

MEASUREMENT METHOD AND COMMUNICATION APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202310151834.1, filed with the China National Intellectual Property Administration on February 14, 2023 and
5 entitled "MEASUREMENT METHOD AND COMMUNICATION APPARATUS", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

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

10 BACKGROUND

[0003] Non-terrestrial network (non-terrestrial network, NTN) communication is less affected by geographical conditions and has strong coverage, and therefore can be widely used in various scenarios. A satellite is used as an example. When a natural disaster (for example, an earthquake or a mudslide) occurs, and a communication facility (for example, a terrestrial base station)
15 constructed on the ground is vulnerable to damage and cannot perform normal communication, a terminal device may still perform data transmission through satellite communication. In addition, in some regions in which it is not convenient to install a terrestrial base station, for example, an ocean, a desert, or a mountain, the terminal device may also achieve good communication efficiency through a satellite.

20 [0004] Because a coverage area of an NTN cell is usually large, and a coverage area of one beam is limited, there may be a large quantity of beams that need to be deployed in one NTN cell. In a scenario in which there are a large quantity of beams in a cell, how to perform beam measurement and beam management becomes a problem worth studying.

SUMMARY

25 [0005] This application provides a measurement method and apparatus, to reduce overheads of beam measurement and maintenance performed by a terminal device on a neighbor cell.

[0006] According to a first aspect, an embodiment of this application provides a measurement method. A terminal device determines, based on a first beam of a serving cell and beam information of a first neighbor cell, a first candidate beam set corresponding to the first neighbor cell; and measures at least one beam in the first candidate beam set, where a total quantity of beams included in the first candidate beam set is less than a total quantity of beams included in the first neighbor cell.

[0007] In the foregoing design, a beam measurement range of the neighbor cell is narrowed with reference to the beam of the serving cell, so that measurement and maintenance overheads of the terminal device can be reduced, to reduce measurement power consumption of the terminal device.

[0008] In a possible design, the beam information includes one or more of the following: beam identifier offset information, indication information of the quantity of beams in the first candidate beam set, and the quantity of beams in the first neighbor cell. Based on this type of beam information, determining the first candidate beam set can be accelerated, to improve beam measurement efficiency.

[0009] In a possible design, the beam information of the first neighbor cell includes I groups of beam information, the first candidate beam set is a union set of I candidate beam subsets, and I is a positive integer; and that the terminal device determines, based on the first beam of the serving cell and the beam information of the first neighbor cell, the first candidate beam set corresponding to the first neighbor cell includes: determining an i^{th} candidate beam subset in the I candidate beam subsets based on the first beam of the serving cell and an i^{th} group of beam information in the I groups of beam information, where i is a positive integer, and $1 \leq i \leq I$. In this design, the to-be-measured candidate beam set can be determined by using one or more groups of beam information. This is flexible, and can implement diversified beam measurement ranges, helping adapt to different communication scenarios.

[0010] In a possible design, the i^{th} group of beam information includes one or more of the following: a beam identifier offset of the i^{th} candidate beam subset relative to the first beam, indication information of a quantity of beams in the i^{th} candidate beam subset, and the quantity of beams in the first neighbor cell. Based on this type of beam information, determining the i^{th} candidate beam subset can be accelerated, to improve beam measurement efficiency. Optionally, for the beam included in the i^{th} candidate beam subset, refer to the following example 1 to example 3 for understanding.

[0011] Example 1: An identifier of a start beam in the i^{th} candidate beam subset is $(BI + M_i) \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI + M_i) \bmod N_i + K_i] \bmod N_i$, where BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th}

candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, where M_i , K_i , and N_i are integers, and mod is a modulo operator. In the example 1, a total quantity of beams included in the i^{th} candidate beam subset is K_i+1 , and the i^{th} candidate beam subset includes K_i+1 beams with consecutive identifiers.

[0012] Example 2: An identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $(BI+M_i) \bmod N_i$, where BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, where M_i , K_i , and N_i are integers, and mod is a modulo operator. In the example 2, a total quantity of beams included in the i^{th} candidate beam subset is K_i+1 , and the i^{th} candidate beam subset includes K_i+1 beams with consecutive identifiers.

[0013] Example 3: An identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$, where BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, where M_i , K_i , and N_i are integers, and mod is a modulo operator. In the example 3, a total quantity of beams included in the i^{th} candidate beam subset is $2*K_i+1$, and the i^{th} candidate beam subset includes $2*K_i+1$ beams with consecutive identifiers.

[0014] It can be learned from the foregoing examples that when I is 1, the first candidate beam set includes K_i+1 or $2*K_i+1$ beams with consecutive identifiers. When I is greater than 1, the first candidate beam set may include beams with inconsecutive identifiers. In other words, in this embodiment of this application, the beams with the consecutive identifiers and/or the inconsecutive identifiers in the neighbor cell can be measured. This is flexible, and can be adapted to a plurality of measurement requirements.

[0015] In a possible design, the first beam is a serving beam of the terminal device in the serving cell, or signal quality of the first beam is greater than or equal to a first signal quality threshold. Based on this design, the determined first candidate beam set may include a serving beam or an optimal beam in the first neighbor cell, so that the terminal device can determine an accurate first candidate beam set, to improve beam measurement and maintenance performance of the terminal device.

[0016] In a possible design, a target beam is determined in the first candidate beam set, where the target beam is a serving beam of the terminal device after the terminal device is changed to the

first neighbor cell, or signal quality of the target beam is greater than or equal to a second signal quality threshold. This design can reduce a latency in determining the optimal beam/serving beam in the first neighbor cell by the terminal device, help improve a rate at which the terminal device completes handover or cell selection/reselection, and reduce interruption caused by the handover or the cell selection/reselection, to improve user experience and performance.

[0017] In a possible design, the terminal device may receive first indication information from the serving cell, where the first indication information indicates at least one group of beam information in the I groups of beam information of the first neighbor cell, and I is a positive integer. In this design, a network configures the beam measurement range of the neighbor cell for the terminal device by indicating the beam information of the first neighbor cell, so that signaling overheads of the beam measurement range can be reduced.

[0018] In a possible design, the terminal device may further determine at least one group of beam information in the I groups of beam information of the first neighbor cell based on coverage range information of at least one beam in the first neighbor cell, where I is a positive integer. In this design, the terminal device can quickly determine, with reference to coverage information of the beam in the neighbor cell, a beam to be measured and maintained, and signaling overheads for sending the beam information by the network can also be reduced.

[0019] In a possible design, the terminal device may measure one beam in the first candidate beam set within a measurement time window associated with the beam, where measurement time windows associated with different beams in the beam set are the same or different. Corresponding to narrowing of the beam measurement range of the neighbor cell, a quantity of measurement time windows or a quantity of measurement beams within the measurement time window also decreases. This design can reduce duration for performing measurement by the terminal device, and reduce measurement overheads and power consumption of the terminal device.

[0020] In a possible design, the serving cell is a cell in a non-terrestrial network NTN, and the terminal device may receive a system information block SIB1 of the serving cell, and access the serving cell based on the SIB1. The SIB1 includes access configuration information used by the terminal device to access the serving cell, and the access configuration information includes one or more of the following: epoch time information of the serving cell, validity duration information of uplink synchronization assistance information of the serving cell, cell scheduling information of the serving cell, timing advance information of the serving cell, satellite polarization information of the serving cell, and satellite ephemeris information of the serving cell. In this design, the access configuration information of the serving cell is sent in advance by using the SIB1, so that a latency in obtaining the access configuration information by the terminal device can be reduced, to reduce an access latency, and improve an access success rate and user experience.

[0021] According to a second aspect, an embodiment of this application provides a measurement method. A terminal device determines, based on a first beam of a serving cell and beam information of a first neighbor cell, a first candidate beam set corresponding to the first neighbor cell. If the serving cell moves, and the terminal device does not move out of a first region, the terminal device may measure at least one beam in the first candidate beam set; or if the serving cell moves, the terminal device determines, based on a second beam of the serving cell and the beam information of the first neighbor cell, a second candidate beam set corresponding to the first neighbor cell; and measures at least one beam in the second candidate beam set. A total quantity of beams included in the first candidate beam set is less than a total quantity of beams included in the first neighbor cell, and a total quantity of beams included in the second candidate beam set is less than a total quantity of beams included in the first neighbor cell.

[0022] The foregoing design may be applied to a scenario in which the serving cell is an earth-moving NTN cell, to match an update of a serving beam or an optimal beam in the serving cell, the to-be-measured beam set in the neighbor cell is updated in a timely manner, so that beam measurement accuracy can be ensured.

[0023] According to a third aspect, an embodiment of this application provides a measurement method. A network device sends beam information of a first neighbor cell, where the beam information of the first neighbor cell is used to determine a to-be-measured first candidate beam set corresponding to the first neighbor cell, and a total quantity of beams included in the first candidate beam set is less than a total quantity of beams included in the first neighbor cell.

[0024] In this design, a network indirectly configures a beam measurement range of the neighbor cell for a terminal device by indicating the beam information of the first neighbor cell, so that signaling overheads of the beam measurement range can be reduced.

[0025] In a possible design, the beam information includes one or more of the following: beam identifier offset information, indication information of the quantity of beams in the first candidate beam set, and the quantity of beams in the first neighbor cell.

[0026] In a possible design, the beam information of the first neighbor cell includes I groups of beam information, and the first candidate beam set is a union set of I candidate beam subsets, where an i^{th} group of beam information in the I groups of beam information is used to determine an i^{th} candidate beam subset in the I candidate beam subsets, I is a positive integer, i is a positive integer, and $1 \leq i \leq I$.

[0027] In a possible design, the i^{th} group of beam information includes one or more of the following: a beam identifier offset of the i^{th} candidate beam subset relative to a first beam, indication information of a quantity of beams in the i^{th} candidate beam subset, and the quantity of beams in the first neighbor cell. Optionally, for the beam included in the i^{th} candidate beam subset,

refer to the following example 1 to example 3 for understanding.

[0028] Example 1: An identifier of a start beam in the i^{th} candidate beam subset is $(BI+M_i) \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$, where BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, where M_i , K_i , and N_i are integers, and mod is a modulo operator.

[0029] Example 2: An identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $(BI+M_i) \bmod N_i$, where BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, where M_i , K_i , and N_i are integers, and mod is a modulo operator.

[0030] Example 3: An identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$, where BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, where M_i , K_i , and N_i are integers, and mod is a modulo operator.

[0031] In a possible design, the first beam is a serving beam of the terminal device in a serving cell, or signal quality of the first beam is greater than or equal to a first signal quality threshold.

[0032] In a possible design, the network device may further receive a beam measurement result from at least one terminal device, and determine the beam information of the first neighbor cell based on the beam measurement result of the at least one terminal device, where a beam measurement result of one of the at least one terminal device indicates a measurement result of a beam that is in at least one neighbor cell and that is measured by the terminal device. In this design, the network supports determining the beam information of the neighbor cell by combining beam measurement results of a plurality of terminal devices for the neighbor cell, to improve accuracy of the beam information, and help the network update and maintain the beam information.

[0033] In a possible design, the network device may further send a system information block SIB1 of the serving cell, where the SIB1 includes access configuration information used by the terminal device to access the serving cell, and the access configuration information includes one or more of the following: epoch time information of the serving cell, validity duration information of uplink synchronization assistance information of the serving cell, cell scheduling information of the serving cell, timing advance information of the serving cell, satellite polarization

information of the serving cell, and satellite ephemeris information of the serving cell.

[0034] According to a fourth aspect, an embodiment of this application provides an access method. A terminal device receives a SIB1 of a first NTN cell from a network device, and accesses the first cell based on the SIB1. The SIB1 includes access configuration information of the first NTN cell, and the access configuration information includes one or more of the following: epoch time information of the first NTN cell, validity duration information of uplink synchronization assistance information of the first NTN cell, cell scheduling information of the first NTN cell, timing advance information of the first NTN cell, satellite polarization information of the first NTN cell, and satellite ephemeris information of the first NTN cell. Optionally, the first NTN cell may also be understood as a serving cell to be accessed by the terminal device.

[0035] In this design, the access configuration information of the to-be-accessed NTN cell is sent in advance by using the SIB1, so that a latency in obtaining the access configuration information by the terminal device can be reduced, to reduce an access latency, and improve an access success rate and user experience.

[0036] Optionally, the access configuration information of the first NTN cell may alternatively be replaced with local cell information of the first NTN cell, where the local cell information includes one or more of the following: epoch time information of the local cell, validity duration information of uplink synchronization assistance information of the local cell, cell scheduling information of the local cell, timing advance information of the local cell, satellite polarization information of the local cell, and satellite ephemeris information of the local cell. The "local cell" herein is the first NTN cell.

[0037] According to a fifth aspect, an embodiment of this application provides an access method. A network device sends a SIB1 of a first NTN cell to a terminal device, where the SIB1 includes access configuration information of the first NTN cell, and the access configuration information includes one or more of the following: epoch time information of the first NTN cell, validity duration information of uplink synchronization assistance information of the first NTN cell, cell scheduling information of the first NTN cell, timing advance information of the first NTN cell, satellite polarization information of the first NTN cell, and satellite ephemeris information of the first NTN cell. Optionally, the first NTN cell may also be understood as an NTN cell to be accessed by the terminal device, or referred to as a serving cell.

[0038] Optionally, the access configuration information of the first NTN cell may alternatively be replaced with local cell information of the first NTN cell, where the local cell information includes one or more of the following: epoch time information of the local cell, validity duration information of uplink synchronization assistance information of the local cell, cell scheduling information of the local cell, timing advance information of the local cell, satellite polarization

information of the local cell, and satellite ephemeris information of the local cell. The "local cell" herein is the first NTN cell.

[0039] According to a sixth aspect, an embodiment of this application provides a communication apparatus. The communication apparatus may be a terminal device; may be an apparatus, a module, a chip, or the like in a terminal device; or may be an apparatus that can be used together with a terminal device. In a design, the communication apparatus may include modules correspond one-to-one to the methods/operations/steps/actions described in the first aspect. The module may be implemented by a hardware circuit, software, or a combination of a hardware circuit and software. In a design, the communication apparatus may include a processing module and a communication module.

[0040] The processing module is configured to: determine, based on a first beam of a serving cell and beam information of a first neighbor cell, a first candidate beam set corresponding to the first neighbor cell; and measure at least one beam in the first candidate beam set, where a total quantity of beams included in the first candidate beam set is less than a total quantity of beams included in the first neighbor cell.

[0041] In a possible design, the beam information includes one or more of the following: beam identifier offset information, indication information of the quantity of beams in the first candidate beam set, and the quantity of beams in the first neighbor cell.

[0042] In a possible design, the beam information of the first neighbor cell includes I groups of beam information, the first candidate beam set is a union set of I candidate beam subsets, and I is a positive integer; and determining, based on the first beam of the serving cell and the beam information of the first neighbor cell, the first candidate beam set corresponding to the first neighbor cell includes: determining an i^{th} candidate beam subset in the I candidate beam subsets based on the first beam of the serving cell and an i^{th} group of beam information in the I groups of beam information, where i is a positive integer, and $1 \leq i \leq I$.

[0043] In a possible design, the i^{th} group of beam information includes one or more of the following: a beam identifier offset of the i^{th} candidate beam subset relative to the first beam, indication information of a quantity of beams in the i^{th} candidate beam subset, and the quantity of beams in the first neighbor cell. Based on this type of beam information, determining the i^{th} candidate beam subset can be accelerated, to improve beam measurement efficiency. Optionally, for the beam included in the i^{th} candidate beam subset, refer to the example 1 to example 3 described in the first aspect for understanding. Details are not described in this embodiment of this application.

[0044] In a possible design, the first beam is a serving beam of the terminal device in the serving cell, or signal quality of the first beam is greater than or equal to a first signal quality

threshold.

[0045] In a possible design, a target beam is determined in the first candidate beam set, where the target beam is a serving beam of the terminal device after the terminal device is changed to the first neighbor cell, or signal quality of the target beam is greater than or equal to a second signal quality threshold.

[0046] In a possible design, the communication module is configured to receive first indication information from the serving cell, where the first indication information indicates at least one group of beam information in the I groups of beam information of the first neighbor cell, and I is a positive integer.

[0047] In a possible design, the processing module is further configured to determine at least one group of beam information in the I groups of beam information of the first neighbor cell based on coverage range information of at least one beam in the first neighbor cell, where I is a positive integer.

[0048] In a possible design, the processing module is further configured to measure one beam in the first candidate beam set within a measurement time window associated with the beam, where measurement time windows associated with different beams in the beam set are the same or different.

[0049] Before the foregoing design is implemented, the terminal device needs to access the serving cell. In a possible design, the serving cell is a cell in a non-terrestrial network NTN. The communication module is further configured to receive a system information block SIB1 of the serving cell; and the processing module is further configured to access the serving cell based on the SIB1, where The SIB1 includes access configuration information used by the terminal device to access the serving cell, and the access configuration information includes one or more of the following: epoch time information of the serving cell, validity duration information of uplink synchronization assistance information of the serving cell, cell scheduling information of the serving cell, timing advance information of the serving cell, satellite polarization information of the serving cell, and satellite ephemeris information of the serving cell. In this design, the access configuration information of the serving cell is sent in advance by using the SIB1, so that a latency in obtaining the access configuration information by the terminal device can be reduced, to reduce an access latency, and improve an access success rate and user experience.

[0050] According to a seventh aspect, an embodiment of this application provides a communication apparatus. The communication apparatus may be a terminal device; may be an apparatus, a module, a chip, or the like in a terminal device; or may be an apparatus that can be used together with a terminal device. In a design, the communication apparatus may include modules correspond one-to-one to the methods/operations/steps/actions described in the second

aspect. The module may be implemented by a hardware circuit, software, or a combination of a hardware circuit and software. In a design, the communication apparatus may include a processing module and a communication module.

[0051] The processing module is configured to determine, based on a first beam of a serving cell and beam information of a first neighbor cell, a first candidate beam set corresponding to the first neighbor cell. If the serving cell moves, and the terminal device does not move out of a first region, the processing module is further configured to measure at least one beam in the first candidate beam set; or if the serving cell moves, the processing module is further configured to: determine, based on a second beam of the serving cell and the beam information of the first neighbor cell, a second candidate beam set corresponding to the first neighbor cell; and measure at least one beam in the second candidate beam set.

[0052] A total quantity of beams included in the first candidate beam set is less than a total quantity of beams included in the first neighbor cell, and a total quantity of beams included in the second candidate beam set is less than a total quantity of beams included in the first neighbor cell.

[0053] For some possible designs, refer to the descriptions in the sixth aspect for understanding. Details are not described in this embodiment of this application. For example, the communication module may be configured to receive first indication information from the serving cell, where the first indication information indicates at least one group of beam information in I groups of beam information of the first neighbor cell, and I is a positive integer.

[0054] According to an eighth aspect, an embodiment of this application provides a communication apparatus. The communication apparatus may be a network device; an apparatus, a module, a chip, or the like in a network device; or an apparatus that can be used together with a network device. In a design, the communication apparatus may include modules correspond one-to-one to the methods/operations/steps/actions described in the third aspect. The module may be implemented by a hardware circuit, software, or a combination of a hardware circuit and software. In a design, the communication apparatus may include a processing module and a communication module.

[0055] The processing module is configured to determine beam information of a first neighbor cell.

[0056] The communication module is configured to send the beam information of the first neighbor cell, where the beam information of the first neighbor cell is used to determine a to-be-measured first candidate beam set corresponding to the first neighbor cell, and a total quantity of beams included in the first candidate beam set is less than a total quantity of beams included in the first neighbor cell.

[0057] In a possible design, the communication module is further configured to receive a beam

measurement result from at least one terminal device; and the processing module is further configured to determine the beam information of the first neighbor cell based on the beam measurement result of the at least one terminal device, where a beam measurement result of one of the at least one terminal device indicates a measurement result of a beam that is in at least one neighbor cell and that is measured by the terminal device. In this design, the network supports determining the beam information of the neighbor cell by combining beam measurement results of a plurality of terminal devices for the neighbor cell, to improve accuracy of the beam information, and help the network update and maintain the beam information.

[0058] In a possible design, the communication module is further configured to send a system information block SIB1 of a serving cell, where the SIB1 includes access configuration information used by the terminal device to access the serving cell, and the access configuration information includes one or more of the following: epoch time information of the serving cell, validity duration information of uplink synchronization assistance information of the serving cell, cell scheduling information of the serving cell, timing advance information of the serving cell, satellite polarization information of the serving cell, and satellite ephemeris information of the serving cell.

[0059] For some other possible designs, refer to the descriptions in the third aspect for understanding. Details are not described in this embodiment of this application.

[0060] According to a ninth aspect, an embodiment of this application provides an access method. The communication apparatus may be a terminal device; may be an apparatus, a module, a chip, or the like in a terminal device; or may be an apparatus that can be used together with a terminal device. In a design, the communication apparatus may include modules correspond one-to-one to the methods/operations/steps/actions described in the fifth aspect. The module may be implemented by a hardware circuit, software, or a combination of a hardware circuit and software. In a design, the communication apparatus may include a processing module and a communication module.

[0061] The communication module is configured to receive a SIB1 of a first NTN cell from a network device.

[0062] The processing module is configured to access the first cell based on the SIB1, where the SIB1 includes access configuration information of the first NTN cell, and the access configuration information includes one or more of the following: epoch time information of the first NTN cell, validity duration information of uplink synchronization assistance information of the first NTN cell, cell scheduling information of the first NTN cell, timing advance information of the first NTN cell, satellite polarization information of the first NTN cell, and satellite ephemeris information of the first NTN cell. Optionally, the first NTN cell may also be understood as a

serving cell to be accessed by the terminal device.

[0063] According to a tenth aspect, an embodiment of this application provides a communication apparatus. The communication apparatus may be a network device; an apparatus, a module, a chip, or the like in a network device; or an apparatus that can be used together with a network device. In a design, the communication apparatus may include modules correspond one-to-one to the methods/operations/steps/actions described in the fifth aspect. The module may be implemented by a hardware circuit, software, or a combination of a hardware circuit and software. In a design, the communication apparatus may include a processing module and a communication module.

[0064] The processing module is configured to determine a SIB1 of a first NTN cell.

[0065] The communication module is configured to send the SIB1 of the first NTN cell to a terminal device, where the SIB1 includes access configuration information of the first NTN cell, and the access configuration information includes one or more of the following: epoch time information of the first NTN cell, validity duration information of uplink synchronization assistance information of the first NTN cell, cell scheduling information of the first NTN cell, timing advance information of the first NTN cell, satellite polarization information of the first NTN cell, and satellite ephemeris information of the first NTN cell. Optionally, the first NTN cell may also be understood as a serving cell to be accessed by the terminal device.

[0066] According to an eleventh aspect, an embodiment of this application provides a communication apparatus. The communication apparatus includes a processor, configured to implement the method described in any one of the first aspect to the fifth aspect. The processor is coupled to a memory. The memory is configured to store instructions and data. When the processor executes the instructions stored in the memory, the method described in any one of the first aspect to the fifth aspect can be implemented. Optionally, the communication apparatus may further include the memory. The communication apparatus may further include a communication interface. The communication interface is used by the communication apparatus to communicate with another device. For example, the communication interface may be a transceiver, a circuit, a bus, a module, a pin, or a communication interface of another type.

[0067] According to a twelfth aspect, an embodiment of this application provides a communication system, including the communication apparatus described in the sixth aspect or the seventh aspect, and the communication apparatus described in the eighth aspect; or including the communication apparatus described in the ninth aspect, and the communication apparatus described in the tenth aspect.

[0068] According to a thirteenth aspect, an embodiment of this application further provides a computer program. When the computer program is run on a computer, the computer is caused to

perform the method according to any one of the first aspect to the fifth aspect.

[0069] According to a fourteenth aspect, an embodiment of this application further provides a computer program product, including instructions. When the instructions are run on a computer, the computer is caused to perform the method according to any one of the first aspect to the fifth aspect.

[0070] According to a fifteenth aspect, an embodiment of this application further provides a computer-readable storage medium. The computer-readable storage medium stores a computer program or instructions. When the computer program or the instructions are run on a computer, the computer is caused to perform the method according to any one of the first aspect to the fifth aspect.

[0071] According to a sixteenth aspect, an embodiment of this application further provides a chip. The chip is configured to read a computer program stored in a memory, to perform the method according to any one of the first aspect to the fifth aspect, or the chip includes a circuit configured to perform the method according to any one of the first aspect to the fifth aspect.

[0072] According to a seventeenth aspect, an embodiment of this application further provides a chip system. The chip system includes a processor, configured to support an apparatus in implementing the method according to any one of the first aspect to the fifth aspect. In a possible design, the chip system further includes a memory. The memory is configured to store a program and data that are necessary for the apparatus. The chip system may include a chip, or may include a chip and another discrete component.

[0073] For effects of the solutions provided in any one of the second aspect to the seventeenth aspect, refer to corresponding descriptions in the first aspect.

BRIEF DESCRIPTION OF DRAWINGS

[0074] FIG. 1 is a diagram of an architecture of a terrestrial network communication system;

[0075] FIG. 2 is a diagram of an architecture of an NTN communication system;

[0076] FIG. 3 is a diagram of an architecture of a 5G satellite communication system;

[0077] FIG. 4A is a diagram of a transparent transmission architecture;

[0078] FIG. 4B is a diagram of a regenerative architecture;

[0079] FIG. 5A is a diagram of coverage of a quasi-earth-fixed NTN cell;

[0080] FIG. 5B is a diagram of coverage of an earth-moving NTN cell;

[0081] FIG. 6A is a diagram of beamforming;

[0082] FIG. 6B is a diagram of a beam distribution mode in a cell;

[0083] FIG. 6C is a diagram of a beam distribution mode in a cell;

[0084] FIG. 6D is a diagram of a measurement time window for beam measurement;

[0085] FIG. 7 is a schematic flowchart of a measurement method according to an embodiment of this application;

[0086] FIG. 8 is a diagram of alternate coverage between cells;

5 [0087] FIG. 9 is a diagram of alternate coverage between cells;

[0088] FIG. 10 is a schematic flowchart of a measurement method according to an embodiment of this application;

[0089] FIG. 11 is a schematic flowchart of an access method according to an embodiment of this application;

10 [0090] FIG. 12 is a diagram of a system information sending manner according to an embodiment of this application;

[0091] FIG. 13 is a diagram of a communication apparatus according to an embodiment of this application; and

15 [0092] FIG. 14 is a diagram of a communication apparatus according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

[0093] To make objectives, technical solutions, and advantages of embodiments of this application clearer, the following further describes embodiments of this application in detail with reference to the accompanying drawings.

20 [0094] "At least one (item)" in embodiments of this application indicates one (item) or more (items). "A plurality of (items)" means two (items) or more than two (items). The term "and/or" describes an association relationship for describing associated objects and represents that three relationships may exist. For example, A and/or B may represent the following three cases: Only A exists, both A and B exist, and only B exists. The character "/" generally indicates an "or" relationship between the associated objects. In addition, it should be understood that although terms such as "first" and "second" may be used in embodiments of this application to describe objects, these objects should not be limited by these terms. These terms are merely used to distinguish the objects from each other.

25 [0095] The terms "including", "having", and any variants thereof in the following descriptions of embodiments of this application are intended to cover a non-exclusive inclusion. For example, a process, a method, a system, a product, or a device that includes a series of steps or units is not limited to the listed steps or units, but optionally further includes other unlisted steps or units, or optionally further includes another inherent step or unit of the process, the method, the product, or

the device. It should be noted that, in embodiments of this application, the word such as "example" or "for example" represents giving an example, an illustration, or a description. Any method or design solution described as an "example" or "for example" in embodiments of this application should not be explained as being more preferred or having more advantageous than another method or design solution. To be precise, use of the word such as "example" or "for example" is intended to present a relative concept in a specific manner.

[0096] Technologies provided in embodiments of this application may be applied to various communication systems, for example, a non-terrestrial network (non-terrestrial network, NTN) system such as a satellite communication system, a high altitude platform station (high altitude platform station, HAPS) communication system, or an unmanned aerial vehicle, an integrated communication and navigation (integrated communication and navigation, IcaN) system, a global navigation satellite system (global navigation satellite system, GNSS), and an ultra-dense low-orbit satellite communication system. The communication system to which embodiments of this application are applied may be converged with a terrestrial communication system. For example, the terrestrial communication system may be a 4th generation (4th generation, 4G) communication system (for example, a long term evolution (long term evolution, LTE) system), a worldwide interoperability for microwave access (worldwide interoperability for microwave access, WiMAX) communication system, a 5th generation (5th generation, 5G) communication system (for example, a new radio (new radio, NR) system), and a future mobile communication system, for example, a 6G communication system.

[0097] A network element in a communication system may send a signal to another network element or receive a signal from another network element. The signal may include information, signaling, data, or the like. The network element may alternatively be replaced with an entity, a network entity, a device, a communication device, a communication module, a node, a communication node, or the like. In embodiments of this application, the network element is used as an example for description.

[0098] For example, the terrestrial 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. In addition, it may be understood that if the communication system includes a plurality of terminal devices, the plurality of terminal devices may also send signals to each other, in other words, both a signal sending network element and a signal receiving network element may be terminal devices.

[0099] FIG. 1 shows an architecture of a mobile communication system. The communication system 100 may include a network device 110 and a terminal device 101 to a terminal device 106. It should be understood that the communication system 100 may include more or fewer network

devices or terminal devices. The network device or the terminal device may be hardware, may be software obtained through functional division, or may be a combination thereof. In addition, the terminal device 104 to the terminal device 106 may also form a communication system. For example, the terminal device 105 may send downlink data to the terminal device 104 or the terminal device 106. The network device and the terminal device may communicate with each other through another device or network element. The network device 110 may send downlink data to the terminal device 101 to the terminal device 106, and may also receive uplink data sent by the terminal device 101 to the terminal device 106. Certainly, the terminal device 101 to the terminal device 106 may also send uplink data to the network device 110, and may also receive downlink data sent by the network device 110.

[00100] The network device 110 is a node in a radio access network (radio access network, RAN), and may also be referred to as a base station or a RAN node (or device). Currently, some examples of the access network device 101 are: an evolved NodeB (evolved NodeB, eNB), a radio network controller (radio network controller, RNC), a NodeB (NodeB, NB), a base station controller (base station controller, BSC), a base transceiver station (base transceiver station, BTS), a home base station (for example, a home evolved NodeB, or a home NodeB, HNB), a baseband unit (baseband unit, BBU), an access point (access point, AP) in a wireless fidelity (wireless fidelity, Wi-Fi) system, a wireless relay node, a wireless backhaul node, a transmission point (transmission point, TP) or a transmission reception point (transmission reception point, TRP), a satellite, a drone, and the like. The network device may alternatively be a gNodeB (next generation NodeB, gNB), a TRP, or a TP in a 5G system, or may be one antenna panel or one group of antenna panels (including a plurality of antenna panels) of a gNodeB in a 5G system. In addition, the network device may alternatively be a network node, for example, a BBU or a distributed unit (distributed unit, DU), that is included in a gNB or a TP. Alternatively, the network device may be a device responsible for a network side function in a device-to-device (device-to-device, D2D) communication system, a machine to machine (machine to machine, M2M) communication system, an internet of things (Internet of Things, IoT) communication system, an internet of vehicles communication system, or another communication system. The network device 110 may alternatively be a network device in a future possible communication system. A specific technology and a specific device form that are used for the network device are not limited in embodiments of this application.

[00101] The terminal device 101 to the terminal device 106 each may also be referred to as a user equipment (user equipment, UE), a mobile station (mobile station, MS), a mobile terminal (mobile terminal, MT), an access terminal, a subscriber unit, a subscriber station, a mobile station, a remote station, a remote terminal, a mobile device, a user terminal, a terminal, a wireless

communication device, a user agent, a user apparatus, or the like, are devices that provide voice or data connectivity for users, or may be internet of things devices. For example, the terminal device 101 to the terminal device 106 include a handheld device, a vehicle-mounted device, and the like that have a wireless communication function. Currently, the terminal device 101 to the terminal device 106 each may be a mobile phone (mobile phone), a tablet computer, a notebook computer, a palmtop computer, a mobile internet device (mobile internet device, MID), a wearable device (for example, a smartwatch, a smart band, or a pedometer), a vehicle-mounted device (for example, a vehicle-mounted device on an automobile, a bicycle, an electric vehicle, an aircraft, a ship, a train, or a high-speed train), a virtual reality (virtual reality, VR) device, an augmented reality (augmented reality, AR) device, a wireless terminal in industrial control (industrial control), a smart home device (for example, a refrigerator, a television, an air conditioner, or an electricity meter), an intelligent robot, a workshop device, a wireless terminal in self driving (self driving), a wireless terminal in remote surgery (remote surgery), a wireless terminal in a smart grid (smart grid), a wireless terminal in transportation safety (transportation safety), a wireless terminal in a smart city (smart city), a wireless terminal in a smart home (smart home), a flight device (for example, an intelligent robot, a hot balloon, an uncrewed aerial vehicle, or an aircraft), or the like. The terminal device 101 to the terminal device 106 may alternatively be other devices having a terminal function. For example, the terminal device 101 to the terminal device 106 may alternatively be devices that function as terminals in D2D communication.

[00102] Based on the descriptions of the architecture of the terrestrial communication system shown in FIG. 1, an example in which embodiments of this application may be applied to a non-terrestrial network (non-terrestrial network, NTN) communication system is used for description. An NTN includes nodes such as a satellite network, a high altitude platform, and an uncrewed aerial vehicle, is significantly characterized by global coverage, long-distance transmission, flexible networking, easy deployment, being not limited by geographical conditions, and the like, and has been widely used in a plurality of fields such as maritime communication, positioning and navigation, disaster relief, scientific experiments, video broadcasting, and earth observation. A terrestrial 5G network and a satellite network are integrated with mutual complementarity to form an integrated communication network that provides seamless global coverage by sea, land, air, space, and ground, and satisfy a plurality of ubiquitous service requirements of users.

[00103] An example in which NTN communication is satellite communication, in other words, the NTN communication system is a satellite system is used in embodiments of this application. As shown in FIG. 2, the NTN communication system includes a satellite 201 and a terminal device 202. For explanations of the terminal device 202, refer to the related descriptions of the terminal device 101 to the terminal device 106. The satellite 201 may also be referred to as a high altitude

platform, a high altitude aircraft, or a satellite base station. Upon comparison between the NTN communication system and a terrestrial network communication system, the satellite 201 may be considered as one or more network devices in an architecture of the terrestrial network communication system. The satellite 201 provides a communication service for the terminal devices 202, and the satellite 201 may further be connected to a core network device. For a structure and a function of the satellite 201, refer to the foregoing descriptions of the network device 110. For a communication manner between the satellite 201 and the terminal device 202, refer to the descriptions in FIG. 1. Details are not described herein again. The solutions in embodiments of this application may also be directly applied to a terrestrial communication network, or may be applied to a terrestrial communication network after being slightly modified in a method that can be figured out by a person skilled in the art. Details are not described herein.

[00104] Some examples of the satellite include: a low earth orbit (low earth orbit, LEO) satellite whose orbital height is 500 kilometers (km) to 2000 km, a medium earth orbit (medium earth orbit, MEO) satellite whose orbital height is 2000 km to 20000 km, a high earth orbit (high earth orbit, HEO) satellite whose orbital height is greater than 20000 km and that has an elliptical orbit, a synchronous earth orbit (geostationary earth orbit, GEO) satellite whose orbital height is 35800 km, and a non-geostationary earth orbit (non-geostationary earth orbit, N GEO) satellite.

[00105] 5G is used as an example. An architecture of a 5G satellite communication system is shown in FIG. 3. A terrestrial terminal device accesses a network through 5G new radio. A 5G gNodeB is deployed on a satellite, and is connected to a terrestrial core network through a radio link. In addition, a radio link exists between satellites, to complete signaling exchanging and user data transmission between gNodeBs. Devices and interfaces in FIG. 3 are described as follows:

[00106] 5G core network: It provides services such as user access control, mobility management, session management, user security authentication, and charging. The 5G core network includes a plurality of functional units, which can be classified into control-plane and data-plane functional entities. An access and mobility management unit (AMF) is responsible for user access management, security authentication, and mobility management. A user plane unit (UPF) is responsible for managing user plane data transmission, traffic statistics collection, and the like.

[00107] Terrestrial station: It is responsible for forwarding signaling and service data between a satellite base station and the 5G core network.

[00108] 5G new radio: It is a radio link between a terminal and a base station.

[00109] Xn interface: It is an interface between 5G gNodeBs, and is mainly used for signaling exchanging such as handover.

[00110] NG interface: It is an interface between a 5G gNodeB and the 5G core network, and

mainly used for exchanging signaling, for example, NAS signaling, of the core network, and service data of a user.

[00111] Some examples of the terrestrial station device are: a device in a core network (core network, CN) in an existing mobile communication architecture (for example, a 3GPP access architecture of a 5G network) or a device in a core network in a future mobile communication architecture. As a bearer network, the core network provides an interface to a data network, provides a communication connection, authentication, management, and policy control for a user equipment (UE), bears a data service, and the like. The CN may further include network elements such as an access and mobility management network element (access and mobility management function, AMF), a session management network element (session management function, SMF), an authentication server network element (authentication server function, AUSF), a policy control node (policy control function, PCF), and a user plane function network element (user plane function, UPF). The AMF network element is configured to manage access and mobility of the UE, and is mainly responsible for functions such as UE authentication, UE mobility management, and UE paging.

[00112] Based on an on-board processing capability, the satellite communication system includes a transparent transmission architecture (transparent payload) and a regenerative architecture (regenerative payload). Transparent transmission may also be referred to as transparent (transparent) forwarding or bend-pipe forwarding transmission, and regenerative may also be referred to as non-transparent transmission.

[00113] In a transparent transmission architecture shown in FIG. 4A, a base station is located on the ground, a satellite is connected to the base station through a gateway (gateway) on the ground, a signal between a terminal device and the base station is transferred through the satellite, and a data processing function is still located at the base station, in other words, the satellite is only responsible for signal forwarding and has no data processing capability. A link between the satellite and the terminal device is a service link (service link), and a link between the satellite and the base station on the ground is referred to as a feeder link (feeder link).

[00114] In a regenerative architecture shown in FIG. 4B. A satellite has some or all base station functions, and the satellite may perform data processing. A complete base station is located on the satellite, or a DU of a base station is located on the satellite. A link between the satellite and a terminal device is a service link (service link).

[00115] In addition, in an NTN network, a network device may manage one or more NTN cells (cells), and communicate with a terminal device through the NTN cell. Embodiments of this application relate to a coverage range of an NTN cell. The coverage range of the NTN cell is a ground coverage region of the NTN cell, and may be briefly referred to as a coverage region of

the NTN cell. Based on movement statuses of NTN cells in ground coverage regions, the NTN cells can be classified into the following three types:

[00116] A first type is earth-fixed (earth-fixed). A coverage region of this type of NTN cell is a fixed region on the ground, that is, continuous fixed-point coverage. For example, an NTN cell provided by a GEO satellite is of this type.

[00117] A second type is quasi-earth-fixed (quasi-earth-fixed). A coverage region of this type of NTN cell is a fixed region on the ground in a period of time, and is changed to another region on the ground after the period of time, that is, fixed-point coverage in the period of time. For example, an LEO satellite and an MEO satellite may provide this type of NTN cell. As shown in FIG. 5A, a ground region 1 is covered by a cell 1 at moments t1 and t2, and then is changed to a ground region 2 covered by the cell 1 a moment t3.

[00118] A third type is earth-moving (earth-moving). A coverage region of this type of NTN cell slides on the ground. For example, an LEO satellite and an MEO satellite may provide this type of NTN cell. As shown in FIG. 5B, a ground region 1 covered by a cell 1 at t1 slides to a ground region 2 at a moment t2, and slides to a ground region 3 at a moment t3.

[00119] A network device in a terrestrial communication system and a satellite in an NTN communication system are collectively considered as network devices. An apparatus configured to implement a function of a network device may be a network device; or may be an apparatus that can support a network device in implementing the function of the network device, for example, a chip system, and the apparatus may be mounted in the network device. In the technical solutions provided in embodiments of this application, the technical solutions provided in embodiments of this application are described by using an example in which the apparatus configured to implement the function of the network device is a network device.

[00120] In embodiments of this application, an apparatus configured to implement a function of a terminal device may be a terminal device; or may be an apparatus that can support a terminal device in implementing the function, for example, a chip system, a hardware circuit, a software module, or a combination of a hardware circuit and a software module, and the apparatus may be mounted in the terminal device or used in cooperation with the terminal device. In embodiments of this application, the chip system may include a chip, or may include a chip and another discrete component. In the technical solutions provided in embodiments of this application, the technical solutions provided in embodiments of this application are described by using an example in which the apparatus configured to implement the function of the terminal device is a terminal device.

[00121] Embodiments of this application relate to beam measurement for an NTN cell. For ease of understanding of embodiments of this application, the following describes technical terms in this application.

[00122] (1) Beam (beam)

[00123] A beamforming (beamforming) technology is introduced in 5G NR. A network device sequentially sweeps, by using several beams in a time-division manner (beam sweeping), some different areas in a cell, to implement complete coverage of the cell. One beam corresponds to a unique identifier (beam index), in other words, different beams have different identifiers. Different beams correspond to different sending directions. As shown in FIG. 6A, an example in which one cell includes eight beams is used. At a moment t1, a network device sends a reference signal in a direction 1 to form a beam 0. This may alternatively be described as follows: At a moment t1, a network device sends a beam 0 in a direction 1. At a moment t2, the network device sends a reference signal in a direction 2 to form a beam 1. This may alternatively be described as follows: At a moment t2, the network device sends a beam 1 in a direction 2. By analogy, complete cell coverage may be formed based on the eight beams, in other words, the foregoing cell includes the eight beams.

[00124] The reference signal may be a synchronization signal/physical broadcast channel block (synchronization signal/PBCH block, SSB) or a channel state information-reference signal (channel state information-reference signal, CSI-RS).

[00125] (2) Beam distribution mode of an NTN cell

[00126] A beam distribution mode of an NTN cell is also referred to as a beam deployment mode, and is an arrangement mode or rule of beams in the NTN cell, for example, how beams in a cell are distributed to form coverage of the current cell, or how beams in a cell are distributed to implement a region in which the cell provides coverage. From a perspective of a beam, a beam distribution mode of an NTN cell may indicate a coverage range of a beam in a first cell.

[00127] In embodiments of this application, a coverage range of a beam in a cell may be a ground region covered by the beam, and is briefly referred to as a coverage region of the beam. It may be understood that coverage regions of all beams in a cell are included in a coverage region of the cell, and a coverage region of a part of (one or more) beams in the cell may also be described as a sub-region in the coverage region of the cell.

[00128] In a possible implementation, beams in an NTN cell are arranged clockwise or counterclockwise based on a value order of identifiers of the beams, to form a coverage region of the NTN cell. FIG. 6B shows a beam distribution mode. Beams in a cell 1 and a cell 2 are arranged counterclockwise in ascending order of identifiers of the beams, and form a circular permutation. For example, a previous beam of a beam 7 in the cell 1 is a beam 6, and a next beam of the beam 7 is a beam 0.

[00129] In another possible implementation, beams in an NTN are arranged in a specific direction based on a value order of identifiers of the beams, to form coverage of an NTN cell. FIG.

6C shows a beam distribution mode. Beams in a cell 1 are arranged in ascending order of identifiers, starting from a bottom end of a short side of a rectangular region. After several beams are arranged along the short side to reach a top end in each column, a new column is arranged starting from the bottom end of the short side. Beams in a cell 2 are arranged in ascending order of identifiers, starting from a bottom end of a short side of a rectangular region. After several beams are arranged along the short side in each column, a new column is arranged starting from a top end of the short side; in other words, a difference between identifiers of beams in two adjacent columns on the top end of the short side is 1 (for example, an identifier 4 and an identifier 5), and identifiers of beams in three adjacent columns form a "Z"-shaped order. Beams in a cell 3 are arranged in ascending order of identifiers, starting from a left end of a long side in a rectangular region. After several beams are arranged along the long side to reach a right end in each row, a new row is arranged starting from the left end. Optionally, the foregoing specific direction may be a satellite sweeping direction, and the satellite sweeping direction may also be understood as a satellite motion direction. In this case, a satellite sweeping direction corresponding to the cell 1 shown in FIG. 6C is a direction from the bottom end of the short side to the top end of the short side, and a satellite sweeping direction corresponding to the cell 3 is a direction from the left end of the long side to the right end of the long side.

[00130] For a quasi-earth-fixed NTN cell or an earth-moving NTN cell, some beams in different NTN cells may cover a same region on the ground in a time division manner. Identifiers of the some beams that cover the same region in the different NTN cells may be the same or different. When a quantity of the some beams is plural, different identifiers of the some beams may be further classified into identifiers that are not exactly the same and completely different identifiers. For example, the foregoing part of beams is one beam. FIG. 6B shows that a beam 4 in the cell 2 and a beam 0 in the cell 1 may cover a same region at different moments. For example, the foregoing part of beams include a plurality of beams. FIG. 6C shows that some beams {0, 1, 5, 6, 10, 11} in the cell 1 and some beams {0, 1, 8, 9, 10, 11} in the cell 2 may cover a same sub-region at different moments, and {0, 1, 5, 6, 10, 11} in the cell 1 and {0, 1, 8, 9, 10, 11} in the cell 2 are not completely the same.

[00131] (3) Status of a terminal device

[00132] A status of a terminal device is classified into an RRC idle state (RRC_IDLE), an RRC inactive state (RRC_INACTIVE), and an RRC connected state (RRC_CONNECTED).

[00133] The RRC idle state may also be briefly referred to as an idle state. When the terminal device is in the RRC idle state, the terminal device does not retain information such as a radio resource control (radio resource control, RRC) context (context). The RRC context is a parameter for establishing communication between the terminal device and a network device. The RRC

context may include a security context, capability information of the terminal device, and the like. In addition, the terminal device does not establish a connection to a core network device. Usually, the terminal device in the RRC idle state only periodically wakes up to receive a paging message.

[00134] The RRC inactive state may also be briefly referred to as an inactive state. When the terminal device is in the RRC inactive state, the RRC context is retained between the terminal device and the network device. In addition, the terminal device also establishes a connection to the core network device, in other words, the core network device is in a core network connected state (CN_CONNECTED). In this case, a procedure of switching to the connected state to receive data is fast, and no additional core network signaling overheads are generated. In addition, the terminal device in the RRC inactive state also enters a sleep state. Therefore, the RRC inactive state can satisfy requirements of reducing a connection latency, signaling overheads, and power consumption.

[00135] The RRC connected state may also be briefly referred to as a connected state. When the terminal device is in the RRC connected state, the terminal device has established the RRC context. The parameter required for establishing communication between the terminal device and the network device has been obtained by both the communication parties. The network device allocates a cell radio network temporary identifier (cell radio network temporary identifier, C-RNTI) to a terminal device that accesses the network device. In addition, the terminal device also establishes a connection to the core network device.

[00136] (4) Beam measurement

[00137] A terminal device measures several beams (for example, SSBs or CSI-RSs) of a cell, to obtain a beam-level measurement result, and then may derive a cell-level measurement result of the cell by using the beam-level measurement result. For example, in the cell shown in FIG. 6A, the terminal device measures quality of each of beams 0 to 7, and averages the quality of the eight beams to obtain a result. The result may be used as cell-level quality of the cell.

[00138] In addition, the terminal device may alternatively determine, based on the beam measurement result in the cell, a beam whose signal quality is the best or whose signal quality satisfies a preset requirement. The determined beam may also be briefly referred to as an optimal beam, and there may be one or more optimal beams. The optimal beam may be used as a serving beam of the terminal device, and there may be one or more serving beams. The serving beam of the terminal device is used to receive downlink information (for example, downlink control information or downlink data), a signal, or the like sent from the cell. It may be understood that a network device may know an optimal beam and/or a serving beam of a terminal device in a connected state. For example, the network device may determine the optimal beam and/or the serving beam of the terminal device based on signal quality in a beam measurement result reported

by the terminal device. However, a terminal device in an idle state or an inactive mode may maintain an optimal beam and/or a serving beam, and the network device does not sense the optimal beam and/or the serving beam of the terminal device.

[00139] Beam measurement may be used for mobility management of the terminal device.

5 Mobility management means that when signal quality of a serving cell (serving cell) of a terminal device declines to a particular extent, the terminal device may change the serving cell of the terminal device through handover, cell selection, or reselection, in other words, select a neighbor cell (neighbor cell) with better communication quality as a new serving cell, to ensure that a communication link between the terminal device and a network is not interrupted. It may be
10 understood that, for a terminal device in the connected state, a serving cell of the terminal device is a cell that is accessed by the terminal device and in which a network device serves the terminal device, and a neighbor cell of the terminal device is a cell in which no link is currently established for the terminal device. A terminal device may change a serving cell of the terminal device through handover. For a terminal device in the idle state or the inactive mode, a serving cell of the terminal
15 device may be understood as a cell on which the terminal device currently camps, a cell on which the terminal device initially camps based on cell selection, or a cell on which the terminal device camps based on cell reselection. A neighbor cell of the terminal device is a cell on which the terminal device currently does not camp. In addition, optionally, the neighbor cell may also be referred to as a non-serving cell.

20 **[00140]** In mobility management, a terminal device needs to perform radio resource management (radio resource management, RRM) measurement, to be specific, monitor communication quality of a serving cell and/or a neighbor cell of the terminal device. For example, the terminal device may monitor the communication quality of the serving cell based on a beam measurement result of the serving cell, and the terminal device may monitor the communication
25 quality of the neighbor cell based on a beam measurement result of the neighbor cell. Optionally, the terminal device may determine, based on the communication quality of the serving cell and/or the neighbor cell, whether to perform handover, cell selection, or reselection.

[00141] Based on a relationship between a frequency of the neighbor cell and a frequency of the serving cell, the beam measurement for the neighbor cell may be classified into intra-frequency
30 measurement (intra-frequency measurement) and inter-frequency measurement (inter-frequency measurement). In addition, based on standards of network devices to which the neighbor cell and the serving cell belong, the beam measurement for the neighbor cell may be further classified into intra-RAT measurement (intra-RAT measurement) and inter-RAT measurement (inter-RAT measurement). An example of the intra-RAT measurement is as follows: Both a serving cell and a
35 neighbor cell are cells of a 5G gNodeB. In addition, usually, the intra-frequency measurement and

the inter-frequency measurement belong to the intra-RAT measurement (intra-RAT measurement). An example of the inter-RAT measurement is as follows: A serving cell may be a cell served by a 5G gNodeB, and a neighbor cell may be a cell served by a 2G, 3G, or 4G (for example, LTE) base station. A method provided below in embodiments of this application may be applied to an intra-frequency measurement, inter-frequency measurement, intra-RAT measurement, or inter-RAT measurement scenario.

[00142] Based on a reference signal type of the frequency, the beam measurement for the neighbor cell may be further classified into SSB-based measurement and CSI-RS-based measurement. The terminal device in the connected state may perform beam measurement for the neighbor cell based on an SSB or a CSI-RS. The terminal device in the idle state/inactive state performs beam measurement for the neighbor cell based on an SSB. Therefore, with reference to the foregoing classification manner using the reference signal type, the beam measurement for the neighbor cell may be further specifically classified into SSB-based intra-frequency measurement, SSB-based inter-frequency measurement, CSI-RS-based intra-frequency measurement, CSI-RS-based inter-frequency measurement, inter-RAT measurement, and the like.

[00143] For the SSB-based intra-frequency measurement and the SSB-based inter-frequency measurement, refer to the following content for understanding: If a center frequency of an SSB of a measurement frequency is the same as a center frequency of an SSB of the serving cell, and a subcarrier spacing (subcarrier spacing, SCS) of the SSB of the measurement frequency is also the same as an SCS of the SSB of the serving cell, beam measurement for the neighbor cell on the frequency is intra-frequency measurement. If a center frequency and/or an SCS of an SSB of a measurement frequency are/is different from those/that of an SSB of the serving cell, beam measurement for the neighbor cell on the frequency is inter-frequency measurement.

[00144] For the CSI-RS-based intra-frequency measurement and the inter-frequency measurement, refer to the following content for understanding: If a center frequency of a CSI-RS of a measurement frequency is the same as a center frequency of a CSI-RS of the serving cell, and an SCS and a cyclic prefix (cyclic prefix, CP) type of the CSI-RS of the measurement frequency are also the same as those of the CSI-RS of the serving cell, beam measurement for the neighbor cell on the frequency is intra-frequency measurement. Otherwise, when the measurement frequency and the serving cell are different in at least one of the center frequencies, the SCS, and the CP types, beam measurement for the neighbor cell on the frequency is inter-frequency measurement.

[00145] In beam measurement, a network device may send a measurement configuration to a terminal device. The measurement configuration may include a measurement object (measurement object), for example, a reference signal (SSB/CSI-RS) on a frequency, and a measurement time

window configuration corresponding to the frequency; a measurement reporting configuration (reporting configuration), for example, a reporting rule and/or a reporting format of a measurement result; a measurement identity (measurement identities), used by the network device to distinguish between measurement objects; a measurement gap (measurement gap), where for example, in the measurement gap, the terminal device does not receive or send information, and performs measurement only on the measurement object; and a measurement quantity configuration (quantity configuration), for example, including a measurement filtering configuration.

[00146] For example, when the reference signal is an SSB, the measurement time window configuration may be an SSB measurement timing configuration (SSB measurement timing configuration, SMTC). The SMTC is a periodic measurement time window. The network device may configure a length of each measurement time window and a gap between two adjacent measurement time windows. The measurement time window may also be referred to as an STMC time window or an SMTC occasion (occasion). The terminal device measures a corresponding frequency in one or more SMTC time windows, and does not need to measure the frequency outside the one or more SMTC time windows. Optionally, each SMTC time window is used for measurement on a beam with a specific beam identifier, in other words, the terminal device measures, in one SMTC time window, only a beam corresponding to the STMC time window. As shown in FIG. 6D, an SMTC time window 1 is used for measuring beams 0 to 7 corresponding to an SSB, an SMTC time window 2 is used for measuring beams 8 to 15 corresponding to an SSB, ..., and an SMTC time window x is used for measuring beams k1 to k8 corresponding to an SSB. In FIG. 6D, an SSB #0 represents a beam whose identifier is 0 and that corresponds to the SSB, an SSB #8 represents a beam whose identifier is 8 and that corresponds to the SSB, and so on. Details are not described in embodiments of this application.

[00147] Currently, in a terrestrial network system, a maximum quantity of beams corresponding to an SSB in a cell is related to a frequency and an SCS of the SSB, a standard of the cell, and the like. For example, in a frequency range 1 (frequency range 1, FR1), a maximum quantity of beams corresponding to an SSB in a cell may be 8. For another example, in a frequency range 2 (frequency range 2, FR2), a maximum quantity of beams corresponding to an SSB in a cell may be 64. A terminal device usually determines, based on a measurement result of measuring all beams in a neighbor cell, whether to perform cell handover, cell selection, or cell reselection. However, in an NTN system, a quantity of beams in an NTN cell is determined based on a coverage area requirement of a satellite and a beam capability of the satellite. For example, a coverage area of an NTN cell usually needs to reach hundreds of thousands of square kilometers, but a diameter of a beam is limited (for example, the diameter of the beam is 50-60 km). Therefore, a quantity of beams that need to be deployed in an NTN cell is far greater than a quantity of beams in a ground

cell. For example, a quantity of beams in an NTN cell may be 128, 256, or 512.

[00148] In a scenario in which there are a large quantity of beams in an NTN cell, a beam sending periodicity is greatly increased. An SSB is used as an example. Assuming that a quantity of beams corresponding to an SSB in an NTN cell is 256, based on a mode in which eight SSBs are sent every 20 ms, a total of 32 20 ms is required to complete sending of the 256 SSBs, in other words, a sending periodicity of the SSB reaches $32 \times 20 = 640$ ms. In this case, if the beam measurement manner in which all the beams in the neighbor cell are measured in the terrestrial network system continues to be used, the terminal device needs to measure more beams, and overheads of beam measurement and maintenance performed by the terminal device on the NTN cell are correspondingly increased. In this manner, measurement power consumption of the terminal device is increased; in addition, a latency of determining an optimal beam/a serving beam by the terminal device is also increased. Consequently, efficiency of completing handover or cell selection/reselection by the terminal device is low, and even subsequent operations such as data receiving/sending, camping, or access of the terminal device are affected, resulting in poor user experience.

[00149] Based on the foregoing problem, embodiments of this application provide a beam measurement solution for a neighbor cell in an NTN, to narrow a beam measurement range of a neighbor cell with reference to a beam in a current serving cell of a terminal device, so that measurement and maintenance overheads of the terminal device can be reduced, and measurement power consumption of the terminal device can be reduced.

[00150] For example, the following calculation formula may be designed based on a correspondence between an identifier of a beam and beam coverage in an NTN cell: $[(\text{beam index} + M) \bmod N \pm K] \bmod N$, used to determine a beam measurement range in a neighbor cell. The beam index indicates an identifier of a beam in a serving cell of a terminal device, and may also be briefly referred to as a BI. M indicates a beam identifier offset of a beam in the neighbor cell relative to the beam indicated by the BI, where a value of M is an integer, for example, a negative integer, 0, or a positive integer. K may be used to determine a quantity of to-be-measured beams in the neighbor cell, where K is an integer, for example, a negative integer, 0, or a positive integer. N is a total quantity of beams included in the neighbor cell. This may alternatively be described as follows: N is a quantity of beams in the neighbor cell, where N is a positive integer. mod represents a modulo operator. Introducing mod can ensure that a calculated beam identifier is in a range of N beam identifiers in the neighbor cell, for example, a value of (beam index+M) is not greater than N. Certainly, during implementation, a value range of M may alternatively be limited to ensure that a value of (beam index+M) is not greater than N, in other words, (beam index+M) mod N may alternatively be replaced with (beam index+M). This is not limited in

embodiments of this application. In addition, (beam index+M) may alternatively be replaced with (beam index-M). In embodiments of this application, (beam index+M) is used as an example for description below.

[00151] A group of values of M, K, and N is substituted into the calculation formula, to determine a group of to-be-measured beams, where identifiers of the group of to-be-measured beams are consecutive. A plurality of groups of values of M, K, and N are separately substituted into the calculation formula, to determine a plurality of groups of to-be-measured beams. The plurality of groups of to-be-measured beams include some beams with consecutive identifiers and some beams with inconsecutive identifiers.

[00152] For example, the beam index and a group of values of M, N, and K are substituted into the calculation formula, so that identifiers of a start beam and an end beam in a group of to-be-measured beams may be directly obtained. A total quantity of beams included in the group of to-be-measured beams is $2*K+1$, and all the beams in the group of to-be-measured beams may be deduced. For example, the beam index being 0 and a group of values {0, 2, 128} of M, N, and K are substituted into $[(\text{beam index}+M) \bmod N \pm K] \bmod N$, to obtain an identifier of a start beam in a group of to-be-measured beams being $[(\text{beam index}+M) \bmod N - K] \bmod N = 126$, an identifier of an end beam being $[(\text{beam index}+M) + K] \bmod N = 2$, and a quantity of beams is $2*K+1=5$, in other words, identifiers of the beams in the group of to-be-measured beams include {126, 127, 0, 1, 2}.

[00153] Optionally, the operator " $\pm$ " before K may be extended to three possibilities: "-", "+", and " $\pm$ ".

[00154] When the operator before K is "-", an identifier of a start beam in a group of to-be-measured beams may be directly obtained by substituting the beam index and a group of values of M, N, and K into the calculation formula $[(\text{beam index}+M) \bmod N - K] \bmod N$. A quantity of beams in the group of to-be-measured beams is $K+1$, identifiers of the beams in the group of to-be-measured beams are consecutive, and an identifier of an end beam in the group of to-be-measured beams is $(\text{beam index}+M) \bmod N$. For example, when the beam index is 0, and a group of values M, N, and K are {0, 2, 128}, in a corresponding group of to-be-measured beams, an identifier of a start beam is $[(\text{beam index}+M) - K] \bmod N = 126$, an identifier of an end beam is $(\text{beam index}+M) \bmod N = 0$, and a quantity of beams is $K+1=3$, in other words, identifiers of the group of to-be-measured beams include {126, 127, 0}.

[00155] When the operator before K is "+", an identifier of an end beam in a group of to-be-measured beams may be directly obtained by substituting the beam index and a group of values of M, N, and K into the calculation formula $[(\text{beam index}+M) \bmod N + K] \bmod N$. A quantity of beams in the group of to-be-measured beams is $K+1$, identifiers of the beams in the group of to-be-measured beams are consecutive, and an identifier of a start beam in the group of to-be-measured

beams is $(\text{beam index} + M) \bmod N$. For example, when the beam index is 0, and a group of values of M, N, and K are {0, 2, 128}, in a corresponding group of to-be-measured beams, an identifier of a start beam is $(\text{beam index} + M) \bmod N = 0$, an identifier of an end beam is $[(\text{beam index} + M) + K] \bmod N = 2$, and a quantity of beams is $K + 1 = 3$, in other words, identifiers of the beams in the group of to-be-measured beams include {0, 1, 2}.

[00156] In a possible design, M, K, and N are cell granularity information, in other words, values of M, K, and N in the foregoing calculation formula are related to the neighbor cell. M, K, and N corresponding to one neighbor cell include one or more groups of values, and values of M, K, and N corresponding to different neighbor cells may be the same or different. For example, neighbor cells include a cell 2 and a cell 3, a plurality of groups of values of M/K/N corresponding to the cell 2 include 0/2/128 and 5/4/128, and one group of values of M/K/N corresponding to the cell 3 are 1/2/256.

[00157] In another possible design, M, K, and N are cell-combined-beam granularity information, in other words, one or more groups of values of M, K, and N in the foregoing calculation formula are associated with the neighbor cell and the beam index. In a plurality of groups of values of M, K, and N corresponding to one neighbor cell, each beam in the serving cell is associated with at least one of the plurality of groups of values of M, K, and N. Values of M, K, and N that correspond to a same neighbor cell and that are associated with different beams in the serving cell may be the same or different. For example, the serving cell is a cell 1, and neighbor cells include a cell 2 and a cell 3. A group of values of M, K, and N that correspond to the cell 2 and that are associated with a beam 0 in the cell 1 are 0/2/128, and a group of values of M, K, and N that correspond to the cell 3 and that are associated with the beam 0 in the cell 1 are 1/2/1256. A group of values of M, K, and N that correspond to the cell 2 and that are associated with a beam 1 in the cell 1 are 1/4/128, and a group of values of M, K, and N that correspond to the cell 3 and that are associated with the beam 1 in the cell 1 are 0/2/1256. For another example, a plurality of groups of values of M, K, and N that correspond to the cell 2 and that are associated with the beam 0 in the cell 1 include 0/2/128 and 5/4/128.

[00158] Application scenarios of the foregoing calculation formula are described below by using examples.

[00159] Scenario 1: A network device may indicate, based on the foregoing calculation formula, a terminal device to measure some beams in a neighbor cell. For example, the network device may indicate one or more groups of values of M, K, and N to the terminal device for some beams that are expected to be measured by the terminal device. The terminal device may determine a beam measurement range in the neighbor cell by using the one or more groups of values of M, K, and N.

[00160] For example, if identifiers of the some beams expected, by the network device, to be measured by the terminal device are consecutive, the network device indicates one group of values of M, K, and N. If identifiers of the some beams expected, by the network device, to be measured by the terminal device are inconsecutive, the network device indicates a plurality of groups of values of M, K, and N.

[00161] Scenario 2: Beam distribution mode information of a neighbor cell is configured for a terminal device in a predefined manner or in a manner of being indicated by the network device. The beam distribution mode information may indicate one or more of the following: a coverage range of at least one beam in the neighbor cell, a total quantity of beams in the neighbor cell, a coverage range of the neighbor cell, and beam arrangement information (for example, an arrangement direction such as clockwise, counterclockwise, or satellite sweeping) in the neighbor cell. The terminal device may determine one or more groups of values of M, K, and N based on the beam distribution mode information, in other words, the terminal device may determine a beam measurement range of the neighbor cell.

[00162] For example, if the terminal device expects to measure some beams with consecutive identifiers in the neighbor cell, the terminal device may determine one group of values of M, K, and N; or if the terminal device expects to measure some beams with inconsecutive identifiers in the neighbor cell, the terminal device may determine a plurality of groups of values of M, K, and N.

[00163] In addition, the terminal device may also determine specific values of M, K, and N based on the coverage range of the at least one beam in the neighbor cell.

[00164] Scenario 3: The scenario 1 and the scenario 2 may be combined for use. For example, a terminal device may obtain one or more groups of values of M, K, and N that are indicated by a network device, and additionally determine one or more groups of values of M, K, and N based on beam distribution mode information of a neighbor cell.

[00165] Scenario 4: For any group of values of M, K, and N, a network device may determine some beams that are expected to be measured by a terminal device, and configure values of some information in M, K, and N for the terminal device. The terminal device may determine, based on beam distribution mode information of a neighbor cell, values of remaining information that is not indicated by the network device and that is in M, K, and N.

[00166] Optionally, after obtaining one or more groups of values of the some information that is in M, K, and N and that is indicated by the network device, the terminal device may further additionally determine one or more groups of values of some information in M, K, and N based on the beam distribution mode information of the neighbor cell.

[00167] Based on the design of the foregoing calculation formula, a beam measurement range

of the terminal device for the neighbor cell can be narrowed, beam measurement overheads can be reduced, and signaling overheads for indicating the beam measurement range by the network device can be reduced.

[00168] For ease of implementation, detailed descriptions are provided below by using an example in which a terminal device measures some beams in a first neighbor cell. It may be understood that there may be one or more neighbor cells of the terminal device. When there are a plurality of neighbor cells of the terminal device, beam information of any one of the plurality of neighbor cells may be understood with reference to beam information of the first neighbor cell. In embodiments of this application, the first neighbor cell is used as an example for description below.

[00169] FIG. 7 shows a measurement method. The method mainly includes the following procedure.

[00170] S701: A terminal device obtains beam information of a first neighbor cell.

[00171] Beam information of the first neighbor cell is used to determine a first candidate beam set corresponding to the first neighbor cell, the first candidate beam set includes a to-be-measured beam in the first neighbor cell, and a total quantity of beams in the first candidate beam set is less than a total quantity of beams in the first neighbor cell. Optionally, the beam information of the first neighbor cell may also be described as beam coverage information of the first neighbor cell. Corresponding to the design of the foregoing calculation formula, it may be understood that the beam information of the first neighbor cell may include one or more of the following: beam identifier offset information (M), indication information (K) of the quantity of beams in the first candidate beam set, and the quantity (N) of beams in the first neighbor cell. The quantity of beams in the first candidate beam set is the total quantity of beams included in the first candidate beam set, and the quantity of beams in the first neighbor cell is the total quantity of beams included in the first neighbor cell.

[00172] In an optional implementation, the terminal device may receive the beam information of the first neighbor cell from a serving cell. For example, a network device sends the beam information of the first neighbor cell to the terminal device through the serving cell.

[00173] For the terminal device in a connected state, the network device may send the beam information of the first neighbor cell to the terminal device by using dedicated signaling (for example, RRC signaling). For example, when the beam information of the first neighbor cell is cell granularity information, the beam information of the first neighbor cell that is sent by the network device may include one or more groups of beam information corresponding to the first neighbor cell. For another example, when the beam information of the first neighbor cell is cell-combined-beam granularity information, the beam information of the first neighbor cell that is sent by the network device may include one or more groups of beam information associated with at

least one beam in the serving cell of the terminal device. The at least one beam may include only an optimal beam or the serving beam of the terminal device, or the at least one beam includes all beams in the serving cell.

[00174] For the terminal device in an idle state or an inactive mode, the network device may send the beam information of the first neighbor cell to the terminal device by using broadcast signaling. For example, when the beam information of the first neighbor cell is cell granularity information, the network device may send same broadcast signaling in a direction corresponding to each beam in the serving cell, where the same broadcast signaling includes one or more groups of beam information corresponding to the first neighbor cell. For another example, when the beam information of the first neighbor cell is cell-combined-beam granularity information, the network device may send, in a direction corresponding to a beam in the serving cell, one or more groups of beam information corresponding to the first neighbor cell associated with the beam, and beam information transmitted in directions corresponding to different beams is the same or different.

[00175] Optionally, the network device may determine the beam information of the first neighbor cell based on a beam distribution mode, in a cell, deployed by an operator.

[00176] Alternatively, optionally, the network device may determine a correspondence between beam coverage ranges of a plurality of cells based on beam measurement results of the plurality of cells that are historically reported by at least one terminal device. Then, the network device determines the beam information of the first neighbor cell based on the correspondence between the beam coverage ranges of the cells. The at least one terminal device may be a quasi-fixed UE, and the quasi-fixed UE satisfies one or more of the following: a size of an activity range in a specific time period is not greater than a specified region size threshold; a moving speed is not greater than a specified speed threshold; and a moving distance in a specific time period is not greater than a specified distance threshold. The at least one terminal device may include the terminal device described in S701, or may not include the terminal device described in S701. The plurality of cells may include the serving cell and the first neighbor cell that are of the terminal device and that are described in S701. In this manner, manual or operation deployment planning workload can be reduced, and the beam information can be further updated in a timely manner. For example, a network may determine a latest beam coverage relationship between the plurality of cells at any time based on a beam measurement result reported by the UE, so as to provide accurate beam information for the UE.

[00177] As shown in FIG. 8, an example in which an activity range of a quasi-fixed UE in a specific time period (for example, t_1 to t_3) is in a sub-region 1 (sub-area 1) is used. The network device may determine, based on beam measurement results reported by the UE in a cell 1, a cell 2, and a cell 3, a beam used to cover the sub-region 1 in each cell, to obtain a correspondence

between beam coverage ranges of the cells. For example, at the moment t1, the beam measurement result reported by the UE in the cell 1 indicates that signal quality of a beam 0 in the cell 1 is optimal. At the moment t2, the beam measurement result reported by the UE in the cell 2 indicates that signal quality of a beam 0 in the cell 2 is optimal, and signal quality of {beam 6, beam 7, beam 1, beam 2} in the cell 2 is higher than a specified signal quality threshold. At the moment t3, the beam measurement result reported by the UE in the cell 3 indicates that signal quality of a beam 4 in the cell 3 is optimal, and signal quality of {beam 2, beam 3, beam 5, beam 6} in the cell 3 is higher than the specified signal quality threshold. When the cell 1 is a serving cell of the terminal device, and the cell 2 and the cell 3 are neighbor cells of the terminal device, the network device may determine that to-be-measured beams of the cell 2 associated with the beam 0 in the cell 1 include {beam 6, beam 7, beam 0, beam 1, beam 2}, so that the network device may configure, for the terminal device, beam information of the cell 2 associated with the beam 0 in the cell 1, for example, M/K/N being 0/2/8. Similarly, the network device may determine that to-be-measured beams of the cell 3 associated with the beam 0 in the cell 1 include {beam 2, beam 3, beam 4, beam 5, beam 6}, so that the network device may configure, for the terminal device, beam information of the cell 3 associated with the beam 0 in the cell 1, for example, M/K/N being 4/2/8.

[00178] In another optional implementation, the terminal device may determine the beam information of the first neighbor cell based on beam distribution mode information of the first neighbor cell. For example, for an implementation, refer to the descriptions in the foregoing scenario 2. Details are not described in this embodiment of this application.

[00179] In addition, the terminal device may obtain the beam information of the first neighbor cell with reference to the foregoing two implementations. An example in which the beam information of the first neighbor cell includes one group of beam information is used below for description.

[00180] In a possible combined manner, for the beam identifier offset information (M) in the group of beam information, M may be indicated by the network device to the terminal device; when the network device does not indicate M to the terminal device, the terminal device may consider that M is of 0; when the network device does not indicate M to the terminal device, the terminal device may determine that M is of a first default value, where the first default value may be predefined or may be negotiated by the network device and the terminal device in advance; or when the network device does not indicate M to the terminal device, the terminal device determines a value of M based on the beam distribution mode information of the first neighbor cell. For the indication information (K) of the quantity of beams included in the group of beam information, K may be indicated by the network device to the terminal device; when the network device does not indicate K to the terminal device, the terminal device may consider that K is of 0;

when the network device does not indicate K to the terminal device, the terminal device may determine that K is of a second default value, where the second default value may be predefined, or may be negotiated by the network device and the terminal device in advance; when the network device does not indicate K to the terminal device, the terminal device determines a value of K based on the beam distribution mode information of the first neighbor cell; or when the network device does not indicate K to the terminal device, the terminal device may determine a value of K based on factors such as a beam measurement and maintenance capability (for example, a quantity of beams that can be measured and maintained) of the terminal device and communication quality. For the quantity (N) of beams in the first neighbor cell included in the group of beam information, N may be indicated by the network device to the terminal device; when the network device does not indicate N to the terminal device, the terminal device may consider that the quantity of beams in the first neighbor cell is the same as a quantity of beams in the serving cell, or the terminal device may determine that the quantity of beams in the first neighbor cell is a predefined default value; or when the network device does not indicate N to the terminal device, the terminal device determines a value of N based on the beam distribution mode information of the first neighbor cell.

[00181] In another possible combined manner, when the beam information of the first beam includes a plurality of groups of beam information, the network device may indicate a part of the plurality of groups of beam information, and the terminal device determines, based on the beam distribution mode information of the first neighbor cell, at least one group of beam information that is in the plurality of groups of beam information and that is not indicated by the network device.

[00182] S702: The terminal device determines, based on a first beam of the serving cell and the beam information of the first neighbor cell, the first candidate beam set corresponding to the first neighbor cell.

[00183] Optionally, the first beam is a serving beam of the terminal device in a serving cell. It may be understood that when there are a plurality of serving beams of the terminal device, the first beam may be one of the plurality of serving beams of the terminal device. Alternatively, signal quality of the first beam is greater than or equal to a first signal quality threshold, and the first beam may also be referred to as an optimal beam of the terminal device in the serving cell. It may be understood that when there are a plurality of optimal beams of the terminal device, the first beam may be one of the plurality of optimal beams of the terminal device.

[00184] The beam information of the first neighbor cell includes I groups of beam information, and the first candidate beam set is a union set of I candidate beam subsets. The terminal device may determine an i^{th} candidate beam subset in the I candidate beam subsets based on an i^{th} group of beam information in the I groups of beam information, where I is a positive integer, and i is a

positive integer from 1 to I, that is, $1 \leq i \leq I$. It may be understood that, when I is equal to 1, the first candidate beam set is a union set of one candidate beam subset, or may be described as that the first candidate beam set is the candidate beam subset; or when I is equal to 1, it may be considered that there is no concept of candidate beam subset, and the beam information of the first neighbor cell includes one group of beam information, so that the terminal device may determine the first candidate beam set based on the first beam and the group of beam information.

[00185] Corresponding to the design of the foregoing calculation formula and the descriptions in S701, it may be understood that, the I groups of beam information is cell granularity information, and there is an association relationship between the I groups of beam information and the first neighbor cell, in other words, the I groups of beam information is included in the beam information of the first neighbor cell; or the I groups of beam information is cell-combined-beam granularity information, and the I groups of beam information have an association relationship with the first neighbor cell and the first beam, in other words, the I groups of beam information is beam information that is in the beam information of the first neighbor cell and that has the association relationship with the first beam. The terminal device may receive first information from the serving cell, where the first information indicates at least one group of beam information in the I groups of beam information. The terminal device may alternatively determine at least one group of beam information in the I groups of beam information based on the beam distribution mode information of the first neighbor cell (for example, a coverage range of at least one beam in the first neighbor cell).

[00186] The i^{th} group of beam information in the I groups of beam information includes one or more of the following: a beam identifier offset of the i^{th} candidate beam subset relative to the first beam (for example, denoted as M_i), indication information of a quantity of beams in the i^{th} candidate beam subset (for example, denoted as K_i), and the quantity of beams in the first neighbor cell (for example, denoted as N_i). A relationship between K_i and the quantity of beams in the i^{th} candidate beam subset satisfies K_i+1 or $2K_i+1$. In addition, optionally, the indication information of the quantity of beams in the i^{th} candidate beam subset may alternatively be the quantity of beams in the i^{th} candidate beam subset. This is not limited in this application. Identifiers of the beams in the i^{th} candidate beam subset are described below by using examples.

[00187] Example 1: An identifier of a start beam in the i^{th} candidate beam subset is $(BI+M_i) \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$. The quantity of beams in the i^{th} candidate beam subset is K_i+1 , and the identifiers of all the beams in the i^{th} candidate beam subset are consecutive. As shown in FIG. 8, the cell 1 is the serving cell, and the cell 2 is the first neighbor cell. Assuming that the first beam is a serving beam of the terminal device, the first beam is the beam 0 in the cell 1, and $I=1$, one group of beam

information, namely, $M_1 = 0$, $K_1=2$, and $N_1=8$, is obtained by the terminal device. A start beam in one candidate beam subset, namely, the first candidate beam set is the beam 0 in the first neighbor cell, an end beam is the beam 2 in the first neighbor cell, and the quantity of beams in the first candidate beam set is $K+1=3$. In this case, the first candidate beam set is {beam 0, beam 1, beam 2}.

[00188] Example 2: An identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $(BI+M_i) \bmod N_i$. The quantity of beams in the i^{th} candidate beam subset is K_i+1 , and the identifiers of all the beams in the i^{th} candidate beam subset are consecutive. As shown in FIG. 6C, a cell 1 is the serving cell, and a cell 2 is the first neighbor cell. Assuming that the first beam is a serving beam of the terminal device, the first beam is a beam 6 in the cell 1 (the serving cell), and $I=2$, the terminal device obtains two groups of beam information. If a 1st group of beam information is $M_1 = 2$, $K_1=2$, and $N_1=128$, a start beam in a 1st candidate beam subset is a beam 6 in the first neighbor cell, an end beam is a beam 8 in the first neighbor cell, and a quantity of beams in the 1st candidate beam set is $K_1 + 1=3$, the 1st candidate beam set is {beam 6, beam 7, beam 8}. If a 2nd group of beam information is $M_2 = 5$, $K_2=3$, and $N_2=128$, a start beam in a 2nd candidate beam subset is a beam 8 in the first neighbor cell, an end beam is a beam 11 in the first neighbor cell, and a quantity of beams in the 2nd candidate beam subset is $K_1 + 1=4$, the 2nd candidate beam subset is {beam 8, beam 9, beam 10, beam 11}. The first candidate beam set is a union set of the 1st candidate beam subset and the 2nd candidate beam subset, and the first candidate beam set is {beam 6, beam 7, beam 8, beam 9, beam 10, beam 11}.

[00189] Example 3: An identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$. The quantity of beams in the i^{th} candidate beam subset is $2*K_i+1$, and the identifiers of all the beams in the i^{th} candidate beam subset are consecutive. As shown in FIG. 6C, a cell 1 is the serving cell, and a cell 2 is the first neighbor cell. Assuming that the first beam is a serving beam of the terminal device, the first beam is a beam 6 in the cell 1 (the serving cell), and $I=2$, the terminal device obtains two groups of beam information. If a 1st group of beam information is $M_1 = 2$, $K_1=1$, and $N_1=128$, a start beam in a 1st candidate beam subset is a beam 7 in the first neighbor cell, an end beam is a beam 9 in the first neighbor cell, and a quantity of beams in the 1st candidate beam set is $2 * K_1 + 1=3$, the 1st candidate beam set is {beam 7, beam 8, beam 9}. If a 2nd group of beam information is $M_2 = -5$, $K_2=1$, and $N_2=128$, a start beam in a 2nd candidate beam subset is a beam 0 in the first neighbor cell, an end beam is a beam 2 in the first neighbor cell, and a quantity of beams in the 2nd candidate beam subset is $2 * K_1 + 1=3$, the 2nd candidate beam subset is {beam 0, beam 1, beam 2}. The first candidate beam set is a union

set of the 1st candidate beam subset and the 2nd candidate beam subset, and the first candidate beam set is {beam 0, beam 1, beam 2, beam 7, beam 8, beam 9}.

[00190] Optionally, $(BI + M_i) \bmod N_i$ described in the foregoing example may also be understood as a reference beam in the first neighbor cell. When the first beam is a serving beam or an optimal beam of the terminal device in the serving cell, the reference beam and the first beam may cover a same region on the ground in a time division manner. For example, the terminal device is located in a first region, and a coverage range of the first beam includes the first region. After the terminal device is changed to the first neighbor cell through handover or cell reselection, a coverage range of the reference beam includes the first region. The reference beam may also be understood as a candidate serving beam or a candidate optimal beam after the terminal device is changed to the first neighbor cell. The first candidate beam set measured by the terminal device includes the reference beam. This helps the terminal device quickly determine a serving beam or an optimal beam in the first neighbor cell, to improve efficiency and accuracy of performing handover or cell reselection by the terminal device, so as to improve communication performance, and improve user experience.

[00191] S703: The terminal device measures the beam in the first candidate beam set.

[00192] Optionally, the terminal device may measure one beam in the first candidate beam set within a measurement time window associated with the beam, where measurement time windows associated with different beams in the first candidate beam set are the same or different. As shown in FIG. 6D, the terminal device may measure a corresponding SSB beam in an SMTC time window. It may be understood that, because the total quantity of beams included in the first candidate beam set is less than the total quantity of beams included in the first neighbor cell, compared with measuring all the beams in the first neighbor cell, measuring the first candidate beam set can reduce a quantity of SMTC time windows or a quantity of beams measured in an SMTC time window, so that duration for performing measurement by the terminal device is reduced, and measurement overheads and power consumption of the terminal device are reduced.

[00193] For example, assuming that the first candidate beam set determined by the terminal device is {beam 3, beam 4, beam 5}, the terminal device may perform measurement only in an SMTC time window 1, for example, measure an SSB #3, an SSB #4, and an SSB #5. For another example, assuming that the first candidate beam set determined by the terminal device is {beam 6, beam 7, beam 8, beam 9}, the UE may perform measurement in an SMTC time window 1 and an SMTC time window 2, for example, perform measurement on an SSB #6, an SSB #7, an SSB #8, and an SSB #9.

[00194] Optionally, for the terminal device in the connected mode, the terminal device may further perform the following step S704:

[00195] S704: The terminal device sends, to the network device, a beam measurement result corresponding to the first candidate beam set.

[00196] Optionally, the beam measurement result corresponding to the first candidate beam set may include measurement results of all or a part of beams in the first candidate beam set. For example, the terminal may send only a measurement result of a beam whose quality is higher than a specific threshold in the first candidate beam set.

[00197] It may be understood that, as an optional step, S704 is shown by using a dashed line in FIG. 7.

[00198] Optionally, the network device may update a correspondence between a coverage range of the beam in the serving cell and a coverage range of a beam in at least one neighbor cell based on a beam measurement result corresponding to a first candidate beam set of the at least one neighbor cell, to update the beam information of the first neighbor cell.

[00199] Optionally, the terminal device may further perform the following step S705:

[00200] S705: The terminal device determines a target beam in the first candidate beam set.

[00201] Optionally, the terminal device may determine the target beam based on a measurement result of each beam in the first candidate beam set. The target beam is a serving beam of the terminal device after the terminal device is changed to the first neighbor cell; or signal quality of the target beam is greater than or equal to a second signal quality threshold, and the target beam may also be referred to as an optimal beam in the first neighbor cell. The "change" may refer to handover, cell selection, or cell reselection. Optionally, there may be one or more target beams. The second signal quality threshold may be the same as or different from the foregoing first signal quality threshold. This is not limited in embodiments of this application.

[00202] In a possible implementation, the serving cell and the neighbor cell (for example, the first neighbor cell) described above are quasi-earth-fixed NTN cells, and the terminal device is continuously located in the first region in specific duration. For example, an inactive range or an activity range of the terminal device is not greater than the first region. When the first beam is the serving beam/optimal beam of the terminal device in the serving cell, after the terminal device is changed to the first neighbor cell, the first candidate beam set corresponding to the first neighbor cell may include a beam that replaces the first beam and covers the first region.

[00203] As shown in FIG. 8, it is assumed that the terminal device is located in a sub-region 1 (sub-area 1) in a geographical region 1 (area 1) in specific duration (for example, including t1 to t3). At the moment t1, the cell 1 covers the geographical region 1, the serving cell of the terminal device is the cell 1, and neighbor cells include the cell 2 and the cell 3. The terminal device determines, based on a serving beam/an optimal beam in the cell 1, that a first candidate beam set corresponding to the cell 2 is {beam 6, beam 7, beam 0, beam 1, beam 2}, and a first candidate

beam set corresponding to the cell 3 is {beam 3, beam 4, beam 5}. At the moment t2, the cell 2 covers the geographical region 1. When reselecting the cell 2, the terminal device preferentially determines a serving beam or an optimal beam in the cell 2 from the first candidate beam set {beam 6, beam 7, beam 0, beam 1, beam 2} corresponding to the cell 2. At the moment t3, the cell 3 covers the geographical region 1. When reselecting the cell 3, the UE preferentially determines a serving beam or an optimal beam in the cell 3 from the first candidate beam set {beam 3, beam 4, beam 5} corresponding to the cell 3.

[00204] In addition, when there are a plurality of neighbor cells of the terminal device, for example, in the foregoing example, relative to the serving cell of the terminal device being the cell 1, the neighbor cells may include the cell 2 and the cell 3. The terminal device may determine, based on the first beam in the serving cell, a first candidate beam set corresponding to each of the plurality of neighbor cells (for example, the cell 2 and the cell 3). It may be understood that after the terminal device is changed from the cell 1 to the cell 2, the cell 2 becomes a new serving cell of the terminal device, and the cell 3 is still the neighbor cell of the terminal device. In this case, the terminal device may perform measurement based on the first candidate beam set of the cell 3 that is determined by the terminal device when the terminal device is in the cell 1; or the terminal device may re-determine a first candidate beam set of the cell 3 with reference to beams in the cell 2, to measure beams in the re-determined first candidate beam set of the cell 3. This is not limited in embodiments of this application.

[00205] In another possible implementation, the serving cell and the neighbor cell (for example, the first neighbor cell) described above are earth-moving NTN cells, and the terminal device is continuously located in the first region in specific duration. For example, an inactive range or an activity range of the terminal device is not greater than the first region. When the first beam is the serving beam/optimal beam of the terminal device in the serving cell, after the terminal device is changed to the first neighbor cell, the first candidate beam set corresponding to the first neighbor cell may include a beam that replaces the first beam and covers the first region for the first time.

[00206] As shown in FIG. 9, it is assumed that the terminal device is located in a sub-region 1 (sub-area 1) in a geographical region 1 (area 1) in specific duration (for example, including t1 to t3). At a moment t1, a cell 1 covers the geographical region 1, the serving cell of the terminal device is the cell 1, and neighbor cells include a cell 2, a cell 3, and a cell 4. For example, a first beam (for example, a serving beam or an optimal beam) in the cell 1 is a beam 0. The terminal device may determine that a first candidate beam set corresponding to the cell 2 is {beam 7, beam 0, beam 1}, and first candidate beam sets corresponding to the cell 3 and the cell 4 are both {beam 3, beam 4, beam 5}.

[00207] Because coverage of the cell 1 slides on the ground, even if the UE is always in the

sub-region 1, the serving beam or the optimal beam of the terminal device in the cell 1 gradually changes from the beam 0 to the beam 5, and then to the beam 3.

[00208] When coverage of the cell 2 slides to a range of the geographical region 1, if the UE determines to reselect the cell 2, the UE may preferentially determine, in the first candidate beam set {beam 7, beam 0, beam 1} corresponding to the cell 2, a serving beam or an optimal beam that is used for the first time in the cell 2. Same as the case in the cell 1, as the coverage of the cell 2 slides, the serving beam or the optimal beam of the terminal device in the cell 2 may subsequently change.

[00209] Similarly, when coverage of the cell 3 or the cell 4 slides to the range of the geographical region 1, if the UE determines to reselect the cell 3 or the cell 4, the UE may preferentially determine, in the first candidate beam set {beam 3, beam 4, beam 5} corresponding to the cell 3 or the cell 4, a serving beam or an optimal beam that is used for the first time in the cell 3 or the cell 4. Same as the case in the cell 1, as the coverage of the cell 3 or the cell 4 slides, the serving beam or the optimal beam of the terminal device in the cell 3 or the cell 4 may subsequently change.

[00210] According to the foregoing method provided in this embodiment of this application, the to-be-measured beam in the first neighbor cell can be precisely determined with reference to the serving cell and the beam information of the first neighbor cell, to prevent the terminal device from measuring an unrelated beam, reduce beam measurement and maintenance overheads of the terminal device, and reduce measurement power consumption of the terminal device. In addition, the terminal device can more accurately and quickly determine the serving beam or the optimal beam in the first neighbor cell based on the first candidate beam set, so that the terminal device can more quickly complete handover or cell selection/reselection, to perform a subsequent operation such as data transmission, camping, or access. This design can reduce interruption caused by handover or cell selection/reselection, to improve user experience and performance.

[00211] It is considered that a coverage range of an earth-moving NTN cell slides on the ground, even if the terminal device remains unchanged, the serving beam or the optimal beam of the terminal device in the serving cell may change in specific duration. Based on this, an embodiment of this application further provides a measurement method, which may be applied to a scenario in which a serving cell and/or a neighbor cell are/is NTN cells/an NTN cell. Refer to FIG. 10. The method mainly includes the following procedure.

[00212] S1001: A terminal device obtains beam information of a first neighbor cell.

[00213] For understanding of this step, refer to the descriptions in S701. Details are not described in this embodiment of this application.

[00214] S1002: The terminal device determines, based on a first beam of a serving cell and the

beam information of the first neighbor cell, a first candidate beam set corresponding to the first neighbor cell.

[00215] Optionally, the first beam is a serving beam or an optimal beam of the terminal device. For understanding of this step, refer to the descriptions in S702. Details are not described in this embodiment of this application.

[00216] As shown in FIG. 9, a serving cell of the terminal device is a cell 1, and neighbor cells of the terminal device include a cell 2, a cell 3, and a cell 4. For example, the first beam is a beam 0 in the cell 1. The terminal device may determine that a first candidate beam set corresponding to the cell 2 is {beam 7, beam 0, beam 1}, and first candidate beam sets corresponding to the cell 3 and the cell 4 are both {beam 3, beam 4, beam 5}. It is assumed that coverage of the cell 1 slides on the ground, so that a serving beam or an optimal beam of the terminal device changes from the beam 0 to the beam 5, and then to the beam 3.

[00217] In a possible design, the terminal device may update, based on the changed serving beam or optimal beam, first candidate beam sets corresponding to the neighbor cells (for example, the cell 2, the cell 3, and the cell 4) to obtain second candidate beam sets corresponding to the neighbor cells. After performing S1002, the terminal device further performs steps S1003 and S1004. Optionally, the terminal device may further perform S1005 after performing S1004. In this design, to match the update of the serving beam or the optimal beam in the serving cell, the to-be-measured beam set in the neighbor cell is updated in a timely manner, so that beam measurement accuracy can be ensured.

[00218] In another possible design, it is assumed that the terminal device remains unchanged or moves in a first region. For example, a coverage range of the cell 1 is denoted as a region 1. The terminal device is always located in a sub-region 1 in the region 1. In this case, the terminal device may not need to update the first candidate beam sets corresponding to the neighbor cells (the cell 2, the cell 3, and the cell 4). After performing S1002, the terminal device further performs step S1006. Optionally, the terminal device may further perform S1007 after performing S1006. This design can reduce unnecessary beam set determining operations and measurement overheads of the terminal device.

[00219] S1003: The terminal device determines, based on a second beam of the serving cell and the beam information of the first neighbor cell, a second candidate beam set corresponding to the first neighbor cell.

[00220] The second beam is a changed serving beam or optimal beam in the serving cell. When the beam information of the first neighbor cell is cell granularity information, the beam information of the first neighbor cell described in S1003 may be the same as that described in S1001. When the beam information of the first neighbor cell is cell-combined-beam granularity information, the

beam information of the first neighbor cell described in S1001 is beam information of the first neighbor cell associated with the first beam, and the beam information of the first neighbor cell described in S1002 is beam information of the first neighbor cell associated with the second beam.

[00221] For example, the second beam is the beam 5 in the cell 1. The terminal device may determine that a second candidate beam set corresponding to the cell 2 is {beam 2, beam 5, beam 6}, and second candidate beam sets corresponding to the cell 3 and the cell 4 are both {beam 1, beam 2, beam 6}.

[00222] S1004: The terminal device measures a beam in the second candidate beam set corresponding to the first neighbor cell.

[00223] S1005: The terminal device determines a target beam in the second candidate beam set.

[00224] For example, corresponding to the descriptions in S1003, the terminal device may determine, in {beam 2, beam 5, beam 6} in the cell 2, a serving beam or an optimal beam of the terminal device after the terminal device is changed to the cell 2. The terminal device may determine, in {beam 1, beam 2, beam 6} in the cell 3 or the cell 4, a serving beam or an optimal beam of the terminal device after the terminal device is changed to the cell 3 or the cell 4.

[00225] S1006: The terminal device measures a beam in the first candidate beam set corresponding to the first neighbor cell.

[00226] S1007: The terminal device determines a target beam in the first candidate beam set.

[00227] For example, corresponding to the descriptions in S1002, the terminal device may determine, in {beam 7, beam 0, beam 1} in the cell 2, a serving beam or an optimal beam of the terminal device after the terminal device is changed to the cell 2. The terminal device may determine, in {beam 3, beam 4, beam 5} in the cell 3 or the cell 4, a serving beam or an optimal beam of the terminal device after the terminal device is changed to the cell 3 or the cell 4.

[00228] In addition, this application further provides an NTN cell access method. For example, the access method may be applied to the foregoing scenario in which the terminal device accesses the serving cell in the foregoing embodiment, or may be applied to a scenario in which another terminal device accesses an NTN.

[00229] For ease of understanding, system information (system information, SI) in the access method is first described in detail. The SI is a message sent by a network device, and the message includes information required for initialization of a terminal device and some related information for implementing another function or feature. The SI is classified into minimum system information (minimum SI, MSI) and other system information (other SI, OSI).

[00230] The MSI includes a master information block (master information block, MIB) and a system information block 1 (system information block 1, SIB1). The SIB1 may also be referred to as remaining minimum system information (remaining minimum SI, RMSI). The terminal device

periodically broadcasts the MIB over a broadcast channel (broadcast channel, BCH). The terminal device periodically broadcasts the SIB1 over a downlink shared channel (downlink shared channel, DL-SCH), or sends the SIB1 to a terminal device in a connected state by using dedicated signaling.

[00231] The OSI includes another SIB, for example, a SIB2 to a SIB21. The network device periodically broadcasts another SIB over the DL-SCH. Alternatively, the network device broadcasts another SIB over the DL-SCH as required (on-demand). For example, when a terminal device in an idle state or an inactive state requests another SIB, the network broadcasts the another SIB; otherwise, the network does not send the another SIB. Alternatively, the network device sends another SIB to a terminal device in a connected state by using dedicated signaling.

[00232] In addition, the network device sends scheduling information of the system information by using the SIB1. The scheduling information is used by the terminal device to determine a sending time point of a SIB other than the SIB1. In other words, after receiving the SIB1, the terminal device may obtain the another SIB based on the scheduling information of the system information. A specific mechanism is as follows: One or more other SIBs may form one system information message (SI message), and sending periodicities of the other SIBs included in the SI message are the same, and are all a sending periodicity of the SI message. Sending periodicities of different SI messages may be the same or different. Usually, a basic procedure in which a terminal device in an idle state or an inactive state obtains system information is as follows: The terminal device first obtains a MIB, obtains a SIB1 based on scheduling information in the MIB, and then obtains another SIB based on scheduling information in the SIB1.

[00233] FIG. 11 shows an NTN cell access method. The method mainly includes the following steps.

[00234] S1101: A network device sends an SSB and a MIB of a first NTN cell.

[00235] Correspondingly, a terminal device receives the SSB and the MIB of the first NTN cell that are sent by the network device. The first NTN cell may also be understood as a serving cell to be accessed by the terminal device.

[00236] Optionally, the terminal device may first measure, according to the measurement method in the foregoing embodiment, a beam corresponding to the SSB based on an STMC time window, to determine a serving beam or an optimal beam in the first NTN cell. Then, the terminal device receives the MIB through the serving beam or the optimal beam in the first NTN cell.

[00237] S1102: The network device sends a SIB1 of the first NTN cell.

[00238] Correspondingly, the terminal device may receive the SIB1 based on scheduling information included in the MIB. The SIB1 may include local cell information of the first NTN cell. It may be understood that the SIB1 in this embodiment of this application is a name of a message including the local cell information of the to-be-accessed first NTN cell, and the SIB1

may alternatively be replaced with another name. This is not limited in embodiments of this application.

[00239] The local cell information of the first NTN cell is used by the terminal device to access the first NTN cell, and may also be referred to as access configuration information for the terminal device to access the first NTN cell. The local cell information, or referred to as the access configuration information, of the first NTN cell may include one or more of the following:

(1) epoch time information (epochTime) of the local cell;

(2) validity duration information (ntn-UISyncValidityDuration) of uplink synchronization assistance information of the local cell;

(3) cell scheduling information of the local cell, for example, including a cell-specific scheduling offset (cellSpecificKoffset), where the cell-specific scheduling offset is a scheduling offset (kmac) used in a scenario in which uplink and downlink frame timings on a network device side are not aligned;

(4) timing advance information of the local cell, for example, including one or more of the following: a common timing advance (ta-Common), a drift rate of the common timing advance (ta-CommonDrift), a variant of the drift rate of the common timing advance (ta-CommonDriftVariant), and a timing advance report control indication (ta-Report);

(5) satellite polarization information of the local cell, for example, downlink polarization information (ntn-PolarizationDL) and uplink polarization information (ntn-PolarizationUL); and

(6) satellite ephemeris information (ephemerisInfo) of the local cell, for example, satellite location and speed information, or satellite orbit parameter information.

[00240] It may be understood that the local cell in the foregoing (1) to (6) is the first NTN cell to be accessed by the terminal device, namely, the first NTN cell described in S1102.

[00241] Optionally, the network device may repeatedly send the SIB1. For example, as shown in FIG. 12, an example in which an SCS is 30 kHz, one system frame (system frame, SFN) includes 20 slots (slots), and duration of each slot is 0.5 ms is used to show that the network device sends eight SSBs, namely, an SSB0 to an SSB7, in 1st to 4th slots of a frame SFN #0 whose system frame number is 0. The network device separately sends a SIB1 in 17th to 20th slots of the SFN #0 in directions corresponding to the SSB0 to the SSB3; the network device separately sends the SIB1 in 1st to 4th slots of an SFN #1 in directions corresponding to the SSB4 to the SSB7; and the network device repeatedly sends the SIB1 in 5th to 12th slots in directions corresponding to the SSB0 to the SSB7. In this design, coverage performance of the SIB1 can be improved. It is ensured that the terminal device normally receives the SIB1, to ensure that the terminal device normally performs another operation, such as paging listening and access, in a cell subsequently. In addition, after

quality of a communication link is improved, an RRC message of the SIB1 has a larger margin, and more information may be added. This is not limited in embodiments of this application.

[00242] Optionally, the network device may send the SIB1 by "segment". Alternatively, it may be understood that the quantity of SIB1s, sent by the network device, described in S1102 is one or more. A meaning of sending by "segment" may be understood with reference to the following content: one SIB1 message is divided into a plurality of SIB1 messages, or content of the SIB1 is divided into a plurality of parts. For example, the content of the SIB1 is divided into a SIB1-1 (or referred to as the SIB1) and a SIB1-2 (or referred to as a SIB1bis), and the SIB1-1 may be first sent, and then the SIB1-2 is sent.

[00243] Optionally, the access method may further include the following step S1103: As an optional step, S1103 is shown by using a dashed line in FIG. 11.

[00244] S1103: The network device sends a SIB19 of the first NTN cell.

[00245] The SIB19 of the first NTN cell includes information irrelevant to access to the first NTN cell (namely, the serving cell). For example, the SIB19 includes neighbor cell information and/or a measurement related parameter for cell reselection.

[00246] For example, the neighbor cell information may include one or more of the following: neighbor cell frequency information (carrierFreq), for example, a frequency number of a neighbor cell frequency, where the frequency number may be an absolute radio frequency channel number (absolute radio frequency channel number, ARFCN); neighbor cell identifier information, for example, a physical cell identifier (physical cell identifier, PCI) of a neighbor cell; epoch time information (epochTime) of the neighbor cell; validity duration information of uplink synchronization assistance information (ntn-UISyncValidityDuration) of the neighbor cell; scheduling information of the neighbor cell, for example, a specific scheduling offset (cellSpecificKoffset) of the neighbor cell; timing advance information of the neighbor cell, for example, a common timing advance (ta-Common), a drift rate of the common timing advance (ta-CommonDrift), a drift rate variant of the common timing advance (ta-CommonDriftVariant), or a timing advance report control indication (ta-Report); satellite polarization information of the neighbor cell, for example, downlink polarization information (ntn-PolarizationDL) and uplink polarization information (ntn-PolarizationUL); and satellite ephemeris information (ephemerisInfo) of the neighbor cell, for example, satellite location and speed information, or satellite orbit parameter information.

[00247] The measurement related parameter for the cell reselection may include one or more of the following: service stop time information (t-Service) of the serving cell, for example, a time point at which the serving cell stops serving a current region; reference point information (referenceLocation) in the serving cell, where the reference point information is used to control,

based on a location, the terminal device to perform measurement for the cell reselection; and a distance threshold (distanceThresh), where the distance threshold is used to control, based on the location, the terminal device to perform measurement for the cell reselection.

[00248] Optionally, a location at which the network device sends the SIB19 may be a location other than the SSB and the SIB1. For example, in the example in FIG. 12, the network device may separately send the SIB19 in 13th to 20th slots of the SFN #1 in the directions corresponding to the SSB0 to the SSB7. In addition, the network device may alternatively send the SIB19 at any location in 5th to 16th slots of the SFN #0.

[00249] Optionally, the network device may send the SIB19 by using a single SI message, in other words, the SI message includes only one OSI, namely, the SIB19. Alternatively, the SIB19 and another SIB may form one SI message. For example, the SI message includes the SIB19 and a SIB 2.

[00250] In addition, optionally, if a capacity of the SIB1 described in S1102 allows, the SIB1 or a "segment" of the SIB1 may also include the neighbor cell information and/or the measurement related parameter for the cell reselection described in S1103. For example, the SIB1 (or a "segment" of the SIB1 (for example, the SIB1-2)) may include the local cell information and neighbor cell information of a neighbor cell 1/2; and the SIB19 includes neighbor cell information of a neighbor cell 3/4/5/6.

[00251] S1104: The terminal device initiates random access to the first NTN cell.

[00252] For example, the terminal device may initiate random access to the first NTN cell based on the received MIB and SIB1 by using access-related information.

[00253] The access-related information may include one or more of the following: the local cell information, or referred to as the access configuration information, of the NTN cell described in S1102; a random access configuration parameter, for example, a random access preamble (preamble) configuration or a random access time-frequency resource configuration; and a system parameter of the first NTN cell, for example, a system frame number, a subcarrier spacing, and a downlink channel configuration and/or an uplink channel configuration.

[00254] In addition, it may be understood that an execution sequence of S1103 and S1104 is not limited in embodiments of this application. For example, S1103 may be performed before S1104, or may be performed after S1104.

[00255] According to the foregoing access method provided in this embodiment of this application, the local cell information of the to-be-accessed NTN cell is included in the SIB1 and indicated to the terminal device, so that the terminal device can obtain all parameters required for accessing the NTN cell in advance, without needing to obtain the SIB19 based on scheduling of the SIB1. This reduces a latency in obtaining an access-related parameter of the NTN cell by the

terminal device, to reduce an access latency, and improve an access success rate and user experience. In addition, the manner of placing the NTN access-related information into the SIB1 can be implemented by enhancing only RRC message encoding and decoding of the SIB1 and the SIB19. The system information is still sent and received by reusing an existing procedure, and does not involve any change in another aspect. The implementation is simple, has little impact on the terminal device and the network device, and is easy to implement. In addition, after the local cell information related to NTN access is moved out of the SIB19, the SIB19 has a larger margin. For example, when a total size of an RRC message of the SIB19 is limited, after a part of information is moved out, more neighbor cell information or more other information may be added to the SIB19. This is not limited in embodiments of this application.

[00256] It should be understood that in the foregoing embodiments, the terminal device and/or the network device may perform a part or all of the steps in embodiments. These steps or operations are merely examples. Other operations or variations of various operations may be further performed in embodiments of this application. In addition, the steps may be performed in a sequence different from a sequence presented in embodiments, and not all the operations in embodiments of this application may be performed. In addition, sequence numbers of the steps do not mean an execution sequence. An execution sequence of the processes should be determined based on functions and internal logic of the processes, and should not constitute any limitation on implementation processes of embodiments of this application.

[00257] Based on a same idea, an embodiment of this application provides a communication apparatus 1300. Refer to FIG. 13. The communication apparatus 1300 includes a processing module 1301 and a communication module 1302. The communication apparatus 1300 may be a terminal device, or may be a communication apparatus that is used in a terminal device or used together with a terminal device and that can implement a method performed on a terminal device side. Alternatively, the communication apparatus 1300 may be a network device, or may be a communication apparatus that is used in a network device or used together with a network device and that can implement a method performed on a network device side.

[00258] The communication module may also be referred to as a transceiver module, a transceiver, a transceiver machine, a transceiver apparatus, or the like. The processing module may also be referred to as a processor, a processing board, a processing unit, a processing apparatus, or the like. Optionally, the communication module is configured to perform a sending operation and a receiving operation on the terminal device side or the network device side in the foregoing methods. A component configured to implement a receiving function in the communication module may be considered as a receiving unit, and a component configured to implement a sending function in the communication module may be considered as a sending unit. In other words, the

communication module includes the receiving unit and the sending unit.

[00259] When the communication apparatus 1300 is used in a terminal device, the processing module 1301 may be configured to implement the processing function of the terminal device in the example in FIG. 7, FIG. 10, or FIG. 11, and the communication module 1302 may be configured to implement the receiving and sending functions of the terminal device in the example in FIG. 7, FIG. 10, or FIG. 11. Alternatively, the communication apparatus may be understood with reference to the descriptions and the possible designs of the sixth aspect, the seventh aspect, and the ninth aspect in the summary.

[00260] When the communication apparatus 1300 is used in a network device, the processing module 1301 may be configured to implement the processing function of the network device in the example in FIG. 7, FIG. 10, or FIG. 11, and the communication module 1302 may be configured to implement the receiving and sending functions of the network device in the example in FIG. 7, FIG. 10, or FIG. 11. Alternatively, the communication apparatus may be understood with reference to the descriptions and the possible designs of the eighth aspect and the tenth aspect in the summary.

[00261] In addition, it should be noted that the communication module and/or the processing module may be implemented by a virtual module. For example, the processing module may be implemented by a software functional unit or a virtual apparatus, and the communication module may be implemented by a software function or a virtual apparatus. Alternatively, the processing module or the communication module may be implemented by using a physical apparatus. For example, if the apparatus is implemented by using a chip/chip circuit, the communication module may be an input/output circuit and/or a communication interface, and performs an input operation (corresponding to the foregoing receiving operation) and an output operation (corresponding to the foregoing sending operation). The processing module is an integrated processor, a microprocessor, or an integrated circuit.

[00262] Division into the modules in this embodiment of this application is an example, is merely division into logical functions, and may be other division during actual implementation. In addition, functional modules in examples of embodiments of this application may be integrated into one processor, each of the functional modules may exist alone physically, or two or more functional modules may be integrated into one module. The integrated module may be implemented in a form of hardware, or may be implemented in a form of a software functional module.

[00263] Based on a same technical concept, an embodiment of this application further provides a communication apparatus 1400. For example, the communication apparatus 1400 may be a chip or a chip system. Optionally, in this embodiment of this application, the chip system may include

a chip, or may include a chip and another discrete device.

[00264] The communication apparatus 1400 may be configured to implement a function of any network element in the communication system described in the foregoing examples. The communication apparatus 1400 may include at least one processor 1410. Optionally, the processor 1410 is coupled to a memory; and the memory may be located in the apparatus, the memory may be integrated with the processor, or the memory may be located outside the apparatus. For example, the communication apparatus 1400 may further include at least one memory 1420. The memory 1420 stores a computer program, a computer program or instructions, and/or data that are/is necessary for implementing any one of the foregoing examples. The processor 1410 may execute the computer program stored in the memory 1420, to complete the method in any one of the foregoing examples.

[00265] The communication apparatus 1400 may further include a communication interface 1430, and the communication apparatus 1400 may exchange information with another device through the communication interface 1430. For example, the communication interface 1430 may be a transceiver, a circuit, a bus, a module, a pin, or another type of communication interface. When the communication apparatus 1400 is a chip-type apparatus or circuit, the communication interface 1430 in the communication apparatus 1400 may alternatively be an input/output circuit, and may input information (or referred to as receiving information) and output information (or referred to as sending information). The processor is an integrated processor, a microprocessor, an integrated circuit, or a logic circuit. The processor may determine output information based on input information.

[00266] The coupling in embodiments of this application may be an indirect coupling or a communication connection between apparatuses, units, or modules in an electrical form, a mechanical form, or another form, and is used for information exchanging between the apparatuses, the units, or the modules. The processor 1410 may cooperate with the memory 1420 and the communication interface 1430. A specific connection medium between the processor 1410, the memory 1420, and the communication interface 1430 is not limited in embodiments of this application.

[00267] Optionally, refer to FIG. 14. The processor 1410, the memory 1420, and the communication interface 1430 are connected to each other through a bus 1440. The bus 1440 may be a peripheral component interconnect (peripheral component interconnect, PCI) bus, an extended industry standard architecture (extended industry standard architecture, EISA) bus, or the like. Buses may be classified into an address bus, a data bus, a control bus, and the like. For ease of representation, only one bold line represents the bus in FIG. 14, but this does not mean that there is only one bus or only one type of bus.

[00268] In embodiments of this application, the processor may be a general-purpose processor, a digital signal processor, an application-specific integrated circuit, a field programmable gate array or another programmable logic device, a discrete gate or transistor logic device, or a discrete hardware component, and may implement or execute the methods, steps, and logical block diagrams disclosed in embodiments of this application. The general-purpose processor may be a microprocessor or any conventional processor or the like. The steps of the method disclosed with reference to embodiments of this application may be directly performed by a hardware processor, or may be performed by using a combination of hardware in the processor and a software module.

[00269] In embodiments of this application, the memory may be a non-volatile memory, a hard disk drive (hard disk drive, HDD) or a solid-state drive (solid-state drive, SSD), or may be a volatile memory (volatile memory), for example, a random access memory (random access memory, RAM). The memory is any other medium that can carry or store expected program code in a form of an instruction or a data structure and that can be accessed by a computer, but is not limited thereto. The memory in embodiments of this application may alternatively be a circuit or any other apparatus that can implement a storage function, and is configured to store the program instructions and/or the data.

[00270] In a possible implementation, the communication apparatus 1400 may be used in a network device. Specifically, the communication apparatus 1400 may be a network device, or may be an apparatus that can support a network device in implementing the function of the network device in any one of the foregoing examples. The memory 1420 stores a computer program (or instructions) and/or data for implementing the function of the network device in any one of the foregoing examples. The processor 1410 may execute the computer program stored in the memory 1420, to complete the method performed by the network device in any one of the foregoing examples. When the communication apparatus 1400 is used in a network device, the communication interface in the communication apparatus 1400 may be configured to: interact with a terminal device, and send information to the terminal device or receive information from the terminal device.

[00271] In another possible implementation, the communication apparatus 1400 may be used in a terminal device. Specifically, the communication apparatus 1400 may be the terminal device, or may be an apparatus that can support a terminal device in implementing the function of the terminal device in any one of the foregoing examples. The memory 1420 stores a computer program (or instructions) and/or data for implementing the function of the terminal device in any one of the foregoing examples. The processor 1410 may execute the computer program stored in the memory 1420, to complete the method performed by the terminal device in any one of the foregoing examples. When the communication apparatus 1400 is used in a terminal device, the

communication interface in the communication apparatus 1400 may be configured to: interact with a network device, and send information to the network device or receive information from the network device.

[00272] The communication apparatus 1400 provided in this example may be used in the network device to complete the method performed by the network device, or may be used in the terminal device to complete the method performed by the terminal device. Therefore, for technical effects that can be achieved by the communication apparatus 1400, refer to the foregoing method examples. Details are not described herein again.

[00273] Based on the foregoing example, an embodiment of this application provides a communication system, including a network device and a terminal device. The network device and the terminal device may implement the method provided in the example shown in FIG. 7, FIG. 10, or FIG. 11.

[00274] The technical solutions provided in embodiments of this application may be fully or partially 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 a computer, all or a part of the procedures or functions according to embodiments of this application are generated. The computer may be a general-purpose computer, a special-purpose computer, a computer network, a network device, a terminal device, or another programmable apparatus. 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 (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 a computer, or a data storage device, such as a server or a data center, integrating one or more usable media. The usable medium may be a magnetic medium (for example, a floppy disk, a hard disk drive, or a magnetic tape), an optical medium (for example, a digital video disc (digital video disc, DVD)), a semiconductor medium, or the like.

[00275] In embodiments of this application, on a premise that there is no logical contradiction, examples may be mutually referenced. For example, methods and/or terms in the method embodiments may be mutually referenced, functions and/or terms in the apparatus embodiments may be mutually referenced, and functions and/or terms between the apparatus examples and the

method examples may be mutually referenced.

[00276] It is clear that a person skilled in the art may make various modifications and variations to embodiments of this application without departing from the scope of embodiments of this application. In this way, embodiments of this application are also intended to cover these
5 modifications and variations provided that they fall in the scope of the claims of embodiments of this application and equivalent technologies thereof.

CLAIMS

1. A measurement method, comprising:

determining, based on a first beam of a serving cell and beam information of a first neighbor cell, a first candidate beam set corresponding to the first neighbor cell, wherein a total quantity of beams comprised in the first candidate beam set is less than a total quantity of beams comprised in the first neighbor cell; and

measuring at least one beam in the first candidate beam set.

2. The method according to claim 1, wherein the beam information comprises one or more of the following: beam identifier offset information, indication information of the quantity of beams in the first candidate beam set, and the quantity of beams in the first neighbor cell.

3. The method according to claim 1 or 2, wherein the beam information of the first neighbor cell comprises I groups of beam information, the first candidate beam set is a union set of I candidate beam subsets, and I is a positive integer; and

determining, based on the first beam of the serving cell and the beam information of the first neighbor cell, the first candidate beam set corresponding to the first neighbor cell comprises:

determining an i^{th} candidate beam subset in the I candidate beam subsets based on the first beam of the serving cell and an i^{th} group of beam information in the I groups of beam information, wherein i is a positive integer, and $1 \leq i \leq I$.

4. The method according to claim 3, wherein the i^{th} group of beam information comprises one or more of the following: a beam identifier offset of the i^{th} candidate beam subset relative to the first beam, indication information of a quantity of beams in the i^{th} candidate beam subset, and the quantity of beams in the first neighbor cell.

5. The method according to claim 4, wherein an identifier of a start beam in the i^{th} candidate beam subset is $(BI + M_i) \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI + M_i) \bmod N_i + K_i] \bmod N_i$, wherein

BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, wherein M_i , K_i , and N_i are integers, and mod is a modulo operator.

6. The method according to claim 4, wherein an identifier of a start beam in the i^{th} candidate beam subset is $[(BI + M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $(BI + M_i) \bmod N_i$, wherein

BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the

i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, wherein M_i , K_i , and N_i are integers, and mod is a modulo operator.

7. The method according to claim 4, wherein

an identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$, wherein

BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, wherein M_i , K_i , and N_i are integers, and mod is a modulo operator.

8. The method according to any one of claims 1 to 7, wherein the first beam is a serving beam of the terminal device in the serving cell, or signal quality of the first beam is greater than or equal to a first signal quality threshold.

9. The method according to any one of claims 1 to 8, further comprising:

determining a target beam in the first candidate beam set, wherein the target beam is a serving beam of the terminal device after the terminal device is changed to the first neighbor cell, or signal quality of the target beam is greater than or equal to a second signal quality threshold.

10. The method according to any one of claims 1 to 9, further comprising:

receiving first indication information from the serving cell, wherein the first indication information indicates at least one group of beam information in the I groups of beam information of the first neighbor cell, and I is a positive integer.

11. The method according to any one of claims 1 to 10, further comprising:

determining the at least one group of beam information in the I groups of beam information of the first neighbor cell based on coverage range information of at least one beam in the first neighbor cell, wherein I is a positive integer.

12. The method according to any one of claims 1 to 11, wherein measuring the terminal beam in the first candidate beam set comprises:

measuring one beam in the first candidate beam set within a measurement time window associated with the beam, wherein measurement time windows associated with different beams in the beam set are the same or different.

13. The method according to any one of claims 1 to 12, wherein the serving cell is a cell in a non-terrestrial network NTN, and the method further comprises:

receiving a system information block SIB1 of the serving cell, wherein the SIB1 comprises access configuration information used by the terminal device to access the serving cell, and the access configuration information comprises one or more of the following: epoch time information

of the serving cell, validity duration information of uplink synchronization assistance information of the serving cell, cell scheduling information of the serving cell, timing advance information of the serving cell, satellite polarization information of the serving cell, and satellite ephemeris information of the serving cell.

5 14. A measurement method, comprising:

 sending beam information of a first neighbor cell, wherein the beam information of the first neighbor cell is used to determine a to-be-measured first candidate beam set corresponding to the first neighbor cell, and a total quantity of beams comprised in the first candidate beam set is less than a total quantity of beams comprised in the first neighbor cell.

10 15. The method according to claim 14, wherein the beam information comprises one or more of the following: beam identifier offset information, indication information of the quantity of beams in the first candidate beam set, and the quantity of beams in the first neighbor cell.

 16. The method according to claim 14 or 15, wherein the beam information of the first neighbor cell comprises I groups of beam information, and the first candidate beam set is a union
15 set of I candidate beam subsets, wherein an i^{th} group of beam information in the I groups of beam information is used to determine an i^{th} candidate beam subset in the I candidate beam subsets, I is a positive integer, i is a positive integer, and $1 \leq i \leq I$.

 17. The method according to claim 16, wherein the i^{th} group of beam information comprises one or more of the following: a beam identifier offset of the i^{th} candidate beam subset relative to a
20 first beam, indication information of a quantity of beams in the i^{th} candidate beam subset, and the quantity of beams in the first neighbor cell.

 18. The method according to claim 17, wherein an identifier of a start beam in the i^{th} candidate beam subset is $(BI + M_i) \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI + M_i) \bmod N_i + K_i] \bmod N_i$, wherein

25 BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, wherein M_i , K_i , and N_i are integers, and mod is a modulo operator.

 19. The method according to claim 17, wherein an identifier of a start beam in the i^{th} candidate
30 beam subset is $[(BI + M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $(BI + M_i) \bmod N_i$, wherein

 BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, wherein
35 M_i , K_i , and N_i are integers, and mod is a modulo operator.

20. The method according to claim 17, wherein

an identifier of a start beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i - K_i] \bmod N_i$, and an identifier of an end beam in the i^{th} candidate beam subset is $[(BI+M_i) \bmod N_i + K_i] \bmod N_i$, wherein

5 BI is an identifier of the first beam, M_i is the beam identifier offset of the i^{th} candidate beam subset relative to the first beam, K_i is the indication information of the quantity of beams in the i^{th} candidate beam subset, and N_i is the total quantity of beams in the first neighbor cell, wherein M_i , K_i , and N_i are integers, and mod is a modulo operator.

21. The method according to any one of claims 14 to 20, wherein the first beam is a serving
10 beam of a terminal device in a serving cell, or signal quality of the first beam is greater than or equal to a first signal quality threshold.

22. The method according to any one of claims 14 to 21, further comprising:

receiving a beam measurement result from at least one terminal device, wherein a beam
measurement result of one of the at least one terminal device indicates a measurement result of a
15 beam that is in at least one neighbor cell and that is measured by the terminal device; and

determining the beam information of the first neighbor cell based on the beam measurement
result of the at least one terminal device.

23. The method according to any one of claims 14 to 22, further comprising:

20 sending a system information block SIB1 of the serving cell, wherein the SIB1 comprises
access configuration information used by the terminal device to access the serving cell, and the
access configuration information comprises one or more of the following: epoch time information
of the serving cell, validity duration information of uplink synchronization assistance information
of the serving cell, cell scheduling information of the serving cell, timing advance information of
the serving cell, satellite polarization information of the serving cell, and satellite ephemeris
25 information of the serving cell.

24. A communication apparatus, configured to implement the method according to any one
of claims 1 to 13, or configured to implement the method according to any one of claims 14 to 23.

25. A communication apparatus, comprising:

a processor, wherein the processor is coupled to a memory, and the processor is configured
30 to invoke computer program instructions stored in the memory, to perform the method according
to any one of claims 1 to 13, or perform the method according to any one of claims 14 to 23.

26. A computer-readable storage medium, wherein the computer-readable storage medium
stores instructions; and when the instructions are run on a computer, the computer is caused to
perform the method according to any one of claims 1 to 13 or the method according to any one of
35 claims 14 to 23.

27. A computer program product, comprising instructions, wherein when the instructions are run on a computer, the computer is caused to perform the method according to any one of claims 1 to 13 or the method according to any one of claims 14 to 23.