the receiving parameter of the signal based on the reference channel information may include: The second apparatus receives the signal based on a receiving parameter, of the signal, corresponding to the reference channel information; or the second apparatus adjusts the receiving parameter of the signal based on a receiving parameter, of the signal, corresponding to the reference channel information. That the second apparatus processes the channel information corresponding to the signal based on the reference channel information may include: The second apparatus adjusts the channel information corresponding to the signal based on the reference channel information, so that the channel information corresponding to the signal is the same as or similar to the reference channel information, and an error between the channel information corresponding to the signal and the reference channel information is less than or equal to a preset threshold.

[00246] Example 7: The reference information includes the response of the reference device.

[00247] In this example, the second apparatus may process the receiving parameter of the signal based on the response of the reference device. That the second apparatus processes the receiving parameter of the signal based on the response of the reference device may include: The second apparatus processes the receiving parameter of the signal, so that a response of the second apparatus is the same as the response of the reference device.

[00248] The foregoing examples are examples for description, and impose no limitation thereto. For example, the foregoing reference information may be used separately, or may be used in combination. For example, at least two pieces of reference information are used in combination. For example, the reference information includes the reference location and the channel information of the reference location. For another example, the reference information includes the reference AOA and the reference AOD.

[00249] The second apparatus may determine the reference information in the following manner.

[00250] In a possible implementation, the second apparatus receives the first indication information. The first indication information indicates the reference information. For example, the first apparatus or another apparatus (for example, an apparatus different from the second apparatus and the first apparatus) sends the first indication information to the second apparatus.

[00251] In another possible implementation, the second apparatus determines the reference information. For example, the reference information is predefined. For another example, the second apparatus configures the reference information. Further, optionally, the second apparatus sends the first indication information to the first apparatus. The first indication information indicates the reference information.

[00252] Optionally, the method 300 further includes: The second apparatus obtains the second processing.

[00253] In a first possible implementation, the second apparatus receives second indication information. The second indication information indicates the second processing.

[00254] For example, the second indication information indicates related information of the second processing, for example, a function of the second processing or a processing manner of the second processing.

[00255] In an example, the signal has undergone the first processing and has not undergone the second processing. The second apparatus or another apparatus (for example, an apparatus different from the second apparatus and the first apparatus) determines the function of the second processing based on the channel information and the reference information, and sends the second indication information to the second apparatus. The second indication information indicates the function of the second processing. Specifically, the first apparatus sends the signal, and the second apparatus receives the signal, and obtains the channel information based on the signal, for example, performs channel measurement based on the signal to obtain the channel information. The signal has undergone the first processing and has not undergone the second processing. The second apparatus sends the channel information to the first apparatus or the another apparatus, and the first apparatus or the another apparatus determines the function of the second processing based on the channel information and the reference information, and sends the second indication information to the second apparatus.

[00256] The reference information may include the reference channel information, and the reference channel information may be obtained based on the signal that has undergone the first processing and the second processing. The reference channel information may be collected in advance, determined based on historical information, or predicted by a model. This is not limited herein.

[00257] In a second possible implementation, the second apparatus determines the second processing.

[00258] For example, the second apparatus determines related information of the second processing, for example, a function of the second processing or a processing manner of the second processing.

[00259] In an example, the signal has undergone the first processing and has not undergone the second processing, and the second apparatus determines the function of the second processing based on the channel information and the reference information. Specifically, the first apparatus sends the signal, and the second apparatus receives the signal, and obtains the channel information based on the signal, for example, performs channel measurement based on the signal to obtain the channel information. The signal has undergone the first processing and has not undergone the second processing. The second apparatus determines the function of the second processing based on the channel information and the reference information. For the reference information, refer to the descriptions in the first possible implementation.

[00260] The foregoing describes the first processing and the second processing in detail. The following provides descriptions with reference to FIG. 4.

[00261] FIG. 4 is a diagram of first processing and second processing applicable to an embodiment of this application. As shown in FIG. 4, the first processing is performed on a to-be-transmitted signal, and the signal that has undergone the first processing is sent by a first apparatus (for example, a transmitter or a sending module of the first apparatus); and a second apparatus receives the signal through wireless transmission, performs the second processing, and obtains channel information based on the signal that has undergone the second processing. The second apparatus may process a receiving parameter of the signal; or may receive the signal, obtain the channel information based on the received signal, and then perform the second processing on the channel information, to obtain the channel information that has undergone the second processing. A multipath component (multipath component, MPC) module in FIG. 4 represents a process of multipath propagation of a radio signal in an environment, and the process may be affected by a location of the first apparatus, a location of the second apparatus, the environment, and the like.

[00262] Optionally, the method 300 further includes: A third apparatus manages a model based on radio data.

[00263] The third apparatus represents an apparatus that manages the model. Specifically, the third apparatus may deploy the model, and may manage the model by collecting the radio data. Managing the model includes but is not limited to: switching a model (that is, switching a current model to another model), selecting a model, training a model, monitoring model performance, and evaluating model quality.

[00264] The third apparatus may be the first apparatus; or the third apparatus may be the second apparatus; or the third apparatus may be an apparatus different from the first apparatus and the second apparatus. In addition, the third apparatus may be a network device or a component (for example, a chip, a system on chip, or a circuit) of the network device; or may be a terminal device or a component (for example, a chip, a system on chip, or a circuit) of the terminal device; or may

be an AI node or a component (for example, a chip, a system on chip, or a circuit) of the AI node. This is not limited.

[00265] The radio data, briefly referred to as data, represents data related to the model. For example, the radio data includes an input into and/or an output of the model.

[00266] In an example, the radio data includes channel information and/or location information. In this case, for example, the input into the model is the channel information, and/or the output of the model is the location information. For another example, the input into the model is the location information, and/or the output of the model is the channel information.

[00267] The channel information may be obtained based on the signal. For example, channel measurement is performed based on the signal to obtain the channel information. The signal may have undergone the first processing and/or the second processing. In other words, the channel information may be obtained in a manner in step 320. For the first processing and the second processing, refer to the foregoing related descriptions.

[00268] The location information indicates information about a location related to sending the signal and/or receiving the signal. In an example, the location information includes location information associated with the second apparatus and/or location information associated with the first apparatus.

[00269] In an example, the location information associated with the second apparatus includes at least one of the following: a geographical location (the geographical location may be represented by, for example, a coordinate system such as a latitude and a longitude) of the second apparatus, and location coordinates (the location coordinates may be represented by, for example, a three-dimensional coordinate system) of a receive antenna of receiving the signal by the second apparatus.

[00270] In an example, the location information associated with the first apparatus includes at least one of the following: a geographical location (the geographical location may be represented by, for example, a coordinate system such as a latitude and a longitude) of the first apparatus, and location coordinates (the location coordinates may be represented by, for example, a three-dimensional coordinate system) of a transmit antenna of sending the signal by the first apparatus.

[00271] In a possible case, the third apparatus is the second apparatus. In this case, the method 300 further includes: The second apparatus manages the model based on the radio data. In this case, further, optionally, the first apparatus sends, to the second apparatus, the location information associated with the first apparatus.

[00272] In another possible case, the third apparatus is the first apparatus. In this case, the method 300 further includes: The second apparatus sends the channel information to the first apparatus. Further, optionally, the second apparatus further sends, to the first apparatus, the

location information associated with the second apparatus. In this way, the first apparatus may manage the model based on the channel information and the location information.

[00273] In another possible case, the third apparatus is another apparatus (for example, an apparatus different from the second apparatus and the first apparatus). In this case, the method 300 further includes: The second apparatus sends the channel information to the another apparatus. Further, optionally, the second apparatus further sends, to the another apparatus, the location information associated with the second apparatus. Further, optionally, the first apparatus further sends the location information associated with the first apparatus to the another apparatus.

[00274] The model may be a model used in wireless communication. For example, the model is associated with the channel information. For example, an input into or an output of the model includes the channel information. For another example, an input into or an output of the model is obtained based on the channel information. In this way, the channel information may be obtained in the manner described in the method 300, and then used as an input into or an output of the model, or an input into or an output of the model is obtained. The model may be an AI model. In an example, a type of the model may be a neural network, a linear regression model, a decision tree model, an SVM, a Bayesian network, a Q-learning model, or another ML model. This is not limited herein.

[00275] In an example, the input into the model is the channel information, and the output is the location information; or the input into the model is the location information, and the output is the channel information. In this case, for example, the model may be used to predict the channel information based on a location, or predict a location based on the channel information.

[00276] In another example, the input into the model includes the channel information, and the output includes the channel information. In this case, for example, the model may be used to process the channel information, for example, compress and reconstruct the channel information, or predict the channel information.

[00277] In another example, the input into or the output of the model is obtained through processing based on the channel information. In this case, for example, a modulation or demodulation model may be trained based on the channel information.

[00278] The foregoing provides an example for description. This is not limited. For example, the channel information may be used for time domain/frequency domain channel prediction, and channel information compression. Based on different functions of the channel information, models may also be different, and inputs into or outputs of the models may also be different. In this embodiment of this application, an example in which the channel information is used for a radio map model (namely, an example of the model) is mainly used for description. In an example, the radio map model includes a multipath information obtaining module and a channel information

obtaining module.

[00279] FIG. 5 is a diagram of a radio map model applicable to an embodiment of this application. As shown in FIG. 5, the model includes a multipath information obtaining module and a channel information obtaining module. An input into the multipath information obtaining module includes location information, and an output is multipath information. The input into the multipath information obtaining module may further include environment information, for example, location information, height information, and material information of various objects (for example, a building and a tree) in an area in which a first apparatus and/or a second apparatus is located. The multipath information may include, for example, a delay, a power, an azimuth, and an elevation angle of each path. An input into the channel information obtaining model is the multipath information (namely, the output of the multipath information obtaining module), and an output is channel information. Specifically, after the multipath information is input into the channel information obtaining model, the channel information is output based on the multipath information and a response of an apparatus. The response of the apparatus (for example, the first apparatus and/or the second apparatus) includes a radio frequency link, an antenna pattern, and the like of the apparatus.

[00280] A third apparatus may always collect radio data, or may periodically collect radio data, or may collect (or report or send) radio data when some trigger conditions are met (for example, when model prediction quality is poor). This is not limited herein.

[00281] Further, optionally, an error between the channel information and channel information predicted by the model is greater than or equal to a preset threshold. Based on this, the radio data may be collected based on the model prediction quality. For example, radio data with poor model prediction quality may be collected. In this way, the model may be managed based on the radio data. For example, the model is trained based on the radio data. For another example, the model is switched based on the radio data, and the model is switched to another model. The following provides detailed descriptions in several cases. The radio data described below includes the channel information. Further, optionally, the radio data further includes the location information.

[00282] In a possible case, the third apparatus is the second apparatus. In this case, the second apparatus may collect the radio data when the error between the channel information and the channel information predicted by the model is greater than or equal to the preset threshold, and manage the model based on the radio data.

[00283] In another possible case, the third apparatus is the first apparatus. In this case, the second apparatus may send the channel information to the first apparatus when the error between the channel information and the channel information predicted by the model is greater than or equal to the preset threshold. Further, optionally, the second apparatus further sends, to the first

apparatus, location information associated with the second apparatus. In this way, the first apparatus may manage the model based on the radio data.

[00284] In another possible case, the third apparatus is another apparatus (for example, an apparatus different from the second apparatus and the first apparatus). In this case, the second apparatus may send the channel information to the another apparatus when the error between the channel information and the channel information predicted by the model is greater than or equal to the preset threshold. Further, optionally, the second apparatus further sends, to the another apparatus, location information associated with the second apparatus. In this way, the another apparatus may manage the model based on the radio data.

[00285] For ease of understanding, the following describes, by using an example in which the signal is a reference signal, a specific procedure applicable to embodiments of this application. It may be understood that the procedure described below is merely an example for description, and embodiments of this application are not limited thereto. For content that is not described in detail below, refer to the descriptions in the method 300. Details are not described below again.

[00286] FIG. 6 is a diagram of a communication method 600 according to an embodiment of this application. The method 600 is applicable to a scenario in which a reference signal has undergone first processing and second processing. The method 600 shown in FIG. 6 may include the following steps.

[00287] 610: A second apparatus and/or a first apparatus sends a calibration status. For example, the second apparatus sends the calibration status. The calibration status indicates whether the second apparatus is calibrated. If the second apparatus is calibrated, it indicates that the second apparatus performs the second processing when receiving the reference signal, or is capable of performing the second processing; or if the second apparatus is not calibrated, it indicates that the second apparatus does not perform the second processing when receiving the reference signal, or is incapable of performing the second processing. Therefore, that the calibration status indicates whether the second apparatus is calibrated may be replaced with the following: The calibration status indicates whether the second apparatus is capable of processing the reference signal, or the calibration status indicates whether the second apparatus is capable of performing the second processing on the reference signal, or the calibration status indicates whether the second apparatus performs the second processing on the received reference signal. In addition, the "calibration status" is merely a name, and may be replaced with a "device status", an "apparatus status", or the like. This is not limited herein. That the first apparatus sends the calibration status is similar, and details are not described herein again.

[00288] Alternatively, it may be considered by default that all apparatuses are calibrated. In this case, the method 600 may not include step 610. Alternatively, when a "not calibrated" indication

of an apparatus is not received, it may be considered that the apparatus is calibrated. Alternatively, when a "calibrated" indication of an apparatus is not received, it may be considered that the apparatus is not calibrated.

[00289] Alternatively, it may be considered by default that all sending ends (namely, first apparatuses) are calibrated. In this case, a receiving end (namely, the second apparatus) sends a calibration status indicating whether calibration is performed.

[00290] Alternatively, it may be considered by default that all receiving ends (namely, second apparatuses) are calibrated. In this case, a sending end (namely, the first apparatus) sends a calibration status indicating whether calibration is performed.

[00291] In the method 600, it is assumed that the first apparatus and the second apparatus are calibrated. For example, it is assumed that in step 610, the calibration status sent by the second apparatus indicates that the second apparatus is calibrated, and the calibration status sent by the first apparatus indicates that the first apparatus is calibrated.

[00292] 620: The first apparatus performs the first processing on the reference signal.

[00293] In a possible implementation, the first apparatus performs the first processing on the reference signal based on reference information. For details, refer to the related descriptions in the method 300. Details are not described herein again.

[00294] 630: The first apparatus sends the reference signal that has undergone the first processing.

[00295] 640: The second apparatus performs the second processing on the reference signal that has undergone the first processing, to obtain channel information.

[00296] Specifically, the second apparatus receives the reference signal that has undergone the first processing, and performs the second processing on the reference signal that has undergone the first processing, to obtain the channel information.

[00297] In a first possible implementation, the second apparatus performs, based on the reference information, the second processing on the reference signal that has undergone the first processing, and obtains the channel information based on the reference signal that has undergone the second processing.

[00298] In a second possible implementation, the second apparatus receives the reference signal that has undergone the first processing, determines the channel information based on the reference signal that has undergone the first processing, and performs the second processing on the channel information, to obtain the channel information that has undergone the second processing. For example, the second apparatus performs the second processing on the channel information based on the reference information, to obtain the channel information that has undergone the second processing.

[00299] For ease of description, step 640 in FIG. 6 shows only the first possible implementation. It may be understood that this embodiment of this application is not limited thereto.

[00300] 650: The second apparatus sends location information and channel information that are associated with the second apparatus.

[00301] The channel information is the channel information obtained in step 640.

[00302] In a first possible implementation, the first apparatus receives the location information and the channel information that are associated with the second apparatus. Further, optionally, the first apparatus manages a model based on radio data. The radio data includes location information and channel information, and the location information includes the location information associated with the second apparatus and/or location information associated with the first apparatus. For the location information, refer to related descriptions in the foregoing method 300. Details are not described herein again.

[00303] In a second possible implementation, the third apparatus receives the location information and the channel information that are associated with the second apparatus. Further, optionally, the third apparatus manages a model based on radio data. The radio data includes location information and channel information, and the location information includes the location information associated with the second apparatus and/or location information associated with the first apparatus. Further, optionally, the first apparatus sends the location information associated with the first apparatus to the third apparatus. For the location information, refer to related descriptions in the foregoing method 300. Details are not described herein again.

[00304] For ease of description, step 650 in FIG. 6 shows only the first possible implementation. It may be understood that this embodiment of this application is not limited thereto.

[00305] Based on the foregoing technical solution, the reference signal has undergone the first processing and the second processing, so that the obtained channel information is decoupled from a receiving end and a sending end (namely, the first apparatus and the second apparatus), thereby implementing hybrid use of radio data (for example, channel information) collected by a plurality of apparatuses, and expanding the application scope of the radio data.

[00306] FIG. 7 is a diagram of a communication method 700 according to an embodiment of this application. The method 700 is applicable to a scenario in which second processing is obtained. The method 700 shown in FIG. 7 may include the following steps.

[00307] 710: A second apparatus and/or a first apparatus sends a calibration status.

[00308] For the calibration status, refer to the related descriptions in step 610. Details are not described herein again.

[00309] In the method 700, it is assumed that the first apparatus is calibrated and the second apparatus is not calibrated. For example, it is assumed that in step 710, the calibration status sent

by the second apparatus indicates that the second apparatus is not calibrated, and it is considered by default that the first apparatus is calibrated. For another example, it is assumed that in step 710, the calibration status sent by the second apparatus indicates that the second apparatus is not calibrated, and the calibration status sent by the first apparatus indicates that the first apparatus is calibrated.

[00310] 720: The first apparatus performs first processing on a reference signal.

[00311] 730: The first apparatus sends the reference signal that has undergone the first processing.

[00312] 740: The second apparatus obtains channel information based on the reference signal that has undergone the first processing.

[00313] 750: The second apparatus sends location information and channel information that are associated with the second apparatus.

[00314] The channel information is the channel information obtained in step 740.

[00315] In a first possible implementation, the first apparatus receives the location information and the channel information that are associated with the second apparatus.

[00316] In a second possible implementation, another apparatus (for example, referred to as a fourth apparatus) receives the location information and the channel information that are associated with the second apparatus. The fourth apparatus may be the third apparatus described above, or may be an apparatus different from the first apparatus, the second apparatus, and the third apparatus. This is not limited herein.

[00317] For ease of description, step 750 in FIG. 7 shows only the first possible implementation. It may be understood that this embodiment of this application is not limited thereto. It is assumed that the first apparatus receives the location information and the channel information that are associated with the second apparatus, and the method 700 further includes step 760 and step 770.

[00318] 760: The first apparatus determines the second processing based on the location information, the channel information, and reference information.

[00319] The location information includes the location information associated with the second apparatus and/or location information associated with the first apparatus. For the location information, refer to related descriptions in the foregoing method 300. Details are not described herein again.

[00320] Specifically, the first apparatus calibrates the second apparatus based on the collected location information, the collected channel information, and the reference information, to obtain the second processing (for example, obtain a function or a processing manner of the second processing). The reference information may include, for example, a reference location and channel information corresponding to the reference location. For example, the first apparatus determines,

based on the collected location information, a reference location that is in the reference information and that is the same as the collected location information, and compares the collected channel information and the channel information corresponding to the reference location, to obtain the function of the second processing.

[00321] 770: The first apparatus sends second indication information to the second apparatus, where the second indication information indicates the second processing.

[00322] Based on the foregoing technical solution, the first processing is performed on the reference signal, and the channel information obtained based on the reference signal is compared with the reference information, to determine the second processing (for example, the function of the second processing), so that the second apparatus can process the reference signal based on the second processing, thereby improving availability of radio data (for example, the channel information).

[00323] FIG. 8 is a diagram of a communication method 800 according to an embodiment of this application. The method 800 is applicable to a scenario in which a function of first processing is obtained. The method 800 shown in FIG. 8 may include the following steps.

[00324] 810: A second apparatus and/or a first apparatus sends a calibration status.

[00325] For the calibration status, refer to the related descriptions in step 610. Details are not described herein again.

[00326] In the method 800, it is assumed that the first apparatus is not calibrated and the second apparatus is calibrated. For example, it is assumed that in step 810, the calibration status sent by the first apparatus indicates that the first apparatus is not calibrated, and it is considered by default that the second apparatus is calibrated. For another example, it is assumed that in step 810, the calibration status sent by the first apparatus indicates that the first apparatus is not calibrated, and the calibration status sent by the second apparatus indicates that the second apparatus is calibrated.

[00327] 820: The first apparatus sends a reference signal.

[00328] 830: The second apparatus performs second processing on the reference signal, to obtain channel information.

[00329] For step 830, refer to step 640. Details are not described herein again.

[00330] 840: The second apparatus determines the first processing based on location information, the channel information, and reference information.

[00331] Specifically, the second apparatus calibrates the first apparatus based on the collected location information, the collected channel information, and the reference information, to obtain the first processing (for example, obtain a function or a processing manner of the first processing). The reference information may include, for example, a reference location and channel information corresponding to the reference location. For example, the second apparatus determines, based on

the collected location information, a reference location that is in the reference information and that is the same as the collected location information, and compares the collected channel information and the channel information corresponding to the reference location, to obtain the function of the first processing. For the location information, refer to related descriptions in the foregoing method 300. Details are not described herein again.

[00332] The first processing is determined in at least the following three implementations.

[00333] In a first possible implementation, the second apparatus determines the first processing based on the location information, the channel information, and the reference information. The location information includes location information associated with the second apparatus and location information associated with the first apparatus. Further, optionally, the first apparatus sends, to the second apparatus, the location information associated with the first apparatus.

[00334] In a second possible implementation, the second apparatus sends, to the first apparatus, the location information and channel information that are associated with the second apparatus; and the first apparatus determines the first processing based on the location information, the channel information, and the reference information.

[00335] In a third possible implementation, the second apparatus sends, to another apparatus (for example, referred to as a fifth apparatus), the location information and channel information that are associated with the second apparatus; and the fifth apparatus determines the first processing based on the location information, the channel information, and the reference information. Further, optionally, the first apparatus sends, to the fifth apparatus, the location information associated with the first apparatus. The fifth apparatus may be the third apparatus described above, or may be a fourth apparatus, or may be an apparatus different from the first apparatus, the second apparatus, the third apparatus, and the fourth apparatus. This is not limited herein.

[00336] For ease of description, step 840 in FIG. 8 shows only the first possible implementation. It may be understood that this embodiment of this application is not limited thereto. It is assumed that the second apparatus determines the first processing based on the location information, the channel information, and the reference information. The method 800 further includes step 850.

[00337] 850: The second apparatus sends third indication information to the first apparatus, where the third indication information indicates the first processing.

[00338] Based on the foregoing technical solution, the second processing is performed on the reference signal, and the channel information obtained based on the reference signal is compared with the reference information, to determine the first processing (for example, the function of the first processing), so that the first apparatus can process the reference signal based on the first processing, thereby improving availability of radio data (for example, the channel information).

[00339] FIG. 9 is a diagram of a communication method 900 according to an embodiment of this application. The method 900 is applicable to a scenario in which radio data meeting a specific condition is collected. The method 900 shown in FIG. 9 may include the following steps.

[00340] 910: A first apparatus performs first processing on a reference signal.

[00341] In a possible implementation, the first apparatus performs the first processing on the reference signal based on reference information. For details, refer to the related descriptions in the method 300. Details are not described herein again.

[00342] 920: The first apparatus sends the reference signal that has undergone the first processing.

[00343] For example, the first apparatus may broadcast the reference signal that has undergone the first processing.

[00344] 930: A second apparatus #1 and a second apparatus #2 perform second processing on the reference signal that has undergone the first processing, to obtain channel information.

[00345] The second apparatus #1 and the second apparatus #2 separately receive the reference signal that has undergone the first processing, and perform the second processing on the reference signal that has undergone the first processing, to obtain the channel information. Specifically, the second apparatus #1 receives the reference signal that has undergone the first processing, and performs the second processing on the reference signal that has undergone the first processing, to obtain channel information #1; and the second apparatus #2 receives the reference signal that has undergone the first processing, and performs the second processing on the reference signal that has undergone the first processing, to obtain channel information #2.

[00346] For step 930, refer to step 640. Details are not described herein again.

[00347] In FIG. 9, two second apparatuses are used as an example for description. This is not limited herein. For example, at least one second apparatus (for example, one second apparatus, or at least two second apparatuses) may receive the reference signal that has undergone the first processing, and perform the second processing on the reference signal that has undergone the first processing, to obtain channel information.

[00348] 940: The second apparatus #1 and the second apparatus #2 separately compare the obtained channel information and channel information predicted by a model.

[00349] In a first possible implementation, the second apparatus (for example, the second apparatus #1 and the second apparatus #2) compares the obtained channel information and the channel information predicted by the model, to determine model prediction quality.

[00350] For example, the second apparatus #1 compares the channel information #1 and the channel information predicted by the model, and the second apparatus #2 compares the channel information #2 and the channel information predicted by the model. If an error between the channel

information #1 and the channel information predicted by the model is less than a preset threshold, in an example, the method 900 further includes step 951. If an error between the channel information #2 and the channel information predicted by the model is greater than or equal to a preset threshold, the method 900 further includes step 952. The second apparatus (for example, the second apparatus #1 and the second apparatus #2) may determine the channel information predicted by the model (for example, the model is deployed in the second apparatuses), or may obtain, from another apparatus (for example, an apparatus different from the second apparatus), the channel information predicted by the model. This is not limited herein. For content related to the model, refer to related descriptions in the method 300. Details are not described herein again.

[00351] 951: The second apparatus #1 sends an acknowledge (acknowledge, ACK) message.

[00352] 952: The second apparatus #2 sends the channel information #2.

[00353] The channel information #2 may be used to manage the model. Optionally, the second apparatus #2 further sends location information associated with the second apparatus #2. In this way, a third apparatus may manage the model based on the channel information #2 and the location information. The location information includes the location information associated with the second apparatus #2 and location information associated with the first apparatus. Managing the model includes but is not limited to: switching a model (that is, switching a current model to another model), selecting a model, training a model, monitoring model performance, and evaluating model quality.

[00354] For example, the channel information #2 and location information associated with the channel information #2 are used to train the model. If an input into the model is the location information and an output is the channel information, the model may be trained by using the location information associated with the channel information #2 as the input into the model and using the channel information #2 as a target output. For example, a parameter of the model is adjusted to reduce a difference between an actual output of the model and the channel information #2.

[00355] For another example, the channel information #2 and location information associated with the channel information #2 are used to switch the model. If an input into the model is the location information and an output is the channel information, a specific model, in models, whose actual output has the smallest difference from the channel information #2 may be determined by using the location information associated with the channel information #2 as the input into the model and using the channel information #2 as a target output, and the model with the smallest difference is selected as a switched model; or specific models, in models, whose actual outputs have differences less than a threshold from the channel information #2 are determined, and a model in the models with the differences less than the threshold is selected as a switched model based on

a preset policy; or a first model in models is determined, where the first model is a 1st determined model, in the models, whose actual output of the model has a difference less than a threshold from the channel information #2, and the first model is selected as a switched model.

[00356] For another example, the channel information #2 and location information associated with the channel information #2 are used to evaluate quality of the model. If an input into the model is the location information and an output is the channel information, quality of the model may be evaluated by comparing an actual output of the model and a target output (the target output is the channel information #2).

[00357] In a second possible implementation, the second apparatus sends the channel information to the first apparatus, and the first apparatus compares the channel information and the channel information predicted by the model, to determine model prediction quality.

[00358] For example, the second apparatus #1 sends the channel information #1 to the first apparatus, and the first apparatus compares the channel information #1 and the channel information predicted by the model; and the second apparatus #2 sends the channel information #2 to the first apparatus, and the first apparatus compares the channel information #2 and the channel information predicted by the model.

[00359] In a third possible implementation, the second apparatus sends the channel information to the another apparatus (for example, the third apparatus, or the fourth apparatus, or an apparatus different from the first apparatus, the third apparatus, the fourth apparatus, and the fifth apparatus), and the another apparatus compares the channel information and the channel information predicted by the model, to determine model prediction quality.

[00360] For example, the second apparatus #1 sends the channel information #1 to the another apparatus, and the another apparatus compares the channel information #1 and the channel information predicted by the model; and the second apparatus #2 sends the channel information #2 to the another apparatus, and the another apparatus compares the channel information #2 and the channel information predicted by the model.

[00361] The foregoing implementation is an example for description, and this embodiment of this application is not limited thereto. For example, different second apparatuses may deploy different models. In this way, models that are deployed by specific second apparatuses and that need to be managed (for example, switched or trained) may be determined in the foregoing manner, for example, through a comparison between channel information obtained based on a reference signal and channel information predicted by each model. For example, for a second apparatus, if channel information obtained by the second apparatus based on a reference signal and channel information predicted by a model deployed in the second apparatus are greater than or equal to the preset threshold, it indicates that the model deployed in the second apparatus needs to be managed,

or it indicates that radio data collected this time needs to be used to manage the model deployed in the second apparatus; or if channel information obtained by the second apparatus based on a reference signal and channel information predicted by a model deployed in the second apparatus are less than the preset threshold, it indicates that the model deployed in the second apparatus does not need to be managed temporarily, or the radio data collected this time does not need to be used to manage the model deployed in the second apparatus.

[00362] Based on the foregoing technical solution, the first processing and the second processing are performed on the reference signal, and channel information predicted based on a model is compared with channel information obtained based on the reference signal, to determine whether radio data (for example, the channel information obtained based on the reference signal) needs to be collected, thereby improving availability of the radio data.

[00363] FIG. 10 is a diagram of a communication method 1000 according to an embodiment of this application. The method 1000 is applicable to a scenario in which reference information is a reference AOA and a reference AOD. The method 1000 shown in FIG. 10 may include the following steps.

[00364] 1010: A second apparatus sends location information associated with the second apparatus.

[00365] The location information associated with the second apparatus may include, for example, a geographical location (the geographical location may be represented by, for example, a coordinate system such as a latitude and a longitude) of the second apparatus, and location coordinates (the location coordinates may be represented by, for example, a three-dimensional coordinate system) of a receive antenna of receiving a signal by the second apparatus.

[00366] A first apparatus or another apparatus (for example, an apparatus different from the second apparatus and the first apparatus) receives the location information associated with the second apparatus. For ease of description, in FIG. 10, an example in which the first apparatus receives the location information associated with the second apparatus is used for description.

[00367] 1020: The first apparatus determines the reference AOA and the reference AOD.

[00368] In a possible implementation, the first apparatus determines the reference AOA and the reference AOD based on the location information. The location information includes the location information associated with the second apparatus and location information associated with the first apparatus. In an example, the first apparatus may obtain the reference AOA and the reference AOD based on a model.

[00369] 1030: The first apparatus indicates the reference AOA to the second apparatus.

[00370] The reference AOA is used to receive a reference signal. Specifically, after determining the reference AOA and the reference AOD, the first apparatus indicates the reference AOA to the

second apparatus. In this way, when subsequently receiving the reference signal, the second apparatus may receive the reference signal based on the reference AOA.

[00371] If the another apparatus determines the reference AOA and the reference AOD in step 1020, the another apparatus may further indicate the reference AOD to the first apparatus, so that the first apparatus sends the reference signal based on the reference AOD.

[00372] 1040: The first apparatus sends the reference signal based on the reference AOD.

[00373] In other words, the first apparatus sends the reference signal at the reference AOD.

[00374] 1050: The second apparatus receives the reference signal based on the AOA, and estimates a channel in a direction of the reference AOA, to obtain channel information.

[00375] Specifically, the second apparatus receives the reference signal at the reference AOA, and performs channel measurement based on the received reference signal, to obtain the channel information.

[00376] 1060: The second apparatus sends the channel information.

[00377] The first apparatus or the another apparatus receives the channel information. For ease of description, in FIG. 10, an example in which the first apparatus receives the channel information is used for description.

[00378] 1070: The first apparatus obtains radio data based on channel information of a plurality of reference AOAs and a plurality of reference AODs.

[00379] The radio data includes the channel information. Further, optionally, the radio data further includes location information, for example, the location information associated with the first apparatus and the location information associated with the second apparatus.

[00380] The first apparatus or the another apparatus may collect, by using steps 1010 to 1060, the channel information corresponding to the plurality of reference AOAs and the plurality of reference AODs, to obtain a plurality of pieces of radio data. In an example, the first apparatus or the another apparatus may manage the model based on the plurality of pieces of radio data.

[00381] Based on the foregoing technical solution, channel information in a specific direction, for example, channel information in a direction of the reference AOA and the reference AOD, is collected, so that impact of an apparatus can be reduced, and quality of the radio data (for example, the channel information) can be improved.

[00382] The methods provided in embodiments of this application are described in detail above with reference to FIG. 3 to FIG. 10. Apparatuses provided in embodiments of this application are described in detail below with reference to FIG. 11 to FIG. 15. It should be understood that descriptions of apparatus embodiments correspond to descriptions of the method embodiments. Therefore, for content that is not described in detail, refer to the method embodiments. For brevity, details are not described herein.

[00383] FIG. 11 is a diagram of a communication apparatus 1100 according to an embodiment of this application. The apparatus 1100 includes a transceiver unit 1110. The transceiver unit 1110 may be configured to implement a corresponding communication function. The transceiver unit 1110 may also be referred to as a communication interface or a communication unit. Optionally, the apparatus 1100 further includes a processing unit 1120. The processing unit 1120 may be configured to perform processing, for example, perform first processing and second processing on a signal.

[00384] Optionally, the apparatus 1100 may further include a storage unit. The storage unit may be configured to store instructions and/or data. The processing unit 1120 may read the instructions and/or the data in the storage unit, to enable the apparatus to implement the foregoing method embodiments.

[00385] Optionally, the transceiver unit 1110 may include a receiving unit and a sending unit. The receiving unit may be configured to perform a receiving-related operation (for example, an operation of receiving data or a message), and the sending unit may be configured to perform a sending-related operation (for example, an operation of sending data or a message).

[00386] In a first possible design, the apparatus 1100 may be the first apparatus in the foregoing embodiments, and the apparatus 1100 may implement steps or procedures corresponding to the first apparatus in the foregoing method embodiments. The transceiver unit 1110 may be configured to perform a receiving/sending-related operation (for example, an operation of sending and/or receiving data or a message) of the first apparatus in the foregoing method embodiments. For example, the transceiver unit 1110 may be configured to perform the receiving/sending-related operation of the first apparatus in the embodiments shown in FIG. 3 to FIG. 10. The processing unit 1120 may be configured to perform a processing-related operation of the first apparatus in the foregoing method embodiments, or an operation other than sending/receiving (for example, an operation other than sending and/or receiving data or a message). For example, the processing unit 1120 may be configured to perform a processing-related operation of the first apparatus in the embodiments shown in FIG. 3 to FIG. 10.

[00387] In a possible implementation, the transceiver unit 1110 is configured to send a signal; and the transceiver unit 1110 is further configured to receive channel information. The channel information is obtained based on the signal, the signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal. Optionally, the processing unit 1120 is configured to perform the first processing on the signal.

[00388] In a second possible design, the apparatus 1100 may be the second apparatus in the

foregoing embodiments, and the apparatus 1100 may implement steps or procedures corresponding to the second apparatus in the foregoing method embodiments. The transceiver unit 1110 may be configured to perform a receiving/sending-related operation (for example, an operation of sending and/or receiving data or a message) of the second apparatus in the foregoing method embodiments. For example, the transceiver unit 1110 may be configured to perform the receiving/sending-related operation of the second apparatus in the embodiments shown in FIG. 3 to FIG. 10. The processing unit 1120 may be configured to perform a processing-related operation of the second apparatus in the foregoing method embodiments, or an operation other than sending/receiving (for example, an operation other than sending and/or receiving data or a message). For example, the processing unit 1120 may be configured to perform a processing-related operation of the second apparatus in the embodiments shown in FIG. 3 to FIG. 10.

[00389] In a possible implementation, the transceiver unit 1110 is configured to receive a signal; and the processing unit 1120 is configured to obtain channel information based on the signal. The signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal. Optionally, the transceiver unit 1110 is further configured to send the channel information.

[00390] In a third possible design, the apparatus 1100 may be the third apparatus in the foregoing embodiments, and the apparatus 1100 may implement steps or procedures corresponding to the third apparatus in the foregoing method embodiments. The transceiver unit 1110 may be configured to perform a receiving/sending-related operation (for example, an operation of sending and/or receiving data or a message) of the third apparatus in the foregoing method embodiments. For example, the transceiver unit 1110 may be configured to perform the receiving/sending-related operation of the third apparatus in the embodiments shown in FIG. 3 to FIG. 10. The processing unit 1120 may be configured to perform a processing-related operation of the third apparatus in the foregoing method embodiments, or an operation other than sending/receiving (for example, an operation other than sending and/or receiving data or a message). For example, the processing unit 1120 may be configured to perform a processing-related operation of the third apparatus in the embodiments shown in FIG. 3 to FIG. 10.

[00391] In a possible implementation, the processing unit 1120 is configured to obtain radio data. The radio data includes channel information and/or location information, the channel information is obtained based on a signal, the signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal, and the location information includes location information associated

with a receiving apparatus of the signal and/or location information associated with a sending apparatus of the signal. The processing unit 1120 is further configured to manage a model based on the radio data. Optionally, the transceiver unit 1110 is configured to receive the radio data.

[00392] It should be understood that a specific process in which the units perform the foregoing corresponding steps is described in detail in the foregoing method embodiments, and for brevity, details are not described herein.

[00393] It should be further understood that the apparatus 1100 herein is embodied in a form of a functional unit. The term "unit" herein may refer to an application-specific integrated circuit (application-specific integrated circuit, ASIC), an electronic circuit, a processor (for example, a shared processor, a dedicated processor, or a group processor) configured to execute one or more software or firmware programs, a memory, a merged logic circuit, and/or another appropriate component that supports the described function. In an optional example, a person skilled in the art may understand that the apparatus 1100 may be specifically the communication apparatus in the foregoing embodiments, and may be configured to perform procedures and/or steps corresponding to the communication apparatus in the foregoing method embodiments. To avoid repetition, details are not described herein again.

[00394] The apparatus 1100 in the foregoing solutions has a function of implementing corresponding steps performed by the communication apparatus in the foregoing methods. The function may be implemented by hardware, or may be implemented by hardware executing corresponding software. The hardware or the software includes one or more modules corresponding to the foregoing functions. For example, the transceiver unit may be replaced by a transceiver (for example, a sending unit in the transceiver unit may be replaced by a transmitter, and a receiving unit in the transceiver unit may be replaced by a receiver), and another unit, for example, the processing unit, may be replaced by a processor, to separately perform a receiving/sending operation and a related processing operation in the method embodiments.

[00395] In addition, the transceiver unit 1110 may alternatively be a transceiver circuit (which may include, for example, a receiving circuit and a sending circuit), and the processing unit may be a processing circuit.

[00396] It should be noted that the apparatus in FIG. 11 may be the communication device in the foregoing embodiments, or may be a chip or a system on chip (system on chip, SoC). The transceiver unit may be an input/output circuit or a communication interface. The processing unit is a processor, a microprocessor, or an integrated circuit integrated on the chip. This is not limited herein.

[00397] FIG. 12 is a diagram of another communication apparatus 1200 according to an embodiment of this application. The apparatus 1200 may be, for example, the foregoing first

apparatus. In an example, the apparatus 1200 includes a signal generation module 1210, a first processing module 1220, a transceiver module 1230, and a location module 1240.

[00398] The signal generation module 1210 may be configured to generate a to-be-transmitted signal.

[00399] The first processing module 1220 may be configured to perform first processing on the to-be-transmitted signal.

[00400] The transceiver module 1230 may be configured to: send a signal and/or receive a signal. For example, the transceiver module 1230 may be configured to: send a signal that has undergone the first processing, or send location information (for example, location information associated with the first apparatus), or receive location information (for example, location information associated with a second apparatus), or receive channel information.

[00401] The location module 1240 may be configured to obtain location information of the apparatus 1200.

[00402] The foregoing modules may be disposed separately, or integrated together, or partially integrated together. This is not limited herein.

[00403] FIG. 13 is a diagram of another communication apparatus 1300 according to an embodiment of this application. The apparatus 1300 may be, for example, the foregoing second apparatus. In an example, the apparatus 1300 includes a channel obtaining module 1310, a second processing module 1320, a transceiver module 1330, and a location module 1340.

[00404] The channel obtaining module 1310 may be configured to determine channel information. For example, the channel information is determined based on a signal processed by the second processing module 1320.

[00405] The second processing module 1320 may be configured to perform second processing on the signal. For example, the second processing module 1320 is configured to perform the second processing on the received signal. For another example, the second processing module 1320 is configured to perform the second processing on the channel information.

[00406] The transceiver module 1330 may be configured to: send a signal and/or receive a signal. For example, the transceiver module 1330 may be configured to: receive a signal that has undergone first processing, or send location information (for example, location information associated with the second apparatus), or receive location information (for example, location information associated with a first apparatus), or send the channel information.

[00407] The location module 1340 may be configured to obtain location information of the apparatus 1300.

[00408] The foregoing modules may be disposed separately, or integrated together, or partially integrated together. This is not limited herein.

[00409] FIG. 14 is a diagram of another communication apparatus 1400 according to an embodiment of this application. The apparatus 1400 includes a processor 1410. The processor 1410 is coupled to a memory 1420. The memory 1420 is configured to store a computer program or instructions and/or data. The processor 1410 is configured to execute the computer program or the instructions stored in the memory 1420, or read the data stored in the memory 1420, to perform the methods in the foregoing method embodiments.

[00410] Optionally, there are one or more processors 1410.

[00411] Optionally, there are one or more memories 1420.

[00412] Optionally, the memory 1420 and the processor 1410 are integrated together or disposed separately.

[00413] Optionally, as shown in FIG. 14, the apparatus 1400 further includes a transceiver 1430. The transceiver 1430 is configured to receive a signal and/or send a signal. For example, the processor 1410 is configured to control the transceiver 1430 to receive a signal and/or send a signal.

[00414] In an example, the processor 1410 may have a function of the processing unit 1120 shown in FIG. 11, the memory 1420 may have a function of the storage unit, and the transceiver 1430 may have a function of the transceiver unit 1110 shown in FIG. 11.

[00415] In a solution, the apparatus 1400 is configured to implement operations performed by a communication apparatus in the foregoing method embodiments.

[00416] For example, the processor 1410 is configured to execute a computer program or instructions, for example, execute the computer program or the instructions stored in the memory 1420, to implement related operations of an RIS in the foregoing method embodiments.

[00417] For another example, the processor 1410 is configured to execute a computer program or instructions, for example, execute the computer program or the instructions stored in the memory 1420, to implement related operations of the first communication apparatus or the second communication apparatus in the foregoing method embodiments.

[00418] It should be understood that, the processor mentioned in embodiments of this application may be a central processing unit (central processing unit, CPU), and may further be another general-purpose processor, a digital signal processor (digital signal processor, DSP), an application-specific integrated circuit (application-specific integrated circuit, ASIC), a field programmable gate array (field programmable gate array, FPGA) or another programmable logic device, a discrete gate or a transistor logic device, a discrete hardware component, or the like. The general-purpose processor may be a microprocessor, or the processor may be any conventional processor or the like.

[00419] It should be further understood that the memory mentioned in embodiments of this application may be a volatile memory and/or a non-volatile memory. The nonvolatile memory may

be a read-only memory (read-only memory, ROM), a programmable read-only memory (programmable ROM, PROM), an erasable programmable read-only memory (erasable PROM, EPROM), an electrically erasable programmable read-only memory (electrically EPROM, EEPROM), or a flash memory. The volatile memory may be a random access memory (random access memory, RAM). For example, the RAM may be used as an external cache. By way of example, but not limitation, the RAM includes a plurality of forms, such as a static random access memory (static RAM, SRAM), a dynamic random access memory (dynamic RAM, DRAM), a synchronous dynamic random access memory (synchronous DRAM, SDRAM), a double data rate synchronous dynamic random access memory (double data rate SDRAM, DDR SDRAM), an enhanced synchronous dynamic random access memory (enhanced SDRAM, ESDRAM), a synchlink dynamic random access memory (synchlink DRAM, SLDRAM), and a direct rambus random access memory (direct rambus RAM, DR RAM).

[00420] It should be noted that when the processor is a general-purpose processor, a DSP, an ASIC, an FPGA or another programmable logic device, a discrete gate or a transistor logic device, or a discrete hardware component, a memory (storage module) may be integrated into the processor.

[00421] It should further be noted that the memory described herein is intended to include, but is not limited to, these and any other appropriate type of memory.

[00422] FIG. 15 is a diagram of a system on chip 1500 according to an embodiment of this application. The system on chip 1500 (or may be referred to as a processing system) includes a logic circuit 1510 and an input/output interface (input/output interface) 1520.

[00423] The logic circuit 1510 may be a processing circuit in the system on chip 1500. The logic circuit 1510 may be coupled and connected to a storage unit, and invoke instructions in the storage unit, so that the system on chip 1500 can implement the methods and functions in embodiments of this application. The input/output interface 1520 may be an input/output circuit in the system on chip 1500, and outputs information processed by the system on chip 1500, or inputs to-be-processed data or signaling information to the system on chip 1500 for processing.

[00424] Optionally, the logic circuit 1510 may be implemented by one or more processors, including the one or more processors or a processing part of the one or more processors.

[00425] Optionally, the input/output interface 1520 may include a transceiver circuit, a transceiver, an input/output circuit, or a communication interface.

[00426] In a solution, the system on chip 1500 is configured to implement operations performed by the communication apparatus (for example, the RIS, the first communication apparatus or the second communication apparatus) in the foregoing method embodiments.

[00427] For example, the logic circuit 1510 is configured to implement processing-related operations performed by the communication apparatus (for example, the first apparatus, the second

apparatus, the third apparatus, the fourth apparatus, or the fifth apparatus) in the foregoing method embodiments; and the input/output interface 1520 is configured to implement sending and/or receiving-related operations performed by the communication apparatus (for example, the first apparatus, the second apparatus, the third apparatus, the fourth apparatus, or the fifth apparatus) in the foregoing method embodiments.

[00428] An embodiment of this application further provides a computer-readable storage medium. The computer-readable storage medium stores computer instructions used to implement the method performed by the communication apparatus (for example, the first apparatus, the second apparatus, the third apparatus, the fourth apparatus, or the fifth apparatus) in the foregoing method embodiments.

[00429] For example, when the computer program is executed by a computer, the computer is enabled to implement the method performed by the communication apparatus (for example, the first apparatus, the second apparatus, the third apparatus, the fourth apparatus, or the fifth apparatus) in the foregoing method embodiments.

[00430] An embodiment of this application further provides a computer program product, including instructions. When the instructions are executed by a computer, the method performed by the communication apparatus (for example, the first apparatus, the second apparatus, the third apparatus, the fourth apparatus, or the fifth apparatus) in the foregoing method embodiments is implemented.

[00431] An embodiment of this application further provides a communication system. The communication system includes at least one of the first apparatus, the second apparatus, the third apparatus, the fourth apparatus, and the fifth apparatus in the foregoing embodiments.

[00432] For explanations and beneficial effects of related content in any one of the apparatuses provided above, refer to the corresponding method embodiment provided above. Details are not described herein again.

[00433] In the several embodiments provided in this application, it should be understood that the disclosed apparatus and method may be implemented in other manners. For example, the described apparatus embodiment is merely an example. For example, division into the units is merely logical function division and may be other division in actual implementation. For example, a plurality of units or components may be combined or integrated into another system, or some features may be ignored or not performed. In addition, the displayed or discussed mutual couplings or direct couplings or communication connections may be implemented through some interfaces. The indirect couplings or communication connections between the apparatuses or units may be implemented in electronic, mechanical, or other forms.

[00434] All or some of the foregoing embodiments may be implemented by using software,

hardware, firmware, or any combination thereof. When software is used to implement the embodiments, all or a part of the 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 this application are all or partially generated. The computer may be a general-purpose computer, a dedicated computer, a computer network, or other programmable apparatuses. For example, the computer may be a personal computer, a server, a network device, or the like. The computer instructions may be stored in a computer-readable storage medium or may be transmitted from one computer-readable storage medium to another computer-readable storage medium. For example, the computer instructions may be transmitted from one 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 (DSL)) 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, for example, 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 DVD), a semiconductor medium (for example, a solid-state drive (solid-state drive, SSD)), or the like. For example, the usable medium may include but is not limited to any medium that can store program code, for example, a USB flash drive, a removable hard disk, a read-only memory (read-only memory, ROM), a random access memory (random access memory, RAM), a magnetic disk, or an optical disc.

[00435] 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.

CLAIMS

1. A communication method, comprising:

sending a signal; and

receiving channel information, wherein the channel information is obtained based on the signal, the signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal.

2. The method according to claim 1, wherein the first processing comprises: processing the sending parameter of the signal based on reference information.

3. The method according to claim 1, wherein the second processing comprises: processing the receiving parameter of the signal and/or the channel information corresponding to the signal based on reference information.

4. The method according to claim 2 or 3, wherein the method further comprises:

sending and/or receiving first indication information, wherein the first indication information indicates the reference information.

5. The method according to any one of claims 1 to 4, wherein the signal has undergone the first processing and has not undergone the second processing, and the method further comprises:

sending second indication information, wherein the second indication information indicates the second processing, and the second processing is determined based on the channel information and the reference information.

6. The method according to any one of claims 1 to 5, wherein the signal has undergone the second processing and has not undergone the first processing, and the method further comprises:

determining the first processing based on the channel information and the reference information; or

receiving third indication information, wherein the third indication information indicates the first processing, and the first processing is determined based on the channel information and the reference information.

7. The method according to any one of claims 2 to 6, wherein the reference information comprises at least one of the following:

a reference transmit antenna, a reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival, and a reference angle of departure.

8. The method according to any one of claims 1 to 7, wherein the method further comprises:

managing a model based on radio data, wherein the radio data comprises the channel

information.

9. The method according to claim 8, wherein an error between the channel information and channel information predicted by the model is greater than or equal to a preset threshold.

10. The method according to claim 8 or 9, wherein the radio data further comprises location information, and the location information comprises location information associated with a receiving apparatus of the signal and/or location information associated with a sending apparatus of the signal.

11. The method according to claim 10, wherein the method further comprises:

receiving fourth indication information, wherein the fourth indication information indicates the location information associated with the receiving apparatus.

12. The method according to any one of claims 1 to 7, wherein the method further comprises:

sending radio data, wherein the radio data comprises the channel information and/or the location information associated with the sending apparatus of the signal, and the radio data is used to manage a model.

13. The method according to any one of claims 8 to 12, wherein

an input into the model comprises the location information, and a target output comprises the channel information; or

an input into the model comprises the channel information, and a target output comprises the location information; and

the location information comprises the location information associated with the receiving apparatus of the signal and/or the location information associated with the sending apparatus of the signal.

14. A communication method, comprising:

receiving a signal; and

obtaining channel information based on the signal, wherein the signal has undergone first processing and/or second processing, the first processing is performed on a sending parameter of the signal, and the second processing is performed on a receiving parameter of the signal and/or the channel information corresponding to the signal.

15. The method according to claim 14, wherein the first processing comprises: processing the sending parameter of the signal based on reference information.

16. The method according to claim 14, wherein the second processing comprises: processing the receiving parameter of the signal and/or the channel information corresponding to the signal based on reference information.

17. The method according to claim 15 or 16, wherein the method further comprises:

sending and/or receiving first indication information, wherein the first indication information

indicates the reference information.

18. The method according to any one of claims 14 to 17, wherein the signal has undergone the first processing and has not undergone the second processing, and the method further comprises:

receiving second indication information, wherein the second indication information indicates the second processing, and the second processing is determined based on the channel information and the reference information; or

determining the second processing based on the channel information and the reference information.

19. The method according to any one of claims 14 to 18, wherein the signal has undergone the second processing and has not undergone the first processing, and the method further comprises:

sending third indication information, wherein the third indication information indicates the first processing, and the first processing is determined based on the channel information and the reference information.

20. The method according to any one of claims 15 to 19, wherein the reference information comprises at least one of the following:

a reference transmit antenna, a reference receive antenna, a reference location, reference channel information, a response of a reference device, a reference angle of arrival, and a reference angle of departure.

21. The method according to any one of claims 14 to 20, wherein the method further comprises:

managing a model based on radio data, wherein the radio data comprises the channel information.

22. The method according to claim 21, wherein an error between the channel information and channel information predicted by the model is greater than or equal to a preset threshold.

23. The method according to claim 21 or 22, wherein the radio data further comprises location information, and the location information comprises location information associated with a receiving apparatus of the signal and/or location information associated with a sending apparatus of the signal.

24. The method according to claim 23, wherein the method further comprises:

receiving fifth indication information, wherein the fifth indication information indicates the location information associated with the sending apparatus.

25. The method according to any one of claims 14 to 20, wherein the method further comprises:

sending radio data, wherein the radio data comprises the channel information and/or location information associated with a receiving apparatus of the signal, and the radio data is used to

manage a model.

26. The method according to any one of claims 21 to 25, wherein

an input into the model comprises the location information, and a target output comprises the channel information; or

an input into the model comprises the channel information, and a target output comprises the location information; and

the location information comprises the location information associated with the receiving apparatus of the signal and/or the location information associated with the sending apparatus of the signal.

27. A communication apparatus, comprising a module or a unit configured to perform the method according to any one of claims 1 to 26.

28. A communication apparatus, comprising a processor, wherein the processor is configured to execute a computer program or instructions, so that the apparatus performs the method according to any one of claims 1 to 26.

29. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program or instructions, and when the computer program or the instructions are run on a communication apparatus, the communication apparatus is enabled to perform the method according to any one of claims 1 to 26.

30. A computer program product, wherein the computer program product comprises a computer program or instructions used to perform the method according to any one of claims 1 to 26.