METHOD FOR INDICATING FREQUENCY-DOMAIN INFORMATION OF COMMON CONTROL RESOURCE SET OF REMAINING MINIMUM SYSTEM INFORMATION

TECHNICAL FIELD

[0001] The present disclosure generally relates to the technical field of communications, and more particularly, to a method and device for indicating frequency-domain information of a common control resource set (CORESET) of remaining minimum system information (RMSI), a method and device for searching for a CORESET of RMSI, a base station, user equipment (UE) and a computer-readable storage medium.

BACKGROUND

[0002] In recent discussions of the 3rd generation partnership project (3GPP), it is proposed that how to indicate a time-frequency position of a common CORESET of RMSI in a physical broadcast channel (PBCH) is an important problem that needs to be solved. A length of only about 8 bits is reserved for indication information of a CORESET of RMSI in a present PBCH and one or two bits may be required to be reserved for future use, which makes a great challenge to indication of a frequency-domain position of the CORESET of the RMSI in a broadband system. In addition, there is also made such a conclusion at present that multiple synchronization signal blocks (SSBs) may correspond to a piece of RMSI, which further increases difficulties in indication of the frequency-domain position. Moreover, considering time-domain merging of PBCHs, it is required that PBCH contents of the SSBs corresponding to each beam are consistent, which further restricts the degree of freedom of frequency-domain indication of the CORESET of the RMSI and increases the difficulties in indication.

SUMMARY

[0003] In view of this, the present application discloses a method and device for indicating frequency-domain information of a CORESET of RMSI, a method and device for searching for a CORESET of RMSI, a base station, UE and a computer-readable storage medium, to

indicate the frequency-domain information of the CORESET of the RMSI with as few bits as possible.

[0004] According to a first aspect of embodiments of the present disclosure, a method for indicating frequency-domain information of a common CORESET of RMSI is provided, which is applied to a base station and includes that:

[0005] adding indication information into a physical broadcast channel (PBCH) of a synchronization signal block (SSB), the indication information including first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

[0006] sending the SSB including the indication information and the CORESET of the RMSI to user equipment (UE) in a beam scanning manner.

[0007] In an embodiment, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include second indication information, and the second indication information may be configured to indicate a bandwidth part where the CORESET of the RMSI is located. The bandwidth part where the CORESET of the RMSI is located may be different from a bandwidth part where the SSB is located, and the bandwidth part may refer to a resource unit with a certain frequency region of a frequency band.

[0008] In an embodiment, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include third indication information, and the third indication information may be configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value or a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value.

[0009] In an embodiment, the first set value may be 0, and the second set value may be 0.

[0010] According to a second aspect of embodiments of the present disclosure, a method for

searching for a common CORESET of RMSI is provided, which is applied to UE and includes that:

[0011] receiving a synchronization signal block (SSB) including indication information from a base station, the indication information including first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

[0012] obtaining the indication information by parsing the SSB, and searching for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

[0013] In an embodiment, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the operation that the CORESET of the RMSI is searched for in the corresponding frequency region according to the indication information may include that:

[0014] the CORESET of the RMSI is searched for according to a center frequency where the SSB is located.

[0015] In an embodiment, in response to the indication information further including second indication information configured to indicate a bandwidth part where the CORESET of the RMSI is located and the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, the operation that the CORESET of the RMSI is searched for in the corresponding frequency region according to the indication information may include that:

[0016] the CORESET of the RMSI is searched for in a bandwidth part except the bandwidth part corresponding to the received SSB, the bandwidth part referring to a resource unit with a certain frequency region of a frequency band.

[0017] In an embodiment, in response to the indication information further including third indication information configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value, the operation that the CORESET of the RMSI is searched for in the corresponding frequency region according to

the indication information may include that:

[0018] the CORESET of the RMSI is searched for in a frequency region lower than that corresponding to the received SSB.

[0019] In an embodiment, in response to the indication information further including third indication information configured to indicate that a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the operation that the CORESET of the RMSI is searched for in the corresponding frequency region according to the indication information may include that:

[0020] the CORESET of the RMSI is searched for in a frequency region higher than a frequency region corresponding to the received SSB.

[0021] According to a third aspect of embodiments of the present disclosure, a device for indicating frequency-domain information of a common CORESET of RMSI is provided, which is applied to a base station and includes: an addition module and a sending module.

[0022] The addition module is configured to add indication information into a PBCH of an SSB. The indication information includes first indication information and the first indication information is configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[0023] The sending module is configured to send the SSB including the indication information added by the addition module and the CORESET of the RMSI to UE in a beam scanning manner.

[0024] In an embodiment, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include second indication information, and the second indication information may be configured to indicate a bandwidth part where the CORESET of the RMSI is located. The bandwidth part where the CORESET of the RMSI is located may be different from a bandwidth part where the SSB is located, and the bandwidth part may refer to a resource unit with a certain frequency region of a frequency band.

[0025] In an embodiment, in response to the first indication information indicating that the

CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include third indication information, and the third indication information may be configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value or that a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value.

[0026] In an embodiment, the first set value may be 0, and the second set value may be 0.

[0027] According to a fourth aspect of embodiments of the present disclosure, a device for searching for a common CORESET of RMSI is provided, which is applied to UE and includes: a receiving module and a parsing and searching module.

[0028] The receiving module is configured to receive an SSB including indication information from a base station. The indication information includes first indication information and the first indication information is configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[0029] The parsing and searching module is configured to obtain the indication information by parsing the SSB received by the receiving module, and search for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

[0030] In an embodiment, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the parsing and searching module may include:

[0031] a first searching unit, configured to search for the CORESET of the RMSI according to a center frequency where the SSB is located.

[0032] In an embodiment, in response to the indication information further including second indication information configured to indicate a bandwidth part where the CORESET of the RMSI is located, and the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, the parsing and searching module may include:

[0033] a second searching unit, configured to search for the CORESET of the RMSI in a

bandwidth part except the bandwidth part corresponding to the received SSB. The bandwidth part may refer to a resource unit with a certain frequency region of a frequency band.

[0034] In an embodiment, in response to the indication information further including third indication information configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value, the parsing and searching module may include:

[0035] a third searching unit, configured to search for the CORESET of the RMSI in a frequency region lower than that corresponding to the received SSB.

[0036] In an embodiment, in response to the indication information further including third indication information configured to indicate that a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the parsing and searching module may include:

[0037] a fourth searching unit, configured to search for the CORESET of the RMSI in a frequency region higher than a frequency region corresponding to the received SSB.

[0038] According to a fifth aspect of embodiments of the present disclosure, a base station is provided, which includes:

[0039] a processor; and

[0040] a memory configured to store instructions executable for the processor,

[0041] wherein the processor may be configured to:

[0042] add indication information into a PBCH of an SSB, the indication information including first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

[0043] send the SSB including the indication information and the CORESET of the RMSI to UE in a beam scanning manner.

[0044] According to a sixth aspect of embodiments of the present disclosure, UE is provided, which includes:

[0045] a processor; and

[0046] a memory configured to store instructions executable for the processor,

[0047] wherein the processor may be configured to:

[0048] receive an SSB including indication information from a base station, the indication information including first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

[0049] obtain the indication information by parsing the SSB, and search for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

[0050] According to a seventh aspect of embodiments of the present disclosure, a computer-readable storage medium is provided, in which computer instructions are stored, the instructions being executed by a processor to implement the steps of the above method for indicating the frequency-domain information of the common CORESET of the RMSI.

[0051] According to an eighth aspect of embodiments of the present disclosure, a computer-readable storage medium is provided, in which computer instructions are stored, the instructions being executed by a processor to implement the steps of the above method for searching for the common CORESET of the RMSI.

[0052] The technical solutions in the embodiments of the present disclosure may have the following beneficial effects.

[0053] The first indication information, configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed, is added into the SSB, and then the first indication information covers all possible frequency-domain positions of the CORESET of the RMSI, so that the frequency-domain information of the CORESET of the RMSI may be indicated with as few bits as possible.

[0054] The SSB including the indication information, configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed, is received from the base station, searching for the CORESET of the RMSI in the corresponding frequency region is achieved, and few bits are occupied by the frequency-domain information of the CORESET of the RMSI in an implementation process, so that searching efficiency of the CORESET of the RMSI is improved.

[0055] It is to be understood that the above general descriptions and detailed descriptions below are only exemplary and explanatory and not intended to limit the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0056] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments consistent with the present disclosure and, together with the description, serve to explain the principles of the present disclosure.

[0057] FIG. 1 is a flow chart showing a method for indicating frequency-domain information of a CORESET of RMSI, according to an exemplary embodiment of the present application.

[0058] FIG. 2 is a schematic diagram illustrating a frequency-domain relationship in case a CORESET of RMSI corresponding to an SSB and the SSB are time division multiplexed, according to an exemplary embodiment of the present application.

[0059] FIG. 3 is a first schematic diagram illustrating a frequency-domain relationship in case a CORESET of RMSI corresponding to an SSB and the SSB are frequency division multiplexed, according to an exemplary embodiment of the present application.

[0060] FIG. 4 is a second schematic diagram illustrating a frequency-domain relationship in case a CORESET of RMSI corresponding to an SSB and the SSB are frequency division multiplexed, according to an exemplary embodiment of the present application.

[0061] FIG. 5 is a third schematic diagram illustrating a frequency-domain relationship in case a CORESET of RMSI corresponding to an SSB and the SSB are frequency division multiplexed, according to an exemplary embodiment of the present application.

[0062] FIG. 6 is a flow chart showing a method for searching for a CORESET of RMSI, according to an exemplary embodiment of the present application.

[0063] FIG. 7 is a signaling flow chart showing a method for searching for a CORESET of RMSI, according to an exemplary embodiment of the present application.

[0064] FIG. 8 is a block diagram of a device for indicating frequency-domain information of a CORESET of RMSI, according to an exemplary embodiment.

[0065] FIG. 9 is a block diagram of a device for searching for a CORESET of RMSI, according to an exemplary embodiment.

[0066] FIG. 10A is a block diagram of another device for searching for a CORESET of RMSI,

according to an exemplary embodiment.

[0067] FIG. 10B is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment.

[0068] FIG. 10C is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment.

[0069] FIG. 10D is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment.

[0070] FIG. 11 is a block diagram of a device for indicating frequency-domain information of a CORESET of RMSI, according to an exemplary embodiment.

[0071] FIG. 12 is a block diagram of a device for searching for a CORESET of RMSI, according to an exemplary embodiment.

DETAILED DESCRIPTION

[0072] Reference will now be made in detail to exemplary embodiments, examples of which are illustrated in the accompanying drawings. The following description refers to the accompanying drawings in which the same numbers in different drawings represent the same or similar elements unless otherwise represented. The implementations set forth in the following description of exemplary embodiments do not represent all implementations consistent with the present disclosure. Instead, they are merely examples of apparatuses and methods consistent with aspects related to the present disclosure as recited in the appended claims.

[0073] FIG. 1 is a flow chart showing a method for indicating frequency-domain information of a CORESET of RMSI, according to an exemplary embodiment of the present application. The embodiments are described based on a base station side. As illustrated in FIG. 1, the method for indicating the frequency-domain information of the CORESET of the RMSI includes the following steps.

[0074] In S101, indication information is added into a PBCH of an SSB, the indication information includes first indication information, and the first indication information is configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[0075] The CORESET of the RMSI refers to a time/frequency resource position where a control channel of the RMSI is located, and the CORESET of the RMSI may also be called a CORESET for/of the control channel PUCCH of the RMSI.

[0076] In the embodiments, in case the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, a center frequency of the CORESET of the RMSI corresponding to the SSB and a center frequency of the SSB are the same, as illustrated in FIG. 2.

[0077] In the embodiments, in case the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include second indication information, and the second indication information is configured to indicate a bandwidth part where the CORESET of the RMSI is located. The bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, as illustrated in FIG. 3. The bandwidth part refers to a resource unit with a certain frequency region of a frequency band.

[0078] In the embodiments, in case the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include third indication information, and the third indication information may be configured to indicate that the number of REs within a gap in the frequency domain between a low-frequency RE of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value. The first set value may be any numerical value in a size of a corresponding bandwidth part and is preferably 0. In case the first set value is 0, a positional relationship of the two in the bandwidth part may be illustrated in FIG. 4. In addition, the third indication information may indicate that the number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, and the second set value may be any numerical value in the size of the corresponding bandwidth part and is preferably 0. When the second set value is 0, the positional relationship of the two in the bandwidth part may be illustrated in FIG. 5.

[0079] According to the embodiments, the indication information and the bandwidth part are combined to represent the frequency-domain information of the CORESET of the RMSI, so that the purpose of reducing a bit overhead is achieved. It can be seen from FIG. 2 to FIG. 5

that the four scenarios may cover all frequency-domain positional relationships of the CORESET of the RMSI and the SSB, namely the frequency-domain positional relationship may be indicated by only two bits, and few bits are used.

[0080] In addition, if a frequency-domain position of the CORESET of the RMSI in the bandwidth part is fixed, i.e., in one of the four scenarios illustrated in FIG. 2 to FIG. 5, for SSBs of each beam, contents of the two bits are the same, so that PBCHs may be merged.

[0081] In S102, the SSB including the indication information and the CORESET of the RMSI are sent to UE in a beam scanning manner.

[0082] A beam width for sending the SSB and a beam width for sending the CORESET of the RMSI may be the same and may also be different.

[0083] According to the embodiments, the first indication information configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed is added into the SSB, and then the first indication information covers all possible frequency-domain positions of the CORESET of the RMSI, such that the frequency-domain information of the CORESET of the RMSI may be indicated with as few bits as possible.

[0084] FIG. 6 is a flow chart showing a method for searching for a CORESET of RMSI, according to an exemplary embodiment of the present application. The embodiments are described based on a UE side. As illustrated in FIG. 6, the method for searching for the CORESET of the RMSI includes the following steps.

[0085] In S601, an SSB including indication information is received from a base station, the indication information includes first indication information, and the first indication information is configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[0086] In S602, the indication information is obtained by parsing the SSB, and the CORESET of the RMSI is searched for in a corresponding frequency region according to the indication information.

[0087] In the embodiments, when the first indication information indicates that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, and UE may search for the CORESET of the RMSI according to a center frequency position

where the SSB is located.

[0088] In the embodiments, in case the indication information further includes second indication information configured to indicate a bandwidth part where the CORESET of the RMSI is located. In case the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, the UE may search for the CORESET of the RMSI in a bandwidth part except the bandwidth part corresponding to the received SSB.

[0089] In the embodiments, when the indication information further includes third indication information, and the third indication information is configured to indicate that the number of REs within a gap in the frequency domain between a low-frequency RE of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value, the UE may search for the CORESET of the RMSI in a frequency region lower than that corresponding to the received SSB. Frequency region is an abbreviated name of frequency region.

[0090] In the embodiments, in case the indication information further includes the third indication information configured to indicate that the number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the UE may search for the CORESET of the RMSI in a frequency region higher than a frequency region corresponding to the received SSB.

[0091] According to the embodiments, the CORESET of the RMSI may be searched for in the corresponding frequency region in different manners based on different frequency-domain positional relationships between the SSB and the CORESET of the corresponding RMSI.

[0092] According to the embodiments, the SSB including the indication information, which is configured to indicate that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed, is received from the base station, searching for the CORESET of the RMSI in the corresponding frequency region is achieved, and few bits are occupied by the frequency-domain information of the CORESET of the RMSI in an implementation process, so that searching efficiency of the CORESET of the RMSI is improved.

[0093] FIG. 7 is a signaling flow chart showing a method for searching for a CORESET of RMSI, according to an exemplary embodiment of the present application. The embodiments are described based on the angle of interaction between a base station and UE. As illustrated in FIG. 7, the method includes the following steps.

[0094] In S701, the base station adds indication information into a PBCH of an SSB, the indication information includes first indication information, and the first indication information is configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[0095] In S702, the base station sends the SSB including the indication information and the CORESET of the RMSI to the UE in a beam scanning manner.

[0096] In S703, the UE receives the SSB including the indication information from the base station.

[0097] In S704, the UE parses the SSB to obtain the indication information and searches for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

[0098] According to the embodiments, through the interaction between the base station and the UE, frequency-domain information of the CORESET of the RMSI may be indicated with as few bits as possible, and the CORESET of the RMSI may be searched for according to the indication information.

[0099] FIG. 8 is a block diagram of a device for indicating frequency-domain information of a CORESET of RMSI, according to an exemplary embodiment. The device may be in a base station. As illustrated in FIG. 8, the device includes an addition module 81 and a sending module 82.

[00100] The addition module 81 is configured to add indication information into a PBCH of an SSB, the indication information including first indication information and the first indication information being configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[00101] In the embodiments, in case the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, a center frequency of the CORESET of the RMSI

and a center frequency of the SSB are the same, as illustrated in FIG. 2.

[00102] In the embodiments, in case the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include second indication information, and the second indication information is configured to indicate a bandwidth part where the CORESET of the RMSI is located. The bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, as illustrated in FIG. 3. The bandwidth part refers to a resource unit with a certain frequency region of a frequency band.

[00103] In the embodiments, in case the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information may further include third indication information, and the third indication information may be configured to indicate that the number of REs within a gap in the frequency domain between a low-frequency RE of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value. The first set value may be any numerical value in a size of a corresponding bandwidth part and is preferably 0. When the first set value is 0, a positional relationship of the two in the bandwidth part may be illustrated in FIG. 4. In addition, the third indication information may indicate that the number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, and the second set value may be any numerical value in the size of the corresponding bandwidth part and is preferably 0. When the second set value is 0, the positional relationship of the two in the bandwidth part may be illustrated in FIG. 5.

[00104] According to the embodiments, the indication information and the bandwidth part are combined to represent the frequency-domain information of the CORESET of the RMSI, so that the purpose of reducing a bit overhead is achieved. It can be seen from FIG. 2 to FIG. 5 that the four scenarios may cover all frequency-domain positional relationships of the CORESET of the RMSI and the SSB, namely the frequency-domain positional relationship may be indicated by only two bits, and few bits are used.

[00105] In addition, if a frequency-domain position of the CORESET of the RMSI in the bandwidth part is fixed, i.e., in one of the four scenarios illustrated in FIG. 2 to FIG. 5, for SSBs of each beam, contents of the two bits are the same, so that PBCHs may be merged.

[00106] The sending module 82 is configured to send the SSB including the indication information added by the addition module 81 and the CORESET of the RMSI to UE in a beam scanning manner.

[00107] A beam width for sending the SSB and a beam width for sending the CORESET of the RMSI may be the same and may also be different.

[00108] According to the embodiments, the first indication information configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed is added into the SSB, and then the first indication information covers all possible frequency-domain positions of the CORESET of the RMSI, so that the frequency-domain information of the CORESET of the RMSI may be indicated with as few bits as possible.

[00109] FIG. 9 is a block diagram of a device for searching for a CORESET of RMSI, according to an exemplary embodiment. The device may be in UE. As illustrated in FIG. 9, the device includes a receiving module 91 and a parsing and searching module 92.

[00110] The receiving module 91 is configured to receive an SSB including indication information from a base station, the indication information including first indication information and the first indication information being configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed.

[00111] The parsing and searching module 92 is configured to obtain the indication information by parsing the SSB received by the receiving module 91, and search for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

[00112] According to the embodiments, the SSB including the indication information configured to indicate whether the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed is received from the base station, searching for the CORESET of the RMSI in the corresponding frequency region is achieved, and few bits are occupied by the frequency-domain information of the CORESET of the RMSI in an implementation process, so that searching efficiency of the CORESET of the RMSI is improved.

[00113] FIG. 10 A is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment. As illustrated in FIG. 10A, based on the embodiments illustrated in FIG. 9, when the first indication information indicates that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the parsing and searching module 92 may include a first searching unit 921.

[00114] The first searching unit 921 is configured to search for the CORESET of the RMSI according to a center frequency where the SSB is located.

[00115] In the embodiments, when the first indication information indicates that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the UE may search for the CORESET of the RMSI according to the center frequency where the SSB is located.

[00116] According to the embodiments, when the first indication information indicates that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the CORESET of the RMSI may be searched for according to the center frequency where the SSB is located, and an implementation manner is simple.

[00117] FIG. 10B is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment. As illustrated in FIG. 10B, based on the embodiments illustrated in FIG. 9, in case the indication information further includes second indication information configured to indicate a bandwidth part where the CORESET of the RMSI is located, and the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, the parsing and searching module 92 may include a second searching unit 922.

[00118] The second searching unit 922 is configured to search for the CORESET of the RMSI in a bandwidth part except the bandwidth part corresponding to the received SSB, the bandwidth part referring to a resource unit with a certain frequency region of a frequency band.

[00119] In the embodiments, in case the indication information further includes the second indication information configured to indicate the bandwidth part where the CORESET of the RMSI is located, and the bandwidth part where the CORESET of the RMSI is located is different from the bandwidth part where the SSB is located, the UE may search for the

CORESET of the RMSI in a bandwidth part except the bandwidth part corresponding to the received SSB.

[00120] According to the embodiments, when the bandwidth part where the CORESET of the RMSI is located is different from the bandwidth part where the SSB is located, the CORESET of the RMSI is searched for in a bandwidth part except the bandwidth part corresponding to the received SSB, and an implementation manner is simple.

[00121] FIG. 10C is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment. As illustrated in FIG. 10C, based on the embodiments illustrated in FIG. 9, when the indication information further includes third indication information, and the third indication information is configured to indicate that the number of REs within a gap in the frequency domain between a low-frequency RE of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value, the parsing and searching module 92 may include a third searching unit 923.

[00122] The third searching unit 923 is configured to search for the CORESET of the RMSI in a frequency region lower than that corresponding to the received SSB.

[00123] According to the embodiments, when the number of REs within a gap in the frequency domain between the low-frequency RE of the SSB and the high-frequency RE of the CORESET of the RMSI is the first set value, the CORESET of the RMSI is searched for in the frequency region lower than the frequency region corresponding to the received SSB, and an implementation manner is simple.

[00124] FIG. 10D is a block diagram of another device for searching for a CORESET of RMSI, according to an exemplary embodiment. As illustrated in FIG. 10D, based on the embodiments illustrated in FIG. 9, when the indication information further includes the third indication information and the third indication information is configured to indicate that the number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the parsing and searching module 92 may include a fourth searching unit 924.

[00125] The fourth searching unit 924 is configured to search for the CORESET of the RMSI in a frequency region higher than a frequency region corresponding to the received SSB.

[00126] According to the embodiments, in case the number of REs within a gap in the

frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the CORESET of the RMSI is searched for in the frequency region higher than the frequency region corresponding to the received SSB, and an implementation manner is simple.

[00127] FIG. 11 is a block diagram of a device for indicating frequency-domain information of a CORESET of RMSI, according to an exemplary embodiment. The device 1100 may be provided as a base station. Referring to FIG. 11, the device 1100 includes a processing component 1122, a wireless transmission/receiving component 1124, an antenna component 1126 and a wireless interface-specific signal processing part, and the processing component 1122 may further include one or more processors.

[00128] One processor in the processing component 1122 may be configured to:

[00129] add indication information into a PBCH of an SSB, the indication information including first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

[00130] send the SSB including the indication information and the CORESET of the RMSI to UE in a beam scanning manner.

[00131] In an exemplary embodiment, there is also provided a non-transitory computer-readable storage medium including instructions, and the instructions may be executed by the processing component 1122 of the device 1100 to implement the method for indicating the frequency-domain information of the common CORESET of the RMSI. For example, the non-transitory computer-readable storage medium may be a read-only memory (ROM), a random access memory (RAM), a compact disc read-only memory (CD-ROM), a magnetic tape, a floppy disc, an optical data storage device and the like.

[00132] FIG. 12 is a block diagram of a device for searching for a CORESET of RMSI, according to an exemplary embodiment. For example, the device 1200 may be UE such as a mobile phone, a computer, a digital broadcast terminal, a messaging device, a gaming console, a tablet, a medical device, exercise equipment, a personal digital assistant, and the like.

[00133] Referring to FIG. 12, the device 1200 may include one or more of the following components: a processing component 1202, a memory 1204, a power component 1206, a

multimedia component 1208, an audio component 1210, an input/output (I/O) interface 1212, a sensor component 1214, and a communication component 1216.

[00134] The processing component 1202 typically controls overall operations of the device 1200, such as the operations associated with display, telephone calls, data communications, camera operations, and recording operations. The processing component 1202 may include one or more processors 1220 to execute instructions to perform all or part of the steps in the abovementioned method. Moreover, the processing component 1202 may include one or more modules which facilitate interaction between the processing component 1202 and other components. For instance, the processing component 1202 may include a multimedia module to facilitate interaction between the multimedia component 1208 and the processing component 1202.

[00135] One processor 1220 in the processing component 1202 may be configured to:

[00136] receive an SSB including indication information from a base station, the indication information including first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

[00137] obtain the indication information by parsing the SSB, and search for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

[00138] The memory 1204 is configured to store various types of data to support the operation of the device 1200. Examples of such data include instructions for any applications or methods operated on the device 1200, contact data, phonebook data, messages, pictures, video, etc. The memory 1204 may be implemented by any type of volatile or non-volatile memory devices, or a combination thereof, such as a static random access memory (SRAM), an electrically erasable programmable read-only memory (EEPROM), an erasable programmable read-only memory (EPROM), a programmable read-only memory (PROM), an ROM, a magnetic memory, a flash memory, and a magnetic or optical disk.

[00139] The power component 1206 provides power to various components of the device 1200. The power component 1206 may include a power management system, one or more power supplies, and other components associated with generation, management and distribution of power for the device 1200.

[00140] The multimedia component 1208 includes a screen providing an output interface between the device 1200 and a user. In some embodiments, the screen may include a liquid crystal display (LCD) and a touch panel (TP). If the screen includes the TP, the screen may be implemented as a touch screen to receive an input signal from the user. The TP includes one or more touch sensors to sense touches, swipes and gestures on the TP. The touch sensors may not only sense a boundary of a touch or swipe action, but also detect a period of time and a pressure associated with the touch or swipe action. In some embodiments, the multimedia component 1208 includes a front camera and/or a rear camera. The front camera and/or the rear camera may receive external multimedia data when the device 1200 is in an operation mode, such as a photographing mode or a video mode. Each of the front camera and the rear camera may be a fixed optical lens system or have focusing and optical zooming capabilities.

[00141] The audio component 1210 is configured to output and/or input an audio signal. For example, the audio component 1210 includes a microphone (MIC), and the MIC is configured to receive an external audio signal when the device 1200 is in an operation mode, such as a call mode, a recording mode and a voice recognition mode. The received audio signal may further be stored in the memory 1204 or sent through the communication component 1216. In some embodiments, the audio component 1210 further includes a speaker configured to output the audio signal.

[00142] The I/O interface 1212 provides an interface between the processing component 1202 and peripheral interface modules, such as a keyboard, a click wheel, buttons and the like. The buttons may include, but are not limited to: a home button, a volume button, a starting button and a locking button.

[00143] The sensor component 1214 includes one or more sensors configured to provide status assessments of various aspects of the device 1200. For instance, the sensor component 1214 may detect an on/off status of the device 1200 and relative positioning of components, such as a display and small keyboard of the device 1200, and the sensor component 1214 may further detect a change in a position of the device 1200 or a component of the device 1200, presence or absence of contact between the user and the device 1200, orientation or acceleration/deceleration of the device 1200 and a change in temperature of the device 1200. The sensor component 1214 may include a proximity sensor configured to detect presence of

an object nearby without any physical contact. The sensor component 1214 may also include a light sensor, such as a complementary metal oxide semiconductor (CMOS) or charge coupled device (CCD) image sensor, configured for use in an imaging application. In some embodiments, the sensor component 1214 may also include an acceleration sensor, a gyroscope sensor, a magnetic sensor, a pressure sensor or a temperature sensor.

[00144] The communication component 1216 is configured to facilitate wired or wireless communication between the device 1200 and other devices. The device 1200 may access a communication-standard-based wireless network, such as a wireless fidelity (WiFi) network, a 2nd-generation (2G) or 3rd-generation (3G) network or a combination thereof. In an exemplary embodiment, the communication component 1216 receives a broadcast signal or broadcast associated information from an external broadcast management system through a broadcast channel. In an exemplary embodiment, the communication component 1216 further includes a near field communication (NFC) module to facilitate short-range communications. For example, the NFC module may be implemented based on a radio frequency identification (RFID) technology, an infrared data association (IrDA) technology, an ultra-wide band (UWB) technology, a Bluetooth (BT) technology, and other technologies.

[00145] In an exemplary embodiment, the device 1200 may be implemented by one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), controllers, micro-controllers, microprocessors or other electronic components, and is configured to execute the method for searching for the CORESET of the RMSI.

[00146] In an exemplary embodiment, there is also provided a non-transitory computer-readable storage medium including instructions, such as included in the memory 1204, executable by the processor 1220 of the device 1200 for performing the abovementioned methods. For example, the non-transitory computer-readable storage medium may be a ROM, a RAM, a CD-ROM, a magnetic tape, a floppy disc, an optical data storage device, and the like.

[00147] The device embodiments substantially correspond to the method embodiments, and thus related parts refer to part of descriptions of the method embodiments. The device

embodiment described above is only schematic, units described as separate parts therein 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 modules therein may be selected according to a practical requirement to achieve the purpose of the solutions of the embodiments. Those of ordinary skill in the art may understand and implement without creative work.

[00148] It is to be noted that relational terms "first", “second” and the like in the present disclosure are adopted only to distinguish one entity or operation from another entity or operation and not always to require or imply existence of any such practical relationship or sequence between the entities or operations. Terms “include” and “have” or any other variation thereof is intended to cover nonexclusive inclusions, so that a process, method, object or device including a series of elements not only includes those elements, but also includes other elements that are not clearly listed, or further includes elements intrinsic to the process, the method, the object or the device. Under the condition of no more limitations, an element defined by statement "including a/an....." does not exclude existence of another element that is the same in a process, method, object or device including the element.

[00149] Other implementation solutions of the present disclosure will be apparent to those skilled in the art from consideration of the specification and practice of the present disclosure. This application is intended to cover any variations, uses, or adaptations of the present disclosure following the general principles thereof and including such departures from the present disclosure as come within known or customary practice in the art. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the present disclosure being indicated by the following claims.

[00150] It will be appreciated that the present disclosure is not limited to the exact construction that has been described above and illustrated in the accompanying drawings, and that various modifications and changes may be made without departing from the scope thereof. It is intended that the scope of the disclosure only be limited by the appended claims.

WHAT IS CLAIMED IS:

1. A method for indicating frequency-domain information of a common control resource set (CORESET) of remaining minimum system information (RMSI), for applying to a base station, comprising:

adding indication information into a physical broadcast channel (PBCH) of a synchronization signal block (SSB), the indication information comprising first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

sending the SSB including the indication information and the CORESET of the RMSI to user equipment (UE) in a beam scanning manner.

2. The method of claim 1, wherein, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information further comprises second indication information, and the second indication information is configured to indicate a bandwidth part where the CORESET of the RMSI is located; wherein the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, and the bandwidth part refers to a resource unit with a certain frequency region of a frequency band.

3. The method of claim 1, wherein, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information further comprises third indication information, and the third indication information is configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value or a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value.

4. The method of claim 3, wherein the first set value is 0, and the second set value is 0.

5. A method for searching for a common control resource set (CORESET) of remaining minimum system information (RMSI), for applying to user equipment (UE), comprising:

receiving a synchronization signal block (SSB) including indication information from a base station, the indication information comprising first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

obtaining the indication information by parsing the SSB, and searching for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

6. The method of claim 5, wherein, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the searching for the CORESET of the RMSI in the corresponding frequency region according to the indication information comprises:

searching for the CORESET of the RMSI according to a center frequency where the SSB is located.

7. The method of claim 5, wherein, in response to the indication information further comprising second indication information configured to indicate that a bandwidth part where the CORESET of the RMSI is located, and the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, the searching for the CORESET of the RMSI in the corresponding frequency region according to the indication information comprises:

searching for the CORESET of the RMSI in a bandwidth part except the bandwidth part corresponding to the received SSB, the bandwidth part referring to a resource unit with a certain frequency region of a frequency band.

8. The method of claim 5, wherein, in response to the indication information further comprising third indication information configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value, the searching for the CORESET of the RMSI in the corresponding frequency region according to the indication information comprises:

searching for the CORESET of the RMSI in a frequency region lower than that corresponding to the received SSB.

9. The method of claim 5, wherein, in response to the indication information further comprising third indication information configured to indicate that a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the searching for the CORESET of the RMSI in the corresponding frequency region according to the indication information comprises:

searching for the CORESET of the RMSI in a frequency region higher than a frequency region corresponding to the received SSB.

10. A device for indicating frequency-domain information of a common control resource set (CORESET) of remaining minimum system information (RMSI), applied to a base station, comprising:

an addition module, configured to add indication information into a physical broadcast channel (PBCH) of a synchronization signal block (SSB), the indication information comprising first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

a sending module, configured to send the SSB including the indication information added by the addition module and the CORESET of the RMSI to UE in a beam scanning manner.

11. The device of claim 10, wherein, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information further comprises second indication information, and the second indication information is configured to indicate a bandwidth part where the CORESET of the RMSI is located; wherein the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, and the bandwidth part refers to a resource unit with a certain frequency region of a frequency band.

12. The device of claim 10, wherein, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are frequency division multiplexed, the indication information further comprises third indication information, and the third indication information is configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value or a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value.

13. The device of claim 12, wherein the first set value is 0, and the second set value is 0.

14. A device for searching for a common control resource set (CORESET) of remaining minimum system information (RMSI), applied to user equipment (UE), comprising:

a receiving module, configured to receive a synchronization signal block (SSB) including indication information from a base station, the indication information comprising first indication information and the first indication information being configured to indicate whether a CORESET of RMSI corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

a parsing and searching module, configured to obtain the indication information by parsing the SSB received by the receiving module, and search for the CORESET of the

RMSI in a corresponding frequency region according to the indication information.

15. The device of claim 14, wherein, in response to the first indication information indicating that the CORESET of the RMSI corresponding to the SSB and the SSB are time division multiplexed, the parsing and searching module comprises:

a first searching unit, configured to search for the CORESET of the RMSI according to a center frequency where the SSB is located.

16. The device of claim 14, wherein, in response to the indication information further comprising second indication information configured to indicate a bandwidth part where the CORESET of the RMSI is located, and the bandwidth part where the CORESET of the RMSI is located is different from a bandwidth part where the SSB is located, the parsing and searching module comprises:

a second searching unit, configured to search for the CORESET of the RMSI in a bandwidth part except the bandwidth part corresponding to the received SSB, the bandwidth part refers to a resource unit with a certain frequency region of a frequency band.

17. The device of claim 14, wherein, in response to the indication information further comprising third indication information configured to indicate that a number of REs within a gap in the frequency domain between a low-frequency resource element (RE) of the SSB and a high-frequency RE of the CORESET of the RMSI is a first set value, the parsing and searching module comprises:

a third searching unit, configured to search for the CORESET of the RMSI in a frequency region lower than that corresponding to the received SSB.

18. The device of claim 14, wherein, in response to the indication information further comprising third indication information configured to indicate that a number of REs within a gap in the frequency domain between a high-frequency RE of the SSB and a low-frequency RE of the CORESET of the RMSI is a second set value, the parsing and searching module

comprises:

a fourth searching unit, configured to search for the CORESET of the RMSI in a frequency region higher than a frequency region corresponding to the received SSB.

19. A base station, comprising:

a processor; and

a memory configured to store instructions executable for the processor,

wherein the processor is configured to:

add indication information into a physical broadcast channel (PBCH) of a synchronization signal block (SSB), the indication information comprising first indication information and the first indication information being configured to indicate whether a control resource set (CORESET) of remaining minimum system information (RMSI) corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

send the SSB including the indication information and the CORESET of the RMSI to user equipment (UE) in a beam scanning manner.

20. User equipment (UE), comprising:

a processor; and

a memory configured to store instructions executable for the processor,

wherein the processor is configured to:

receive a synchronization signal block (SSB) including indication information from a base station, the indication information comprising first indication information and the first indication information being configured to indicate whether a control resource set (CORESET) of remaining minimum system information (RMSI) corresponding to the SSB and the SSB are time division multiplexed or frequency division multiplexed; and

obtain the indication information by parsing the SSB, and search for the CORESET of the RMSI in a corresponding frequency region according to the indication information.

21. A computer-readable storage medium, in which computer instructions are stored, the

instructions being executed by a processor to implement the steps of the method for indicating the frequency-domain information of the common control resource set (CORESET) of the remaining minimum system information (RMSI) of claim 1.

22. A computer-readable storage medium, in which computer instructions are stored, the instructions being executed by a processor to implement the steps of the method for searching for the common control resource set (CORESET) of the remaining minimum system information (RMSI) of claim 5.