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(54) SIGNAL TRANSMISSION METHOD AND CORRESPONDING SIGNAL RECEPTION METHOD

SIGNALÜBERTRAGUNGSVERFAHREN UND ENTSPRECHENDES SIGNALEMPFANGSVERFAHREN

PROCÉDÉ DE TRANSMISSION DE SIGNAL ET RECEPTION DE SIGNAL CORRESPONDANTE

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EP 3 422 651 B1

Description

TECHNICAL FIELD

[0001] The invention relates to communications, and more particularly to a method for transmitting a signal, network equipment and terminal equipment. The features of the preamble of the independent claims are known from US 2015/023263 A1. Related technologies are known from US 2011/190024 A1 and US 2014/092827 A1. The document WO2009/092332 A1 (DA TANG MOBILE COMM EQUIPMENT [CN]; YU YANG [CN] ET AL.) 30 July 2009 discloses PBCH/PSS/SSS allocation to each frequency band of a plurality frequency bands.

BACKGROUND

[0002] A carrier width of a 5th-Generation (5G) system has a relatively wide variation range. For example, a maximum width is more than or equal to 80MHz. At present, a Synchronization Signal (SS) and a broadcast signal in the Long Term Evolution (LTE)/4th-Generation (4G) are only transmitted on a central frequency point of a carrier. For a large-bandwidth carrier 5G system, an undiversified synchronization channel and broadcast channel manner in the LTE/4G is unlikely to meet a rapid search requirement of terminal equipment, thereby influencing communication efficiency of the terminal equipment.

[0003] Therefore, how to improve communication efficiency of terminal equipment becomes a technical problem urgent to be solved for a large-bandwidth carrier communication system.

SUMMARY

[0004] The present invention is defined in the appended independent claims. Advantageous features are set out in the appended dependent claims.

[0005] According to the method for transmitting a signal in the embodiments of the invention, a speed and accuracy of cell search and measurement in an IDLE or CONNECTED state by the terminal equipment may be improved, thereby improving the communication efficiency of the terminal equipment.

BRIEF DESCRIPTION OF DRAWINGS

[0006] In order to describe the technical solutions of the embodiments of the invention more clearly, the drawings required to be used in the embodiments of the invention will be simply introduced below. It is apparent that the drawings described below are only some embodiments of the invention. Other drawings may further be obtained by those of ordinary skilled in the art according to these drawings without creative work.

FIG. 1 is a schematic diagram of an application scenario according to an embodiment of the invention.

FIG. 2 is a schematic flowchart of a method for transmitting a signal according to an embodiment of the invention.

FIG. 3 is a schematic diagram of a time-frequency resource location of a downlink signal according to an embodiment of the invention.

FIG. 4 is a schematic diagram of a time-frequency resource location of a downlink signal according to another embodiment of the invention.

FIG. 5 is a schematic diagram of a time-frequency resource location of a downlink signal according to yet another embodiment of the invention.

FIG. 6 is a schematic diagram of a time-frequency resource location of a downlink signal according to yet another embodiment of the invention.

FIG. 7 is a schematic diagram of a time-frequency resource location of a downlink signal according to yet another embodiment of the invention.

FIG. 8 is a schematic flowchart of a method for transmitting a signal according to another embodiment of the invention.

FIG. 9 is a schematic block diagram of network equipment according to an embodiment of the invention.

FIG. 10 is a schematic block diagram of terminal equipment according to an embodiment of the invention.

FIG. 11 is a schematic structure diagram of network equipment according to another embodiment of the invention.

FIG. 12 is a schematic structure diagram of terminal equipment according to another embodiment of the invention.

DETAILED DESCRIPTION

[0007] The technical solutions in the embodiments of the invention will be clearly and completely described below in combination with the drawings in the embodiments of the invention.

[0008] It is to be understood that the technical solutions of the embodiments of the invention may be applied to various communication systems, for example, a present communication system of a Global System of Mobile Communication (GSM), a Code Division Multiple Access (CDMA) system, a Wideband Code Division Multiple Access (WCDMA) system, a General Packet Radio Service (GPRS), an LTE system, a Universal Mobile Telecommunication System (UMTS) or the like, and are particularly applied to a future 5G system.

[0009] In the embodiments of the invention, terminal equipment may refer to User Equipment (UE), an access terminal, a user unit, a user station, a mobile station, a mobile radio station, a remote station, a remote terminal, mobile equipment, a user terminal, a terminal, wireless communication equipment, a user agent or a user device. The access terminal may be a cell phone, a cordless

phone, a Session Initiation Protocol (SIP) phone, a Wireless Local Loop (WLL) station, a Personal Digital Assistant (PDA), handheld equipment with a wireless communication function, computing equipment, other processing equipment connected to a wireless modem, vehicle-mounted equipment, wearable equipment, terminal equipment in a future 5G network, terminal equipment in a future evolved Public Land Mobile Network (PLMN) or the like.

[0010] In the embodiments of the invention, network equipment may be equipment configured to communicate with the terminal equipment. The network equipment may be a Base Transceiver Station (BTS) in the GSM or the CDMA, may also be a NodeB (NB) in the WCDMA system, may also be an Evolutional Node B (eNB or eNodeB) in the LTE system and may further be a wireless controller in a Cloud Radio Access Network (CRAN) scenario, or the network equipment may be a relay station, an access point, vehicle-mounted equipment, wearable equipment, network equipment in the future 5G network, network equipment in the future evolved PLMN or the like.

[0011] In the embodiments of the invention, a carrier may also be represented as a cell and represents a communication system. In other words, in the embodiments of the invention, a carrier corresponds to a cell and a communication system.

[0012] FIG. 1 is a schematic diagram of an application scenario according to an embodiment of the invention. A communication system in FIG. 1 may include network equipment, for example, an eNodeB 20, and at least one terminal equipment, for example, UE 10, UE 11, UE 12, UE 13, UE 14, UE 15, UE 16 and UE 17. The eNodeB 20 is configured to provide communication service for the at least one terminal equipment in the UE 10 to the UE 17 for access to a core network. Each terminal equipment in the UE 10 to the UE 17 searches for an SS, broadcast signal or the like transmitted by the eNodeB 20, thereby accessing the network and further communicating with the network. For a large-bandwidth carrier system, an undiversified synchronization channel and broadcast channel manner is unlikely to meet a rapid search requirement of terminal equipment, thereby bringing influence to communication efficiency of the terminal equipment. According to the embodiment of the invention, multiple groups of synchronization channels, broadcast channels or the like are set in a carrier/cell to meet the rapid search requirement of the terminal equipment, thereby improving the communication efficiency of the terminal equipment.

[0013] FIG. 2 is a schematic flowchart of a method for transmitting a signal 200 according to an embodiment of the invention. The method 200 is executed by network equipment, for example, an eNodeB 20 in FIG. 1. The network equipment may communicate with terminal equipment in a carrier/cell. For simplicity, descriptions will be made with the carrier as an example, that is, the method in FIG. 2 is for the carrier. There are many frequency points in a bandwidth of the carrier. As shown in FIG. 2, the method 200 includes the following operations.

[0014] In S210, a time-frequency resource location of a downlink signal is determined. The downlink signal includes at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS. The time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier.

[0015] In S220, the downlink signal is transmitted according to the time-frequency resource location of the downlink signal.

[0016] In the embodiment of the invention, the time-frequency resource location of the downlink signal, for example, the SS, the broadcast signal, the common control channel signal, the common reference signal or the MRS, is on the multiple frequency points of the carrier within the predetermined time, and the multiple frequency points are part of frequency points within the bandwidth of the carrier. That is, the downlink signal is neither transmitted on a single frequency point of the carrier nor transmitted on all of the frequency points of the carrier. Therefore, a rapid search requirement of terminal equipment may be met, a system overhead may be reduced, and communication efficiency of the terminal equipment may further be improved.

[0017] In such a manner, according to the method for transmitting a signal in the embodiment of the invention, the downlink signal is transmitted on the multiple frequency points of the carrier within the predetermined time, so that the rapid search requirement of the terminal equipment may be met, and the communication efficiency of the terminal equipment may further be improved.

[0018] It is to be understood that, in the embodiment of the invention, the predetermined time represents a period of time, which is not limited in the invention. For example, the predetermined time may be one or more radio frames and may also be one or more subframes or symbols. Transmission on the multiple frequency points of the carrier within the predetermined time may not only refer to repeated transmission on the multiple frequency points within a period of time according to periodicity but also refer to transmission on a frequency point in periodicity within a period of time and transmission on another frequency point in next periodicity.

[0019] It is also to be understood that, in the embodiment of the invention, patterns of time-frequency resource locations of various downlink signals may be preset. The network equipment and the terminal equipment may determine the time-frequency resource locations of the downlink signals according to the preset patterns. The patterns of the time-frequency resource locations of various downlink signals may also be determined and transmitted to the terminal equipment by the network equipment. There are no limits made in the invention.

[0020] The embodiment of the invention will be specifically described below for various downlink signals.

[0021] In an example, in an embodiment of the invention, the downlink signal includes the SS. Under this condition, the network equipment may transmit the SS on the multiple frequency points according to periodicity.

[0022] Specifically, for enabling the terminal equipment to rapidly find the SS, in the embodiment of the invention, the network equipment transmits the SS on the multiple frequency points of the carrier according to the periodicity, namely repeatedly transmitting the SS on the multiple frequency points. That is, in the embodiment of the invention, multiple sets of SSs, usually particular digital sequences, are set and repeatedly transmitted on the multiple frequency points respectively. For example, time-frequency resource locations of the SSs may be shown in FIG. 3.

[0023] For example, if a frequency bandwidth of a 5G carrier/cell is 80MHz, a set of SSs cyclically repeated over time may be set on each 20MHz frequency-domain resource, and a terminal may be synchronized with the cell if finding any set of SSs.

[0024] In an example, periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0025] In an example, sequences used by transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0026] Specifically, digital sequences for the SSs on different frequency-domain resources of the same 5G carrier/cell may be different. If different digital sequences are used, the digital sequences for the SSs on different frequency-domain resources of the same 5G carrier/cell may form a certain internal relationship. For example, different cyclic shifts of the same root sequence may be used, and the cyclic shifts may be represented by use of a specific offset to belong to the same carrier/cell.

[0027] In an example, in an embodiment of the invention, the downlink signal includes the broadcast signal. Under this condition, the network equipment may transmit the broadcast signal on the multiple frequency points according to the periodicity.

[0028] Specifically, for enabling the terminal equipment to rapidly find the broadcast signal, in the embodiment of the invention, the network equipment transmits the broadcast signal on the multiple frequency points of the carrier according to the periodicity, namely repeatedly transmitting the broadcast signal on the multiple frequency points. For example, a time-frequency resource location of the broadcast signal may be shown in FIG. 4.

[0029] For example, multiple sets of basic system information, or called Master Information Blocks (MIBs), cyclically repeated over time are set on different frequency resources in the 5G carrier/cell, and are carried by Physical Broadcast Channels (PBCHs). A downlink/uplink bandwidth, a System Frame Number (SFN), an antenna number, a control signal transmission mode or the like may be included so as to facilitate rapid reception and demodulation of the terminal equipment.

[0030] In an example, the PBCHs may form a correspondence with the SSs. For example, there may be a PBCH in each of frequency-domain resources (frequency points) on which the SSs are set, for example, as shown in FIG. 4.

[0031] In an example, in an embodiment of the invention, the downlink signal includes the common control channel signal or the common reference signal. A time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region. The downlink control region is located on the multiple frequency points in a radio frame. A time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

[0032] Specifically, in the embodiment of the invention, the downlink control region occupies limited frequency and time resources. That is, the downlink control region is smaller than the overall downlink bandwidth of the carrier in terms of frequency and smaller than the length of the radio frame in terms of time. The shortest downlink control region may be a symbol. For example, a location of the downlink control region may be shown in FIG. 5.

[0033] The downlink control region may also be called a downlink common control region and is configured to transmit a common control channel and/or the common reference signal. The common control channel may indicate a location of a dedicated control channel, and the dedicated control channel is configured to demodulate a certain block of user data. A common reference symbol may be configured for cell measurement reselection in an IDLE state and cell measurement handover in a CONNECTED state.

[0034] With adoption of the technical solution in the embodiment of the invention, a speed and accuracy of measurement of the terminal equipment in the IDLE or CONNECTED state may be improved.

[0035] In an example, the method may further include that information of the downlink control region is explicitly or implicitly indicated to terminal equipment.

[0036] That is, the information of the downlink control region may be explicitly or implicitly indicated.

[0037] Specifically, the network equipment may explicitly or implicitly indicate the information of the downlink control region to the terminal equipment through at least one of: starting and ending location information of each of the multiple frequency points; information of the radio frame and a subframe in the radio frame where the downlink control region is located; information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not; relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not; a content of the

broadcast signal; or a content of basic system information indicated by the broadcast signal.

[0038] For example, it is determined whether a common control channel exists on a certain frequency resource in the 5G carrier/cell or not. If the common control channel exists on a certain frequency resource in the 5G carrier/cell, its location and an occupied resource size may be indicated in one or different ones of the following manners (not always all of the manners): starting and ending locations of different frequency resources in the 5G carrier/cell; time allocation for radio frames and radio subframes on different frequency resources in the 5G carrier/cell; sequences (for example, sequence lengths, a serial number of a root sequence in all sequences and an offset of cyclic shifts) for the SSs (in the corresponding frequency resource); relative time-frequency locations between the SSs and the PBCHs; contents of the PBCHs, including masks superimposed on the contents of the PBCHs and/or check bits; and contents of second-level or lower-level system information indicated by first-level system information (carried by the PBCHs).

[0039] In an example, in an embodiment of the invention, the downlink signal includes the MRS. Under this condition, the network equipment may transmit the MRS in a location, not used for downlink control region, of the multiple frequency points, according to the periodicity.

[0040] For example, a reference signal configured for cell measurement reselection in the IDLE state and cell measurement handover in the CONNECTED state may be cyclically transmitted on different frequencies in a location, not used for downlink control region, of the 5G carrier/cell. A density of the reference signal is usually lower than a reference signal for demodulation, and it may be called an MRS. For example, a time-frequency resource location of the MRS may be shown in FIG. 6. Therefore, the speed and accuracy of measurement of the terminal equipment in the IDLE or CONNECTED state may further be improved.

[0041] In an example, if a time-frequency resource location of the MRS conflicts with a time-frequency resource location of downlink data, the MRS or the downlink data is transmitted in a punched manner, for example, as shown in FIG. 7.

[0042] It is to be understood that the time-frequency resource locations of multiple downlink signals are shown in FIG. 4 to FIG. 7. However, a relationship between the time-frequency resource locations of different downlink signals is not limited in the invention. In other words, the time-frequency resource locations of different downlink signals may be associated and may also be unassociated.

[0043] It is also to be understood that the specific examples in the embodiment of the invention are adopted not to limit the scope of the embodiment of the invention but only to help those skilled in the art to better understand the embodiment of the invention.

[0044] According to the method for transmitting a signal in the embodiment of the invention, the speed and accuracy of cell search and measurement in the IDLE or CONNECTED state by the terminal equipment may be improved, so that the communication efficiency of the terminal equipment may be improved.

[0045] The method for transmitting a signal in the embodiments of the invention is described above from a network equipment side, and the method for transmitting a signal in the embodiments of the invention will be described below from a terminal equipment side.

[0046] FIG. 8 is a schematic flowchart of a method for transmitting a signal 800 according to an embodiment of the invention. The method 800 is executed by terminal equipment, for example, any one of UE 10 to UE 17 in FIG. 1. As shown in FIG. 8, the method 800 includes the following operations.

[0047] In S810, a time-frequency resource location of a downlink signal is determined. The downlink signal includes at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS. The time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier.

[0048] In S820, the downlink signal transmitted by network equipment is received according to the time-frequency resource location of the downlink signal.

[0049] According to the method for transmitting a signal in the embodiment of the invention, the downlink signal is received on the multiple frequency points of the carrier within the predetermined time, so that a rapid search requirement of terminal equipment may be met, and communication efficiency of the terminal equipment may be improved.

[0050] In an example, in an embodiment of the invention, the downlink signal includes the SS. The operation that the downlink signal transmitted by the network equipment is received according to the time-frequency resource location of the downlink signal includes that the SS transmitted by the network equipment according to periodicity is received on the multiple frequency points.

[0051] In an example, periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0052] In an example, sequences used by transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0053] In an example, in an embodiment of the invention, the downlink signal includes the broadcast signal. The operation that the downlink signal transmitted by the network equipment is received according to the time-frequency resource location of the downlink signal includes that the broadcast signal transmitted by the network equipment according to the periodicity is received on the multiple frequency points.

[0054] In an example, in an embodiment of the inven-

tion, the downlink signal includes the common control channel signal or the common reference signal. A time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region. The downlink control region is located on the multiple frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

[0055] In an example, the method 800 may further include that information, explicitly or implicitly indicated by the network equipment, of the downlink control region is acquired. The operation that the time-frequency resource location of the downlink signal is determined may include that the downlink control region is determined according to the information of the downlink control region.

[0056] In an example, the operation that the downlink control region is determined according to the information of the downlink control region includes that the downlink control region is determined according to at least one of: starting and ending location information of each of the multiple frequency points; information of the radio frame and a subframe in the radio frame where the downlink control region is located; information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not; relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not; a content of the broadcast signal; or a content of basic system information indicated by the broadcast signal.

[0057] In an example, in an embodiment of the invention, the downlink signal includes the MRS. The operation that the downlink signal transmitted by the network equipment is received according to the time-frequency resource location of the downlink signal includes that the MRS transmitted by the network equipment according to the periodicity is received in a location, not used for downlink control region, of the multiple frequency points.

[0058] It is to be understood that, in the embodiment of the invention, interaction between the network equipment and the terminal equipment and related properties, functions or the like described from the network equipment side correspond to descriptions made from the terminal equipment side and will not be elaborated herein for simplicity.

[0059] According to the method for transmitting a signal in the embodiment of the invention, a speed and accuracy of cell search and measurement in an IDLE or CONNECTED state by the terminal equipment may be improved, thereby improving communication efficiency of the terminal equipment.

[0060] It is to be understood that, in various embodiments of the invention, a sequence number of each process does not mean an execution sequence. Instead, the execution sequence of each process should be determined by its function and an internal logic and should not form any limit to an implementation process of the embodiments of the invention.

[0061] The method for transmitting a signal according to the embodiments of the invention is described above in detail. Network equipment and terminal equipment according to the embodiments of the invention will be described below. It is to be understood that the network equipment and terminal equipment of the embodiments of the invention may execute various methods in the abovementioned embodiments of the invention. That is, the following specific working process of each equipment may refer to the corresponding process in the method embodiments.

[0062] FIG. 9 is a schematic block diagram of network equipment 900 according to an embodiment of the invention. As shown in FIG. 9, the network equipment 900 includes a determination module 910 and a transmission module 920.

[0063] The determination module 910 is configured to determine a time-frequency resource location of a downlink signal. The downlink signal includes at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS, the time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier.

[0064] The transmission module 920 is configured to transmit the downlink signal according to the time-frequency resource location of the downlink signal.

[0065] According to the network equipment in the embodiment of the invention, the downlink signal is transmitted on the multiple frequency points of the carrier within the predetermined time, so that a rapid search requirement of terminal equipment may be met, and communication efficiency of the terminal equipment may be improved.

[0066] In an example, in an embodiment of the invention, the downlink signal includes the SS. The transmission module 920 is specifically configured to transmit the SS on the multiple frequency points according to periodicity.

[0067] In an example, periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0068] In an example, sequences for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0069] In an example, in an embodiment of the invention, the downlink signal includes the broadcast signal. The transmission module 920 is specifically configured to transmit the broadcast signal on the multiple frequency points according to the periodicity.

[0070] In an example, in an embodiment of the invention, the downlink signal includes the common control channel signal or the common reference signal. A time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region. The downlink control region is located on the multiple frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

[0071] In an example, in an embodiment of the invention, the transmission module 920 is further configured to explicitly or implicitly indicate information of the downlink control region to terminal equipment.

[0072] In an example, the transmission module 920 is specifically configured to explicitly or implicitly indicate the information of the downlink control region to the terminal equipment through at least one of: starting and ending location information of each of the multiple frequency points; information of the radio frame and a subframe in the radio frame where the downlink control region is located; information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not; relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not; a content of the broadcast signal; or a content of basic system information indicated by the broadcast signal.

[0073] In an example, in an embodiment of the invention, the downlink signal includes the MRS. The transmission module 920 is specifically configured to transmit the MRS in a location, not used for downlink control region, of the multiple frequency points, according to the periodicity.

[0074] In an example, the transmission module 920 is further configured to, if a time-frequency resource location of the MRS conflicts with a time-frequency resource location of downlink data, transmit the MRS or the downlink data in a punched manner.

[0075] The network equipment 900 according to the embodiment of the invention may correspond to network equipment in the method for transmitting a signal according to the embodiment of the invention and the above-mentioned and other operations and/or functions of each module in the network equipment 900 are adopted to implement the corresponding flows of each method respectively and will not be elaborated herein for simplicity.

[0076] According to the network equipment of the embodiment of the invention, a speed and accuracy of cell search and measurement in an IDLE or CONNECTED state by the terminal equipment may be improved, so that the communication efficiency of the terminal equipment may be improved.

[0077] FIG. 10 is a schematic block diagram of terminal equipment 1000 according to an embodiment of the invention. As shown in FIG. 10, the terminal equipment 1000 includes a determination module 1010 and a receiving module 1020.

[0078] The determination module 1010 is configured to determine a time-frequency resource location of a downlink signal. The downlink signal includes at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS. The time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier.

[0079] The receiving module 1020 is configured to receive the downlink signal transmitted by network equipment according to the time-frequency resource location of the downlink signal.

[0080] According to the terminal equipment of the embodiment of the invention, the downlink signal is transmitted on the multiple frequency points of the carrier within the predetermined time, so that a rapid search requirement of the terminal equipment may be met, and communication efficiency of the terminal equipment may be improved.

[0081] In an example, in an embodiment of the invention, the downlink signal includes the SS. The receiving module 1020 is specifically configured to receive the SS transmitted by the network equipment according to periodicity on the multiple frequency points.

[0082] In an example, periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0083] In an example, sequences for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

[0084] In an example, in an embodiment of the invention, the downlink signal includes the broadcast signal. The receiving module 1020 is specifically configured to receive the broadcast signal transmitted by the network equipment according to the periodicity on the multiple frequency points.

[0085] In an example, in an embodiment of the invention, the downlink signal includes the common control channel signal or the common reference signal. A time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region. The downlink control region is located on the multiple frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

[0086] In an example, in an embodiment of the invention, the receiving module 1020 is further configured to acquire information, explicitly or implicitly indicated by the network equipment, of the downlink control region.

The determination module 1010 is specifically configured to determine the downlink control region according to the information of the downlink control region.

[0087] In an example, the determination module 1010 is specifically configured to determine the downlink control region according to at least one of: starting and ending location information of each of the multiple frequency points; information of the radio frame and a subframe in the radio frame where the downlink control region is located; information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not; relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not; a content of the broadcast signal; or a content of basic system information indicated by the broadcast signal.

[0088] In an example, in an embodiment of the invention, the downlink signal includes the MRS. The receiving module 1020 is specifically configured to receive the MRS transmitted by the network equipment according to the periodicity in a location, not used for downlink control region, of the multiple frequency points.

[0089] The terminal equipment 1000 according to the embodiment of the invention may correspond to terminal equipment in the method for transmitting a signal according to the embodiment of the invention and the above-mentioned and other operations and/or functions of each module in the terminal equipment 1000 are adopted to implement the corresponding flows of each method respectively and will not be elaborated herein for simplicity.

[0090] According to the terminal equipment in the embodiment of the invention, a speed and accuracy of cell search and measurement in an IDLE or CONNECTED state by the terminal equipment may be improved, so that the communication efficiency of the terminal equipment may be improved.

[0091] FIG. 11 is a structure of network equipment according to another embodiment of the invention. The structure includes at least one processor 1102 (for example, Central Processing Unit (CPU)), at least one network interface 1105 or other communication interface, a memory 1106 and at least one communication bus 1103 configured to implement connection communication between these devices. The processor 1102 is configured to execute an executable module, for example, a computer program, stored in the memory 1106. The memory 1106 may include a high-speed Random Access Memory (RAM) and may also include a non-volatile memory, for example, at least one disk memory. A communication connection with at least one other network element is implemented through the at least one network interface 1105 (which may be wired or wireless).

[0092] In some implementation modes, the memory 1106 stores a program 11061, and the processor 1102 executes the program 11061 to execute the following operations of: determining a time-frequency resource location of a downlink signal, wherein the downlink signal includes at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS, the time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier; and transmitting the downlink signal according to the time-frequency resource location of the downlink signal.

[0093] In an example, the downlink signal includes the SS. The processor 1102 is specifically configured to transmit the SS on the multiple frequency points according to periodicity.

[0094] In an example, periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same or different.

[0095] In an example, sequences for transmitting the SS on different frequency points in the multiple frequency points are the same or different.

[0096] In an example, the downlink signal includes the broadcast signal. The processor 1102 is specifically configured to transmit the broadcast signal on the multiple frequency points according to the periodicity.

[0097] In an example, the downlink signal includes the common control channel signal or the common reference signal, a time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region, the downlink control region is located on the multiple frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

[0098] In an example, the processor 1102 is further configured to explicitly or implicitly indicate information of the downlink control region to terminal equipment.

[0099] In an example, the processor 1102 is specifically configured to explicitly or implicitly indicate the information of the downlink control region to the terminal equipment through at least one of: starting and ending location information of each of the multiple frequency points; information of the radio frame and a subframe in the radio frame where the downlink control region is located; information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not; relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not; a content of the broadcast signal; or a content of basic system information indicated by the broadcast signal.

[0100] In an example, the downlink signal includes the MRS. The processor 1102 is specifically configured to transmit the MRS in a location, not used for downlink control region, of the multiple frequency points, according to the periodicity.

[0101] In an example, the processor 1102 is further configured to, if a time-frequency resource location of the MRS conflicts with a time-frequency resource location of downlink data, transmit the MRS or the downlink data in a punched manner.

[0102] As can be seen from the above technical solution provided by the embodiment of the invention, the downlink signal is transmitted on the multiple frequency points of the carrier within the predetermined time, so that a rapid search requirement of the terminal equipment may be met, and communication efficiency of the terminal equipment may be improved.

[0103] FIG. 12 is a structure of a Mobility Management Entity (MME) according to another embodiment of the invention. The structure includes at least one processor 1202 (for example, CPU), at least one network interface 1205 or other communication interface, a memory 1206 and at least one communication bus 1203 configured to implement connection communication between these devices. The processor 1202 is configured to execute an executable module, for example, a computer program, stored in the memory 1206. The memory 1206 may include a high-speed RAM and may also include a non-volatile memory, for example, at least one disk memory. A communication connection with at least one other network element is implemented through the at least one network interface 1205 (which may be wired or wireless).

[0104] In some implementation modes, the memory 1206 stores a program 12061, and the processor 1202 executes the program 12061 to execute the following operations of determining a time-frequency resource location of a downlink signal, wherein the downlink signal includes at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS, the time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier; and receiving the downlink signal transmitted by network equipment according to the time-frequency resource location of the downlink signal.

[0105] In an example, the downlink signal includes the SS. The processor 1202 is specifically configured to receive the SS transmitted by the network equipment according to periodicity on the multiple frequency points.

[0106] In an example, periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same or different.

[0107] In an example, sequences for transmitting the SS on different frequency points in the multiple frequency points are the same or different.

[0108] In an example, the downlink signal includes the broadcast signal. The processor 1202 is specifically configured to receive the broadcast signal transmitted by the network equipment according to the periodicity on the multiple frequency points.

[0109] In an example, the downlink signal includes the common control channel signal or the common reference signal. A time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region. The downlink control region is located on the multiple frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

[0110] In an example, the processor 1202 is configured to acquire information, explicitly or implicitly indicated by the network equipment, of the downlink control region and determine the downlink control region according to the information of the downlink control region.

[0111] In an example, the processor 1202 is specifically configured to determine the downlink control region according to at least one of: starting and ending location information of each of the multiple frequency points; information of the radio frame and a subframe in the radio frame where the downlink control region is located; information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not; relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not; a content of the broadcast signal; or a content of basic system information indicated by the broadcast signal.

[0112] In an example, the downlink signal includes the MRS. The processor 1202 is specifically configured to receive the MRS transmitted by the network equipment according to the periodicity in a location, not used for downlink control region, of the multiple frequency points.

[0113] As can be seen from the above technical solution provided by the embodiment of the invention, according to the embodiment of the invention, the downlink signal is received on the multiple frequency points of the carrier within the predetermined time, so that a rapid search requirement of terminal equipment may be met, and communication efficiency of the terminal equipment may be improved.

[0114] It is to be understood that, in the embodiments of the invention, the term "and/or" is only an association relationship describing associated objects and represents that there are three relationships. For example, A and/or B may represent three conditions, i.e., independent existence of A, coexistence of A and B and independent existence of B. In addition, the character "/" in the invention usually represents that previous and next associated objects form an "or" relationship.

[0115] Those of ordinary skilled in the art may realize

that the units and algorithm steps of each example described in combination with the embodiments disclosed in the invention may be implemented by electronic hardware, computer software or a combination of the two. For clearly describing exchangeability of hardware and software, the compositions and steps of each example have been generally described in the foregoing descriptions according to functions. Whether these functions are executed in a hardware or software manner depends on specific applications and design constraints of the technical solutions.

[0116] Those skilled in the art may clearly learn about that specific working processes of the system, device and unit described above may refer to the corresponding processes in the method embodiments and will not be elaborated herein for convenient and brief description.

[0117] In some embodiments provided by the application, it is to be understood that the disclosed system, device and method may be implemented in another manner. For example, the device embodiment described above is only schematic, and for example, division of the units is only logic function division, and other division manners may be adopted during practical implementation. For example, multiple units or components may be combined or integrated into another system, or some characteristics may be neglected or not executed. In addition, coupling or direct coupling or communication connection between each displayed or discussed component may be indirect coupling or communication connection, implemented through some interfaces, of the device or the units, and may be electrical and mechanical or adopt other forms.

[0118] The units described as separate parts may or may not be physically separated, and parts displayed as units may or may not be physical units, and namely may be located in the same place, or may also be distributed to multiple network units. Part or all of the units may be selected to achieve the purpose of the solutions of the embodiments of the invention according to a practical requirement.

[0119] In addition, each functional unit in each embodiment of the invention may be integrated into a processing unit, each unit may also physically exist independently, and two or more than two units may also be integrated into a unit. The integrated unit may be implemented in a hardware form and may also be implemented in form of software functional unit.

[0120] When being implemented in form of software functional unit and sold or used as an independent product, the integrated unit may be stored in a computer-readable storage medium. Based on such an understanding, the technical solutions of the invention substantially or parts making contributions to the conventional art or all or part of the technical solutions may be embodied in form of software product, and the computer software product is stored in a storage medium, including a plurality of instructions configured to enable a piece of computer equipment (which may be a personal computer, a server, network equipment or the like) to execute all or part of the steps of the method in each embodiment of the invention. The abovementioned storage medium includes: various media capable of storing program codes such as a U disk, a mobile hard disk, a Read-Only Memory (ROM), a RAM, a magnetic disk or an optical disk.

[0121] The above is only the specific implementation mode of the invention and not intended to limit the scope of protection of the invention. Therefore, the scope of protection of the invention shall be subject to the scope of protection of the claims.

Claims

1. A method for signal transmission, comprising:

determining (S210) a time-frequency resource location of a downlink signal, wherein the downlink signal comprises at least one of a Synchronization Signal, SS, a broadcast signal, a common control channel signal, a common reference signal and a Measurement Reference Signal, MRS, the time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier, wherein time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region; and

transmitting (S220) the downlink signal according to the time-frequency resource location of the downlink signal;

characterized in that

when the downlink signal comprises the MRS, transmitting (S220) the downlink signal according to the time-frequency resource location of the downlink signal comprises:

transmitting the MRS in a location, not used for the downlink control region, of the multiple frequency points, according to periodicity.

2. The method according to claim 1, wherein when the downlink signal comprises the SS, transmitting the downlink signal according to the time-frequency resource location of the downlink signal comprises:

transmitting the SS on the multiple frequency points according to periodicity.

3. The method according to claim 2, wherein periodicities for transmitting the SS on different frequency points in the multiple frequency points are the same as each other or different from each other.

4. The method according to claim 2 or 3, wherein sequences used by transmitting the SS on different fre-

quency points in the multiple frequency points are the same as each other or different from each other.

5. The method according to any one of claims 1-4, wherein when the downlink signal comprises the broadcast signal, transmitting (S220) the downlink signal according to the time-frequency resource location of the downlink signal comprises:
transmitting the broadcast signal on the multiple frequency points according to periodicity.

6. The method according to any one of claims 1-5, wherein the downlink control region is located on a group of consecutive frequency points of the multiple frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame, and wherein the method further comprises:
explicitly or implicitly indicating information of the downlink control region to a terminal equipment through at least one of:

starting and ending location information of each of the frequency points of the group;
information of the radio frame and a subframe in the radio frame where the downlink control region is located;
information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not;
relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not;
a content of the broadcast signal; or
a content of basic system information indicated by the broadcast signal.

7. The method according to any one of claims 1-6, wherein the method further comprises:
if a time-frequency resource location of the MRS conflicts with a time-frequency resource location of downlink data, transmitting the MRS or the downlink data in a punched manner.

8. A method for signal reception, comprising:

determining (S810) a time-frequency resource location of a downlink signal, wherein the downlink signal comprises at least one of a Synchronization Signal, SS, a broadcast signal, a common control channel signal, a common reference signal and a Measurement Reference Signal, MRS, the time-frequency resource location of the downlink signal is on multiple frequency points of a carrier within a predetermined time and the multiple frequency points are part of frequency points within a bandwidth of the carrier, wherein time-frequency resource location of the common control channel signal or the common reference signal is within a downlink control region; and
receiving (S820) the downlink signal transmitted by a network equipment according to the time-frequency resource location of the downlink signal;
characterized in that
when the downlink signal comprises the MRS, receiving (S820) the downlink signal transmitted by the network equipment according to the time-frequency resource location of the downlink signal comprises:
receiving the MRS transmitted by the network equipment according to periodicity in a location, not used for the downlink control region, of the multiple frequency points.

9. The method according to claim 8, wherein when the downlink signal comprises the SS, receiving (S820) the downlink signal transmitted by the network equipment according to the time-frequency resource location of the downlink signal comprises:
receiving the SS transmitted by the network equipment according to periodicity on the multiple frequency points.

10. The method according to claim 9, wherein periodicities for receiving the SS transmitted by the network equipment on different frequency points in the multiple frequency points are the same as each other or different from each other.

11. The method according to claim 9 or 10, wherein sequences used by receiving the SS transmitted by the network equipment on different frequency points in the multiple frequency points are the same as each other or different from each other.

12. The method according to any one of claims 8-11, wherein when the downlink signal comprises the broadcast signal, receiving (S820) the downlink signal transmitted by the network equipment according to the time-frequency resource location of the downlink signal comprises:
receiving the broadcast signal transmitted by the network equipment according to periodicity on the multiple frequency points.

13. The method according to any one of claims 8-12, wherein the downlink control region is located on a group of consecutive frequency points of the multiple

frequency points in a radio frame, and a time-domain length of the downlink control region in the radio frame is smaller than a length of the radio frame.

14. The method according to claim 13, further comprising:

acquiring information, explicitly or implicitly indicated by the network equipment, of the downlink control region, wherein
determining the time-frequency resource location of the downlink signal comprises:

determining the downlink control region according to the information of the downlink control region,
wherein determining the downlink control region according to the information of the downlink control region comprises:
determining the downlink control region according to at least one of:

starting and ending location information of each of the frequency points of the group;
information of the radio frame and a subframe in the radio frame where the downlink control region is located;
information of a sequence for the SS, the information of the sequence for the SS being configured to indicate whether the downlink control region is located on the frequency points where the SS is transmitted or not;
relative time-frequency location information between the SS and the broadcast signal, the relative time-frequency location information being configured to indicate whether the downlink control region is located on the frequency points where the SS and the broadcast signal are transmitted or not;
a content of the broadcast signal; or
a content of basic system information indicated by the broadcast signal.

Patentansprüche

1. Verfahren zur Signalübertragung, umfassend:

Bestimmen (S210) einer Zeit-Frequenz-Ressourcenposition eines Downlink-Signals, wobei das Downlink-Signal ein Synchronisationssignal, SS, und/oder ein Rundfunksignal und/oder ein gemeinsames Steuerkanalsignal und/oder ein gemeinsames Referenzsignal und/oder ein Messreferenzsignal, MRS, umfasst, wobei die Zeit-Frequenz-Ressourcenposition des Downlink-Signals auf mehreren Frequenzpunkten eines Trägers innerhalb einer vorbestimmten Zeit liegt und die mehreren Frequenzpunkte Teil von Frequenzpunkten innerhalb einer Bandbreite des Trägers sind, wobei die Zeit-Frequenz-Ressourcenposition des gemeinsamen Steuerkanalsignals oder des gemeinsamen Referenzsignals innerhalb einer Downlink-Steuerregion liegt; und
Übertragen (S220) des Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals;
dadurch gekennzeichnet, dass
wenn das Downlink-Signal das MRS umfasst, das Übertragen (S220) des Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst:
Übertragen des MRS in einer Position, die nicht für die Downlink-Steuerungsregion verwendet wird, der mehreren Frequenzpunkte, gemäß der Periodizität.

2. Verfahren nach Anspruch 1 wobei wenn das Downlink-Signal das SS umfasst, das Übertragen des Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst:
Übertragen des SS auf den mehreren Frequenzpunkten gemäß der Periodizität.

3. Verfahren nach Anspruch 2, wobei die Periodizitäten für das Übertragen des SS auf verschiedenen Frequenzpunkten in den mehreren Frequenzpunkten gleich oder unterschiedlich voneinander sind.

4. Verfahren nach Anspruch 2 oder 3, wobei die Sequenzen, die beim Übertragen des SS auf verschiedenen Frequenzpunkten in den mehreren Frequenzpunkten verwendet werden, gleich oder unterschiedlich voneinander sind.

5. Verfahren nach einem der Ansprüche 1-4, wobei, wenn das Downlink-Signal das Rundfunksignal umfasst, das Übertragen (S220) des Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst: Übertragen des Rundfunksignals auf den mehreren Frequenzpunkten gemäß der Periodizität.

6. Verfahren nach einem der Ansprüche 1-5, wobei die Downlink-Steuerregion auf einer Gruppe von aufeinanderfolgenden Frequenzpunkten der mehreren Frequenzpunkte in einem Funkframe positioniert ist, und eine Zeitbereichslänge der Downlink-Steuerregion in dem Funkframe kleiner als eine Länge des Funkframes ist, und wobei das Verfahren ferner umfasst:

explizites oder implizites Angeben von Informationen der Downlink-Steuerregion an ein Endgerät durch:

Informationen zur Start- und Endposition der einzelnen Frequenzpunkte der Gruppe; und/oder
Informationen des Funkframes und eines Subframes im Funkframe, in dem sich die Downlink-Steuerregion befindet; und/oder

Informationen einer Sequenz für das SS, wobei die Informationen der Sequenz für das SS dazu ausgelegt sind, anzugeben, ob sich die Downlink-Steuerregion auf den Frequenzpunkten befindet, auf denen das SS übertragen wird oder nicht; und/oder
relative Zeit-Frequenz-Positionsinformationen zwischen dem SS und dem Rundfunksignal, wobei die relativen Zeit-Frequenz-Positionsinformationen dazu ausgelegt sind, anzugeben, ob die Downlink-Steuerregion auf den Frequenzpunkten liegt, wo das SS und das Rundfunksignal übertragen werden oder nicht; und/oder
einen Inhalt des Rundfunksignals; und/oder
einen Inhalt grundlegender Systeminformationen, die durch das Rundfunksignal angegeben werden.

7. Verfahren nach einem der Ansprüche 1-6, wobei das Verfahren ferner umfasst:
wenn eine Zeit-Frequenz-Ressourcenposition des MRS mit einer Zeit-Frequenz-Ressourcenposition von Downlinkdaten kollidiert, Übertragen des MRS oder der Downlinkdaten auf eine erzwungenen Weise.

8. Verfahren zum Signalempfang, umfassend:

Bestimmen (S810) einer Zeit-Frequenz-Ressourcenposition eines Downlink-Signals, wobei das Downlink-Signal ein Synchronisationssignal, SS, und/oder ein Rundfunksignal und/oder ein gemeinsames Steuerkanalsignal und/oder ein gemeinsames Referenzsignal und/oder ein Messreferenzsignal, MRS, umfasst, wobei die Zeit-Frequenz-Ressourcenposition des Downlink-Signals auf mehreren Frequenzpunkten eines Trägers innerhalb einer vorbestimmten Zeit liegt und die mehreren Frequenzpunkte Teil von Frequenzpunkten innerhalb einer Bandbreite des Trägers sind, wobei die Zeit-Frequenz-Ressourcenposition des gemeinsamen Steuerkanalsignals oder des gemeinsamen Referenzsignals innerhalb einer Downlink-Steuerregion liegt; und
Empfangen (S820) des von einer Netzwerkausrüstung übertragenen Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals;
dadurch gekennzeichnet, dass
wenn das Downlink-Signal das MRS umfasst, das Empfangen (S820) des von der Netzwerkausrüstung übertragenen Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst:
Empfangen des durch die Netzwerkausrüstung übertragenen MRS gemäß der Periodizität in einer Position, die nicht für die Downlink-Steuerregion verwendet wird, der mehreren Frequenzpunkte.

9. Verfahren nach Anspruch 8, wobei, wenn das Downlink-Signal das SS umfasst, das Empfangen (S820) des von der Netzwerkausrüstung übertragenen Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst:
Empfangen des von der Netzwerkausrüstung übertragenen SS entsprechend der Periodizität auf den mehreren Frequenzpunkten.

10. Verfahren nach Anspruch 9, wobei die Periodizitäten zum Empfangen des von der Netzwerkausrüstung auf verschiedenen Frequenzpunkten in den mehreren Frequenzpunkten übertragenen SS gleich oder unterschiedlich voneinander sind.

11. Verfahren nach Anspruch 9 oder 10, wobei die Sequenzen, die beim Empfangen des von der Netzwerkausrüstung auf verschiedenen Frequenzpunkten in den mehreren Frequenzpunkten übertragenen SS verwendet werden, gleich oder unterschiedlich voneinander sind.

12. Verfahren nach einem der Ansprüche 8-11, wobei, wenn das Downlink-Signal das Rundfunksignal umfasst, das Empfangen (S820) des von der Netzwerkausrüstung übertragenen Downlink-Signals gemäß der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst:
Empfangen des von der Netzwerkausrüstung übertragenen Rundfunksignals gemäß der Periodizität auf den mehreren Frequenzpunkten.

13. Verfahren nach einem der Ansprüche 8-12, wobei die Downlink-Steuerregion auf einer Gruppe von aufeinanderfolgenden Frequenzpunkten der mehreren Frequenzpunkte in einem Funkframe positioniert ist, und eine Zeitbereichslänge der Downlink-Steuerregion in dem Funkframe kleiner als eine Länge des Funkframes ist.

14. Verfahren nach Anspruch 13, ferner umfassend:

Erfassen von Informationen der Downlink-Steuerregion, die explizit oder implizit durch die Netz-

werkausrüstung angegeben werden, wobei das Bestimmen der Zeit-Frequenz-Ressourcenposition des Downlink-Signals umfasst:

Bestimmen der Downlink-Steuerregion gemäß den Informationen der Downlink-Steuerregion,
wobei das Bestimmen der Downlink-Steuerregion gemäß den Informationen der Downlink-Steuerregion umfasst:

Bestimmen der Downlink-Steuerregion gemäß:

Informationen zur Start- und Endposition der einzelnen Frequenzpunkte der Gruppe; und/oder
Informationen des Funkframes und eines Subframes im Funkframe, in dem sich die Downlink-Steuerregion befindet; und/oder

Informationen einer Sequenz für das SS, wobei die Informationen der Sequenz für das SS dazu ausgelegt sind, anzugeben, ob sich die Downlink-Steuerregion auf den Frequenzpunkten befindet, auf denen das SS übertragen wird oder nicht; und/oder
relative Zeit-Frequenz-Positionsinformationen zwischen dem SS und dem Rundfunksignal, wobei die relativen Zeit-Frequenz-Positionsinformationen dazu ausgelegt sind, anzugeben, ob die Downlink-Steuerregion auf den Frequenzpunkten liegt, wo das SS und das Rundfunksignal übertragen werden oder nicht; und/oder

einen Inhalt des Rundfunksignals; und/oder einen Inhalt grundlegender Systeminformationen, die durch das Rundfunksignal angegeben werden.

Revendications

1. Procédé d'émission de signaux, comprenant les étapes consistant à :

déterminer (S210) un emplacement de ressource temps-fréquence d'un signal en liaison descendante, le signal en liaison descendante comprenant au moins un signal parmi un signal de synchronisation (SS), un signal de diffusion, un signal de canal de commande commun, un signal de référence commun et un signal de référence de mesure (MRS), l'emplacement de ressource temps-fréquence du signal en liaison descendante étant sur de multiples points de fréquence d'une porteuse pendant un temps prédéterminé et les multiples points de fréquence faisant partie de points de fréquence dans une bande passante de la porteuse, l'emplacement de ressource temps-fréquence du signal de canal de commande commun ou du signal de référence commun étant dans une région de commande en liaison descendante ; et
émettre (S220) le signal en liaison descendante selon l'emplacement de ressource temps-fréquence du signal en liaison descendante ;
le procédé étant **caractérisé en ce que** :
quand le signal en liaison descendante comprend le MRS, l'émission (S220) du signal en liaison descendante selon l'emplacement de ressource temps-fréquence du signal en liaison descendante comprend l'étape consistant à :
émettre le MRS dans un emplacement, non utilisé pour la région de commande en liaison descendante, des multiples points de fréquence, selon la périodicité.

2. Procédé selon la revendication 1, dans lequel, quand le signal en liaison descendante comprend le SS, l'émission du signal en liaison descendante selon l'emplacement de ressource temps-fréquence du signal en liaison descendante comprend l'étape consistant à :
émettre le SS sur les multiples points de fréquence selon la périodicité.

3. Procédé selon la revendication 2, dans lequel des périodicités pour émettre le SS sur différents points de fréquence parmi les multiples points de fréquence sont les mêmes entre elles ou sont différentes les unes des autres.

4. Procédé selon la revendication 2 ou 3, dans lequel des séquences utilisées pour émettre le SS sur différents points de fréquence parmi les multiples points de fréquence sont les mêmes entre elles ou sont différentes les unes des autres.

5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel, quand le signal en liaison descendante comprend le signal de diffusion, l'émission (S220) du signal en liaison descendante selon l'emplacement de ressource temps-fréquence du signal en liaison descendante comprend l'étape consistant à :
émettre le signal de diffusion sur les multiples points de fréquence selon la périodicité.

6. Procédé selon l'une quelconque des revendications 1 à 5, dans lequel la région de commande en liaison descendante est située sur un groupe de points de

fréquence consécutifs parmi les multiples points de fréquence dans une trame radio, et une longueur du domaine temporel de la région de commande en liaison descendante dans la trame radio est inférieure à une longueur de la trame radio, et
le procédé comprenant en outre l'étape consistant à :
indiquer explicitement ou implicitement une information de la région de commande en liaison descendante à un équipement terminal par l'intermédiaire d'au moins une des informations suivantes :

une information d'emplacement de début et de fin de chacun des points de fréquence du groupe ;
une information de la trame radio et d'une sous-trame dans la trame radio où est située la région de commande en liaison descendante ;
une information d'une séquence pour le SS, l'information de la séquence pour le SS étant configurée pour indiquer si la région de commande en liaison descendante est située ou non sur les points de fréquence où est émis le SS ;
une information d'emplacement temps-fréquence relative entre le SS et le signal de diffusion, l'information d'emplacement temps-fréquence relative étant configurée pour indiquer si la région de commande en liaison descendante est située ou non sur les points de fréquence où sont émis le SS et le signal de diffusion ;
un contenu du signal de diffusion ; ou
un contenu d'une information de système de base indiquée par le signal de diffusion.

7. Procédé selon l'une quelconque des revendications 1 à 6, le procédé comprenant en outre l'étape consistant à :
si un emplacement de ressource temps-fréquence du MRS est en conflit avec un emplacement de ressource temps-fréquence de données en liaison descendante, émettre le MRS ou les données en liaison descendante d'une manière forcée.

8. Procédé de réception de signaux, comprenant les étapes consistant à :

déterminer (S810) un emplacement de ressource temps-fréquence d'un signal en liaison descendante, le signal en liaison descendante comprenant au moins un signal parmi un signal de synchronisation (SS), un signal de diffusion, un signal de canal de commande commun, un signal de référence commun et un signal de référence de mesure (MRS), l'emplacement de ressource temps-fréquence du signal en liaison descendante étant sur de multiples points de fréquence d'une porteuse pendant un temps prédéterminé et les multiples points de fréquence faisant partie de points de fréquence dans une bande passante de la porteuse, l'emplacement de ressource temps-fréquence du signal de canal de commande commun ou du signal de référence commun étant dans une région de commande en liaison descendante ; et
recevoir (S820) le signal en liaison descendante émis par un équipement de réseau selon l'emplacement de ressource temps-fréquence du signal en liaison descendante ;
le procédé étant **caractérisé en ce que** :
quand le signal en liaison descendante comprend le MRS, la réception (S820) du signal en liaison descendante émis par l'équipement de réseau selon l'emplacement de ressource temps-fréquence du signal en liaison descendante comprend l'étape consistant à :
recevoir le MRS émis par l'équipement de réseau selon une périodicité dans un emplacement, non utilisé pour la région de commande en liaison descendante, des multiples points de fréquence.

9. Procédé selon la revendication 8, dans lequel, quand le signal en liaison descendante comprend le SS, la réception (S820) du signal en liaison descendante émis par l'équipement de réseau selon l'emplacement de ressource temps-fréquence du signal en liaison descendante comprend l'étape consistant à :
recevoir le SS émis par l'équipement de réseau selon une périodicité sur les multiples points de fréquence.

10. Procédé selon la revendication 9, dans lequel des périodicités pour recevoir le SS émis par l'équipement de réseau sur différents points de fréquence parmi les multiples points de fréquence sont les mêmes entre elles ou sont différentes les unes des autres.

11. Procédé selon la revendication 9 ou 10, dans lequel des séquences utilisées pour recevoir le SS émis par l'équipement de réseau sur différents points de fréquence parmi les multiples points de fréquence sont les mêmes entre elles ou sont différentes les unes des autres.

12. Procédé selon l'une quelconque des revendications 8 à 11, dans lequel, quand le signal en liaison descendante comprend le signal de diffusion, la réception (S820) du signal en liaison descendante émis par l'équipement de réseau selon l'emplacement de ressource temps-fréquence du signal en liaison descendante comprend l'étape consistant à :
recevoir le signal de diffusion émis par l'équipement de réseau selon une périodicité sur les multiples points de fréquence.

13. Procédé selon l'une quelconque des revendications 8 à 12, dans lequel la région de commande en liaison descendante est située sur un groupe de points de fréquence consécutifs parmi les multiples points de fréquence dans une trame radio, et une longueur du domaine temporel de la région de commande en liaison descendante dans la trame radio est inférieure à une longueur de la trame radio.

14. Procédé selon la revendication 13, comprenant en outre l'étape consistant à :

acquérir une information, indiquée explicitement ou implicitement par l'équipement de réseau, de la région de commande en liaison descendante,
la détermination de l'emplacement de ressource temps-fréquence du signal en liaison descendante comprenant l'étape consistant à :

déterminer la région de commande en liaison descendante selon l'information de la région de commande en liaison descendante,
la détermination de la région de commande en liaison descendante selon l'information de la région de commande en liaison descendante comprenant l'étape consistant à :
déterminer la région de commande en liaison descendante selon au moins une des informations suivantes :

une information d'emplacement de début et de fin de chacun des points de fréquence du groupe ;
une information de la trame radio et d'une soustrame dans la trame radio où est située la région de commande en liaison descendante ;
une information d'une séquence pour le SS, l'information de la séquence pour le SS étant configurée pour indiquer si la région de commande en liaison descendante est située ou non sur les points de fréquence où est émis le SS ;
une information d'emplacement temps-fréquence relative entre le SS et le signal de diffusion, l'information d'emplacement temps-fréquence relative étant configurée pour indiquer si la région de commande en liaison descendante est située ou non sur les points de fréquence où sont émis le SS et le signal de diffusion ;
un contenu du signal de diffusion ; ou
un contenu d'une information de système de base indiquée par le signal de diffusion.

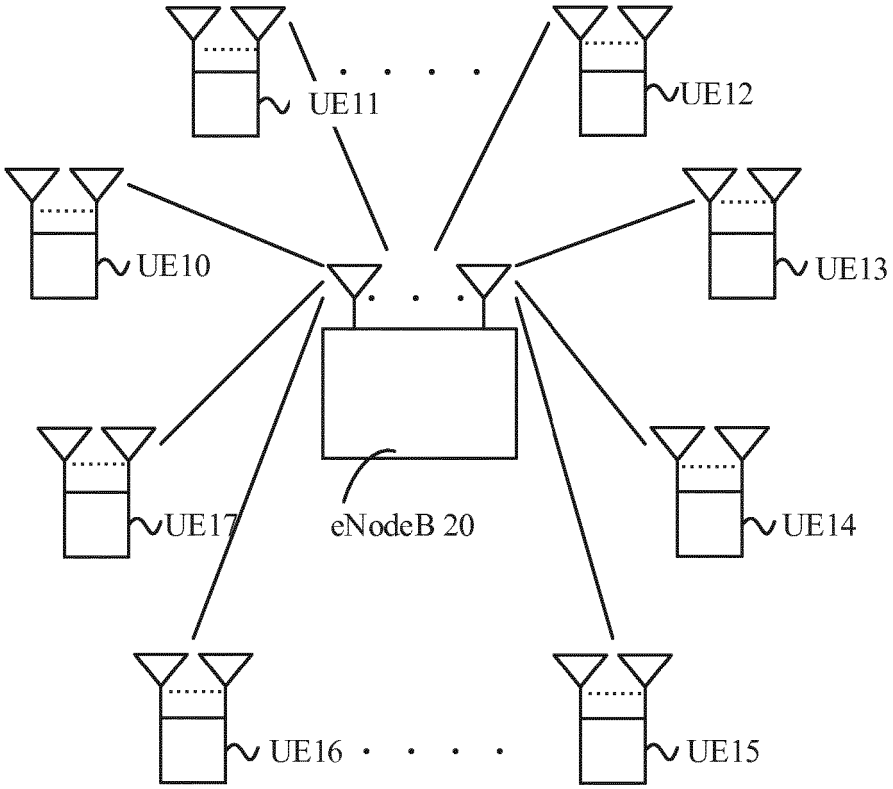
UE11
UE12
UE10
UE13
UE17
eNodeB 20
UE14
UE16
UE15

FIG. 1

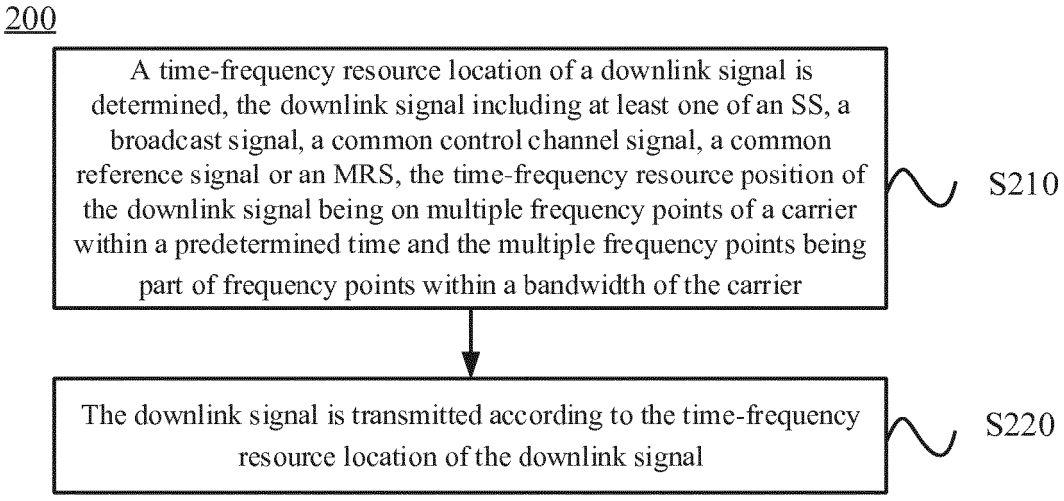
200
A time-frequency resource location of a downlink signal is determined, the downlink signal including at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS, the time-frequency resource position of the downlink signal being on multiple frequency points of a carrier within a predetermined time and the multiple frequency points being part of frequency points within a bandwidth of the carrier
S210
The downlink signal is transmitted according to the time-frequency resource location of the downlink signal
S220

FIG. 2

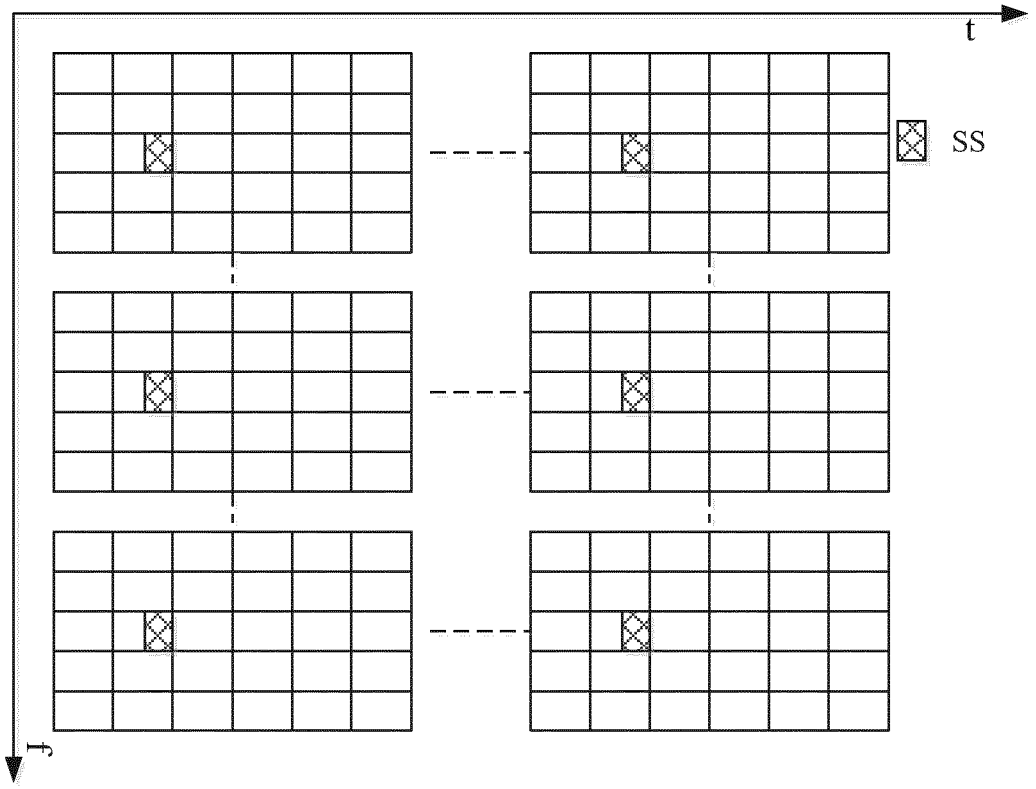

FIG. 3

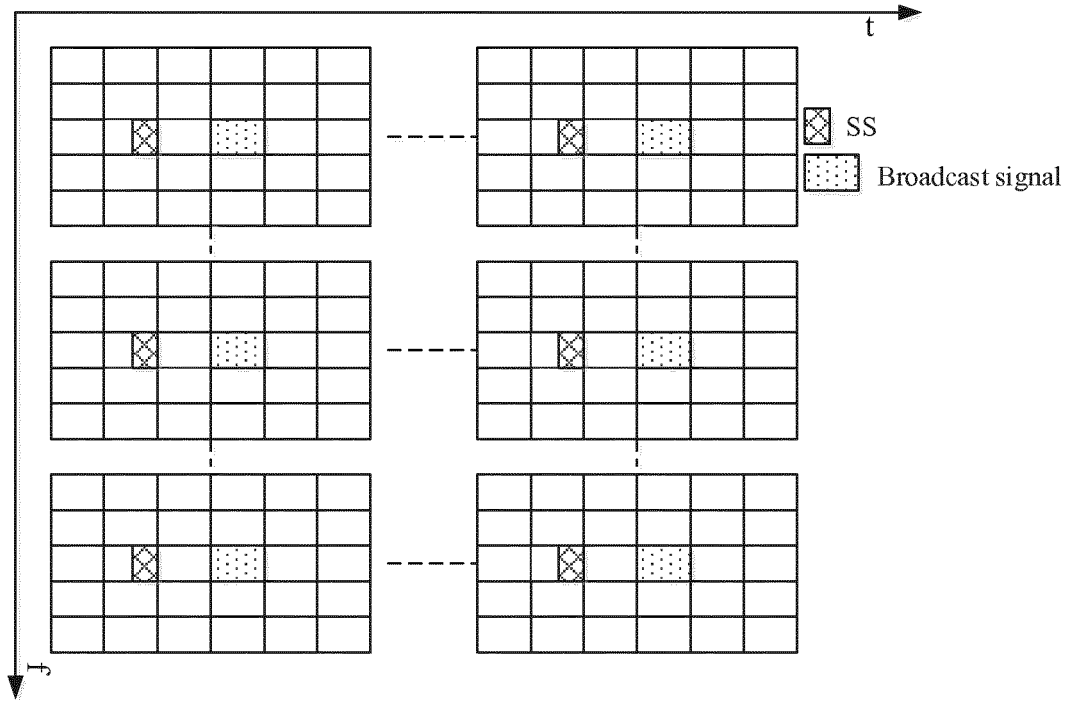

FIG. 4

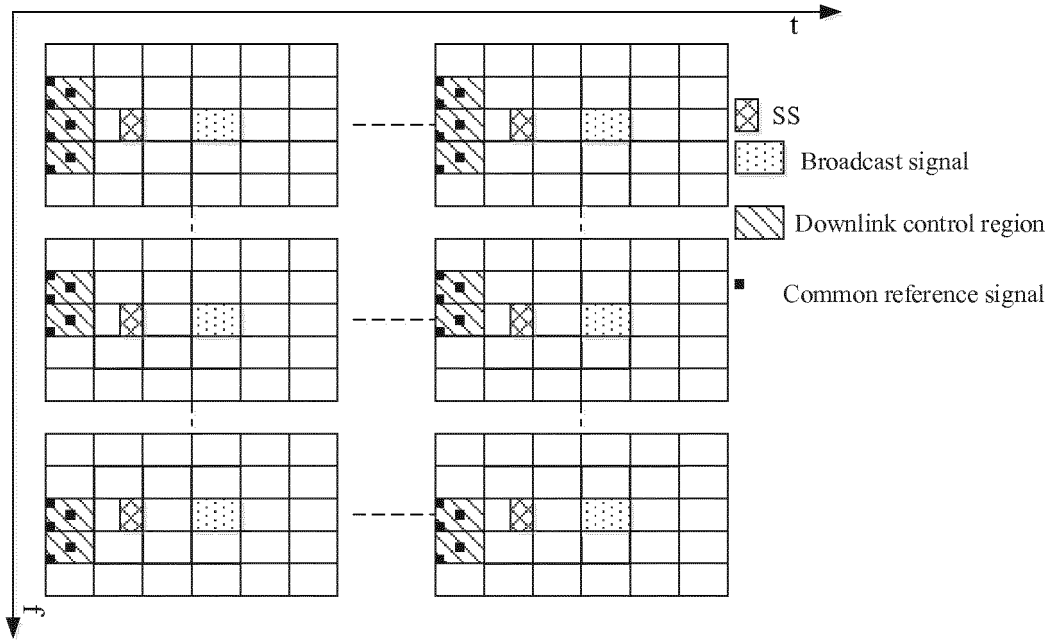
t
f
SS
Broadcast signal
Downlink control region
Common reference signal

FIG. 5

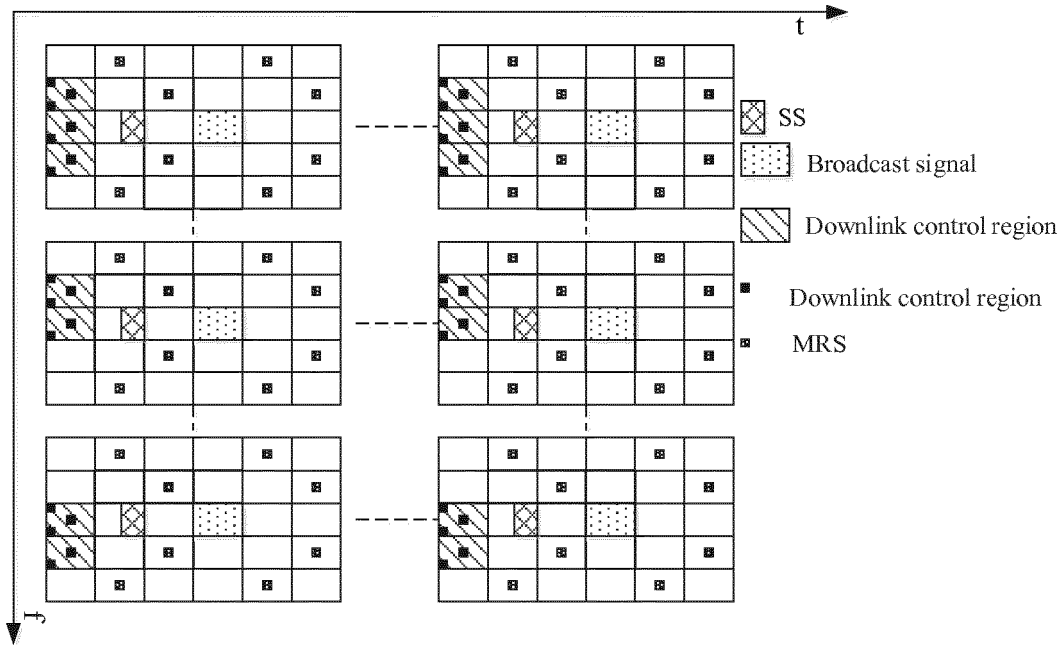
t
f
SS
Broadcast signal
Downlink control region
Downlink control region
MRS

FIG. 6

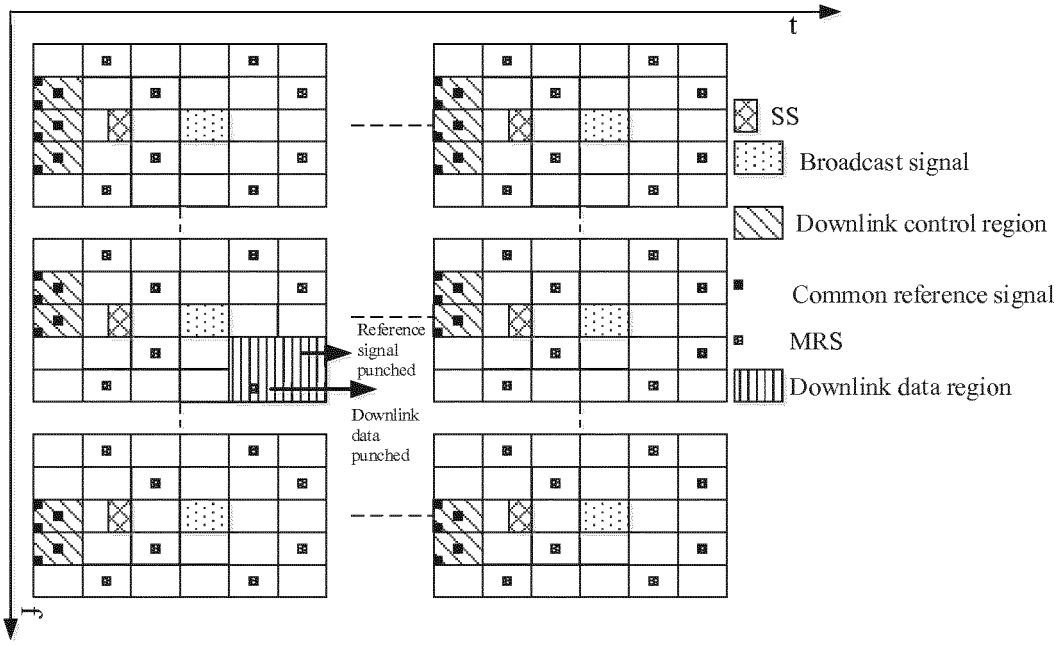
t
f
SS
Broadcast signal
Downlink control region
Common reference signal
MRS
Downlink data region
Reference signal punched
Downlink data punched

FIG. 7

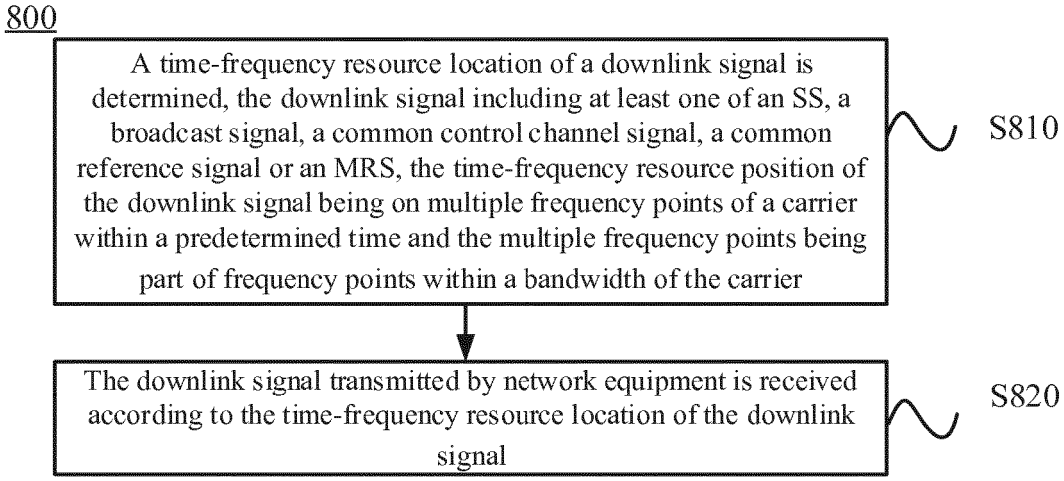
800
A time-frequency resource location of a downlink signal is determined, the downlink signal including at least one of an SS, a broadcast signal, a common control channel signal, a common reference signal or an MRS, the time-frequency resource position of the downlink signal being on multiple frequency points of a carrier within a predetermined time and the multiple frequency points being part of frequency points within a bandwidth of the carrier
S810
The downlink signal transmitted by network equipment is received according to the time-frequency resource location of the downlink signal
S820

FIG. 8

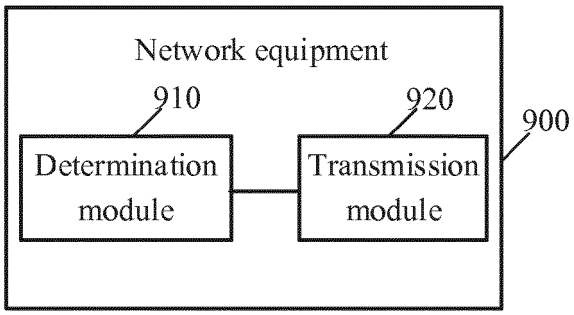

FIG. 9

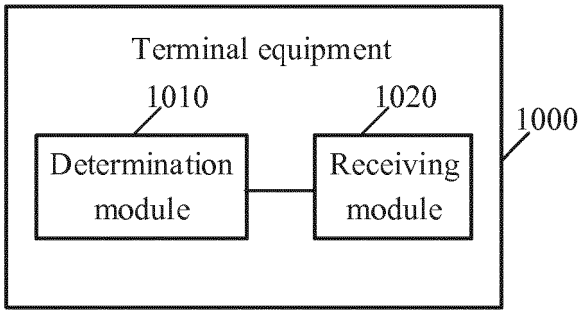

FIG. 10

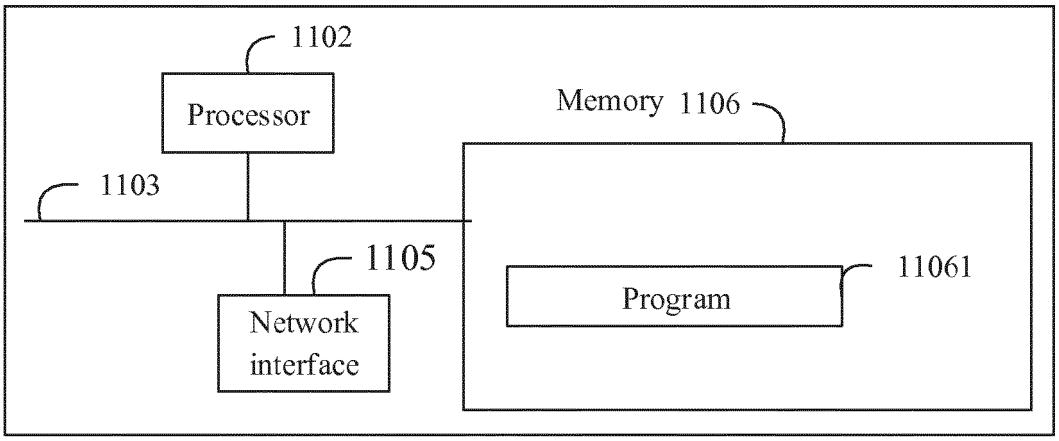

FIG. 11

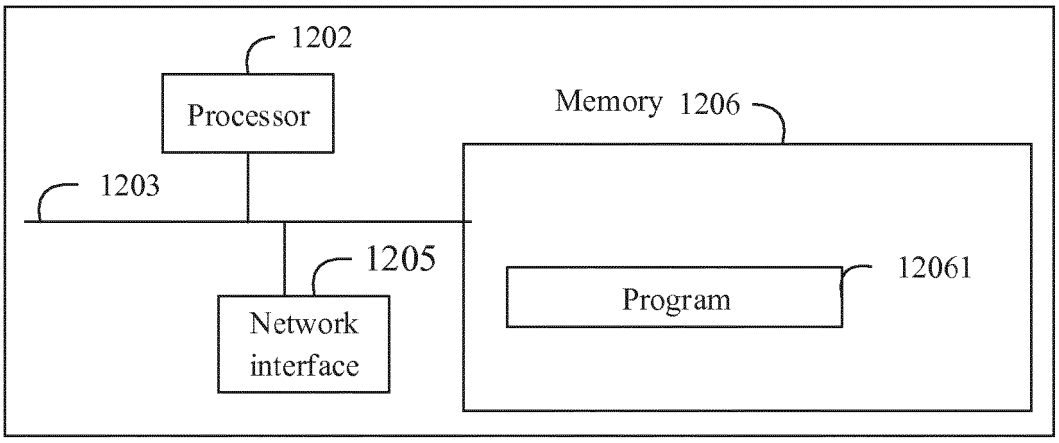
1202
Processor
Memory 1206
1203
1205
Network interface
Program
12061

FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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