(54) **METHOD AND DEVICE FOR TRIGGERING CELL RESELECTION, STORAGE MEDIUM, AND USER TERMINAL**

VERFAHREN UND VORRICHTUNG ZUR AUSLÖSUNG EINER ZELLENNEUAUSWAHL, SPEICHERMEDIUM UND BENUTZERENDGERÄT

PROCÉDÉ ET DISPOSITIF POUR DÉCLENCHER UNE RESÉLECTION DE CELLULE, SUPPORT DE STOCKAGE ET TERMINAL UTILISATEUR

• **SPREADTRUM COMMUNICATIONS: "Discussion on LBT Failures in Non-Connected State", 3GPP DRAFT; R2-1909103, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG2, no. Prague, Czech Republic; 20190826 - 20190830 15 August 2019 (2019-08-15), XP051766912, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG2_RL 2/TSGR2_107/Docs/R2-1909103.zip [retrieved on 2019-08-15]**
• **SPREADTRUM COMMUNICATIONS: "Consideration of LBT failure in NR-U", 3GPP DRAFT; R2-1900937 CONSIDERATION OF LBT FAILURE IN NR-U, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG2, no. Athens, Greece; 20190225 - 20190301 15 February 2019 (2019-02-15), XP051602307, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg%5Fran/WG2% 5FRL2/TSGR2%5F105/Docs/R2%2D1900937%2E zip [retrieved on 2019-02-15]**

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Description

TECHNICAL FIELD

[0001] The present disclosure generally relates to communication technology field, and more particularly, to a method for triggering cell reselection, a storage medium, and a user equipment.

BACKGROUND

[0002] The 3rd Generation Partnership Project (3GPP) standards organization will study how to deploy Fifth-Generation mobile communications (5G) New Radio (NR) systems on unlicensed spectrums, so as to achieve fair and effective use of unlicensed spectrums and increase a data transmission rate of the NR systems.

[0003] For the use of unlicensed spectrums, different countries have different control methods. For example, it is necessary to use the unlicensed spectrums in the manner of Listen-Before-Talk (LBT).

[0004] In the 5G NR communication systems, User Equipment (UE) state includes Radio Resource Control-Idle (RRC-IDLE) state, RRC-Inactive state and RRC-Connected state. When the UE enters the RRC-Connected state from the RRC-IDLE state, it needs to perform RRC connection setup, and when the UE enters the RRC-Connected state from the RRC-Inactive state, it needs to perform an RRC connection resume procedure. The UE can perform cell reselection in the RRC-IDLE state or the RRC-Inactive state, and reselect a more suitable cell, such as a cell with better signal quality or higher priority.

[0005] However, due to the sharing of unlicensed spectrums, consecutive LBT failures may occur. Specifically, if the number of consecutive LBT failures exceeds a preset threshold, or the number of consecutive LBT failures within a preset time period exceeds another preset threshold, it is called an LBT consecutive failure.

[0006] In existing techniques, when an LBT consecutive failure occurs, the UE may continue to try LBT or continue to try LBT after a period of time, which results in a large delay in sending information and affects communication quality.

[0007] WO 2017/193282 A1 discloses an uplink information transmission method. The uplink information includes uplink information of a first cell, and that the UE sends uplink information to the base station by using the cell group includes: the UE sends the uplink information of the first cell sent by using the first cell; or the UE sends the uplink information of the first cell by using a second cell. The first cell is a cell in the cell group, and the second cell is another cell different from the first cell in the cell group. To be specific, in a same reporting period, the uplink information of the first cell may be reported by using the first cell, or may be reported by using the second cell. For example, in a first reporting period, the uplink information of the first cell is reported by using the first cell, and in a second reporting period, the uplink information of the first cell is reported by using the second cell. In addition, when the second cell is an unlicensed spectrum cell, before the uplink information of the first cell is transmitted by using the second cell, it needs to be determined that the second cell is an available licensed spectrum cell.

SUMMARY

[0008] The invention is set out in the appended set of claims.

[0009] Embodiments of the present disclosure provide a method for triggering cell reselection, a storage medium, and a user equipment, which may enable cell reselection to be triggered timely, reduce a delay in sending information, and effectively improve communication quality.

[0010] In an embodiment of the present disclosure, a method for triggering cell reselection is provided according to claim 1. It includes: based on an RRC connection setup request or an RRC resume request being initiated, determining whether a number of consecutive LBT failures exceeds a preset threshold; and based on the number of consecutive LBT failures exceeding the preset threshold, performing cell reselection.

[0011] Said performing cell reselection includes: determining a set of target cells; sorting the target cells in the set; and selecting the target cells that are ranked first successively to perform cell reselection.

[0012] Optionally, said determining the set of target cells includes: determining cells whose cell selection reception level value and cell selection quality value are both greater than zero as the target cells.

[0013] Optionally, said sorting the target cells in the set includes: determining an R value of each target cell in the set; and sorting the target cells according to the R value, wherein the ranking of the target cell becomes higher as the R value increases.

[0014] Optionally, the R value of the target cell is determined based on following formula,

$$R_n = Q_{meas,n} - Q_{offset} - Q_{offsettemp4} \text{ ,}$$

where R_n represents the R value of the target cell, $Q_{meas,n}$ represents a Reference Signal Receiving Power (RSRP) measurement value of the target cell, Q_{offset} represents an offset value, and $Q_{offsettemp4}$ represents a fourth temporary offset.

[0015] Optionally, the cell selection reception level value and the cell selection quality value of the target cell are determined based on following formula,

$$S_{rxlev} = P - X - Q_{offsettemp1} \text{ ,}$$

$$S_{qual} = Q - Y - Q_{offsettemp2} ,$$

where S_{rxlev} represents the cell selection reception level value, P represents a measured target cell selection reception level value, X represents a cell selection reception level value threshold, $Q_{offsettemp1}$ represents a first temporary offset, S_{qual} represents the cell selection quality value, Q represents a measured cell selection quality value, Y represents a cell selection quality value threshold, and $Q_{offsettemp2}$ represents a second temporary offset.

[0016]   Said determining the set of target cells includes: determining a frequency priority of each available cell; and determining the set of target cells based on the frequency priorities of the available cells.

[0017]   Prior to said determining the frequency priority of each available cell, the method further includes: determining a first available cell based on a frequency where a current serving cell is located; and decreasing the frequency priority of the first available cell located on the frequency by a preset level.

[0018]   Said determining the set of target cells based on the frequency priorities of the available cells includes: based on the frequency priorities from high to low, determining whether signal quality of the available cell exceeds preset quality within a preset time period, until it is determined that one or more second available cells whose signal quality exceeds the preset quality within the time period are located on one frequency priority; and determining the set of the target cells based on the one or more second available cells.

[0019]   Optionally, said sorting the target cells in the set includes: determining an R value of each target cell in the set; and sorting the target cells according to the R value, wherein the ranking of the target cell becomes higher as the R value increases.

[0020]   Optionally, the preset quality is determined based on following formula,

$$Thresh = Thresh_x - Q_{offsettemp5} ,$$

where $Thresh$ represents the preset quality, $Thresh_x$ represents a threshold condition under which the target cell is determined as a candidate cell, and $Q_{offsettemp5}$ represents a fifth temporary offset.

[0021]   In an embodiment of the present disclosure, a storage medium according to claim 9 is provided.

[0022]   In an embodiment of the present disclosure, a user equipment including a memory and a processor according to claim 10 is provided.

[0023]   Embodiments of the present disclosure may provide following advantages.

[0024]   In embodiments of the present disclosure, based on an RRC connection setup request or an RRC resume request being initiated, whether a number of consecutive LBT failures exceeds a preset threshold is de-

termined, and based on the number of consecutive LBT failures exceeding the preset threshold, cell reselection is performed. With the above embodiments, the cell reselection is configured to be performed in response to the number of consecutive LBT failures exceeding the preset threshold. Compared with the existing techniques where when LBT fails consecutively, a UE continues to try LBT or continues to try LBT after a period of time, resulting in large delay in sending information, in the embodiments of the present disclosure, cell reselection may be triggered in time, which helps to reduce delay in sending information and effectively improve communication quality.

[0025]   Further, in the embodiments of the present disclosure, by determining the set of target cells and sorting the target cells in the set, an appropriate cell can be determined for cell reselection, thereby increasing a success rate of cell reselection, and further successfully initiating an RRC connection setup request or an RRC resume request.

[0026]   Further, in the embodiments of the present disclosure, in the case of intra-frequency cells, cells whose cell selection reception level value and cell selection quality value are both greater than zero may be determined as the set of the target cells, which helps to determine signal quality of the target cells so as to further improve accuracy of determining the appropriate cell.

[0027]   In the embodiments of the present disclosure, in the case of inter-frequency or inter-system cells, the frequency priority of each available cell is determined, and the set of target cells is determined based on the frequency priorities of the available cells. Therefore, the target cells with relatively high frequency priority are selected. As high-priority cells tend to have higher communication quality, the accuracy of determining the appropriate cell is further improved.

[0028]   In the embodiments of the present disclosure, in the case of inter-frequency or inter-system cells, based on the number of consecutive LBT failures exceeding a preset threshold, the frequency priority of a first available cell is reduced by a preset level. Therefore, it is not prone to select other available cells on the frequency where the current serving cell is located, which helps to further improve the accuracy of determining the appropriate cell.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

Figure 1 is a flow chart of a method for triggering cell reselection according to an embodiment;

Figure 2 is a flow chart of S 12 as shown in Figure 1 according to an embodiment;

Figure 3 is a flow chart of S21 as shown in Figure 2 according to an embodiment; and

Figure 4 is a structural diagram of a device for triggering cell reselection according to an embodiment.

DETAILED DESCRIPTION

[0030]   In the existing techniques, unlicensed spectrums are used in the LBT manner. The unlicensed spectrums being used by the NR system is also called New RAT Un-license (NR-U) technology.

[0031]   Specifically, using LBT, Clear Channel Assessment (CCA) can be performed before communication between a sender and a receiver. If the assessment result is that the channel is idle, data is sent immediately; otherwise, data cannot be transmitted until the end of a next fixed frame period. The fixed frame is composed of a Channel Occupancy Time (COT) and an idle period, where the COT is from 1 millisecond (ms) to 10 ms, and a minimum idle period is 5% of the COT.

[0032]   A threshold of the number of consecutive LBT failures and a time threshold may be configured on a network side, and may be notified to a terminal through a dedicated message or a public message. The dedicated message may use, for example, Radio Resource Control (RRC) signaling, and the public message may use, for example, System Information Block (SIB).

[0033]   In specific implementations, the problem of LBT consecutive failure may occur. For example, if the network side configures the threshold of the number of consecutive LBT failures to 8, the LBT fails 8 times consecutively can be regarded as the LBT consecutive failure. It could be understood that a time threshold T1 and a number threshold can be set for consecutive LBT failures, for example, 10s and 8 times, then the LBT failing 8 times consecutively within 10s can be regarded as the occurrence of LBT consecutive failure.

[0034]   The inventor has discovered through research that in the existing techniques, although there is a cell reselection function, the UE will not perform cell reselection when an LBT consecutive failure occurs, but will continue to try LBT or continue to try LBT after a certain period of time, which may result in a longer delay in sending information, and affect communication quality.

[0035]   Specifically, in the existing techniques, cell reselection is applied based on the UE initiating RRC connection setup but failing. More specifically, a UE state includes Radio Resource Control-Idle (RRC-IDLE) state, RRC-Inactive state and RRC-Connected state. Based on the UE entering the RRC-Connected state from the RRC-IDLE state, it needs to perform RRC connection setup, and based on the UE entering the RRC-Connected state from the RRC-Inactive state, it needs to perform an RRC connection resume procedure. The UE can perform cell reselection in the RRC-IDLE state or the RRC-Inactive state, and reselect a more suitable cell, such as a cell with better signal quality or higher priority.

[0036]   In embodiments of the present disclosure, based on an RRC connection setup request or an RRC resume request being initiated, whether a number of consecutive LBT failures exceeds a preset threshold is determined, and based on the number of consecutive LBT failures exceeding the preset threshold, cell reselection is performed. With the above embodiments, the cell reselection is configured to be performed in response to the number of consecutive LBT failures exceeding the preset threshold. Compared with the existing techniques where when LBT fails consecutively, a UE continues to try LBT or continues to try LBT after a period of time, resulting in large delay in sending information, in the embodiments of the present disclosure, cell reselection may be triggered in time, which helps to reduce delay in sending information and effectively improve communication quality.

[0037]   In order to clarify the objects, characteristics and advantages of the disclosure, embodiments of present disclosure will be described in detail in conjunction with accompanying drawings.

[0038]   Referring to Figure 1, Figure 1 is a flow chart of a method for triggering cell reselection according to an embodiment. The method may be applied at a UE side, and may include S11 and S12.

[0039]   In S11, based on an RRC connection setup request or an RRC resume request being initiated, whether a number of consecutive LBT failures exceeds a preset threshold is determined.

[0040]   In S12, based on the number of consecutive LBT failures exceeding the preset threshold, cell reselection is performed.

[0041]   In some embodiments, in S11, the UE in the RRC-IDLE state or the RRC-Inactive state initiates an RRC Setup Request in a current serving cell, for example, based on the UE in the RRC-IDLE state initiating a procedure of sending an RRC Setup Request message to a network side, or based on the UE in the RRC-Inactive state initiating a procedure of sending an RRC Resume Request to the network side, based on consecutive LBT failures occurring, a number of consecutive LBT failures is counted to determine whether an LBT consecutive failure event has occurred.

[0042]   In some embodiments, based on the number of consecutive LBT failures exceeding a predetermined threshold, it is determined that an LBT consecutive failure event has occurred. The predetermined threshold may be sent to the UE from the network side, or may be predefined by a protocol.

[0043]   In some embodiments, in S12, based on the number of consecutive LBT failures exceeding the preset threshold, cell reselection is performed.

[0044]   In the above embodiments, the cell reselection is configured to be performed in response to the number of consecutive LBT failures exceeding the preset threshold. Compared with the existing techniques where when LBT fails consecutively, a UE continues to try LBT or continues to try LBT after a period of time, resulting in large delay in sending information, in the embodiments of the present disclosure, cell reselection may be triggered in time, which helps to reduce delay in sending

information and effectively improve communication quality.

[0045] Referring to Figure 2, Figure 2 is a flow chart of S12 as shown in Figure 1 according to an embodiment. The step of performing cell reselection may include S21 to S23 which are described in detail below.

[0046] In S21, the UE determines a set of target cells.

[0047] Specifically, the target cell may be a cell that helps to improve communication quality after reselection, for example, a cell with better signal quality or a cell with higher priority.

[0048] In some embodiments, the target cells may be intra-frequency cells or cells with the same frequency priority.

[0049] In some embodiments, said determining the set of target cells includes: determining cells whose cell selection reception level value and cell selection quality value are both greater than zero as the target cells.

[0050] In some embodiments, the cell selection reception level value and the cell selection quality value of the target cell are determined based on following formula,

$$S_{rxlev} = P - X - Q_{offsettemp1},$$

$$S_{qual} = Q - Y - Q_{offsettemp2},$$

where S_{rxlev} represents the cell selection reception level value, P represents a measured target cell selection reception level value, X represents a cell selection reception level value threshold, $Q_{offsettemp1}$ represents a first temporary offset, S_{qual} represents the cell selection quality value, Q represents a measured cell selection quality value, Y represents a cell selection quality value threshold, and $Q_{offsettemp2}$ represents a second temporary offset.

[0051] $Q_{offsettemp1}$ and $Q_{offsettemp2}$ may be configured by the network side for the UE, so that the cell selection reception level value and the cell selection quality value of each target cell can be flexibly adjusted by setting $Q_{offsettemp1}$ and $Q_{offsettemp2}$, which enables the UE to select a more appropriate target cell during reselection. Further, by setting relatively large $Q_{offsettemp1}$ and $Q_{offsettemp2}$ for the current serving cell, it helps to increase difficulty for the UE to choose to camp on the current serving cell, thereby reducing probability of the UE failing to set up an RRC connection in the current serving cell.

[0052] In the embodiments of the present disclosure, in the case of intra-frequency cells or inter-frequency cells with the same priority, cells whose cell selection reception level value and cell selection quality value are both greater than zero may be determined as the set of the target cells, which helps to determine signal quality of the target cells so as to further improve accuracy of determining the appropriate cell.

[0053] In S22, the UE sorts the target cells in the set.

[0054] In some embodiments, said sorting the target cells in the set includes: determining an R value of each target cell in the set; and sorting the target cells according to the R value, wherein the ranking of the target cell becomes higher as the R value increases.

[0055] In some embodiments, the R value of the target cell is determined based on following formula,

$$R_n = Q_{meas,n} - Q_{offset} - Q_{offsettemp4},$$

where R_n represents the R value of the target cell, $Q_{meas,n}$ represents an RSRP measurement value of the target cell, Q_{offset} represents an offset value, and $Q_{offsettemp4}$ represents a fourth temporary offset.

[0056] $Q_{offsettemp4}$ may be configured by the network side for the UE, so that the R value of each target cell can be flexibly adjusted by setting $Q_{offsettemp4}$, which enables the UE to select a more appropriate target cell during reselection.

[0057] In S23, the UE selects the target cells that are ranked first successively to perform cell reselection.

[0058] In the embodiments of the present disclosure, by determining the set of target cells and sorting the target cells in the set, an appropriate cell can be determined for cell reselection, thereby increasing a success rate of cell reselection, and further successfully initiating an RRC connection setup request or an RRC resume request.

[0059] In some embodiments, the target cells may be inter-frequency cells or inter-system cells, where different frequencies have different priorities.

[0060] Still referring to Figure 2, in S21, the UE determines the set of target cells.

[0061] Said determining the set of target cells includes: determining a frequency priority of each available cell; and determining the set of target cells based on the frequency priorities of the available cells. The available cell is configured to be used for cell reselection.

[0062] Referring to Figure 3, Figure 3 is a flow chart of S21 as shown in Figure 2 according to an embodiment. The step of determining the set of target cells includes S31 to S33 which are described in detail below.

[0063] In S31, a frequency priority of each available cell is determined.

[0064] In some embodiments, as the available cells are inter-frequency cells or inter-system cells, they may have different frequency priorities.

[0065] In S32, based on the frequency priorities from high to low, whether signal quality of the available cell exceeds preset quality within a preset time period is determined, until it is determined that one or more second available cells whose signal quality exceeds the preset quality within the time period are located on one frequency priority.

[0066] As cells with high frequency priority generally have better communication quality, it is likely to determine a cell with high quality as a reselected cell based on the order of the frequency priority from high to low.

[0067] In some embodiments, the preset quality is de-

termined based on following formula,

$$Thresh = Thresh_x - Q_{offsettemp5},$$

where *Thresh* represents the preset quality, $Thresh_x$ represents a threshold condition under which the target cell is determined as a candidate cell, and $Q_{offsettemp5}$ represents a fifth temporary offset.

[0068] In some embodiments, whether a cell can be determined as a candidate cell may be determined based on a variety of parameters, for example, using Reference Signal Receiving Power (RSRP) or Reference Signal Receiving Quality (RSRQ) and other parameters, then $Thresh_x$ is a threshold of RSRP or RSRQ.

[0069] $Q_{offsettemp5}$ may be configured by the network side for the UE, so that the preset quality each target cell needs to satisfy can be flexibly adjusted by setting $Q_{offsettem5}$, which enables the UE to select a more appropriate target cell during reselection.

[0070] In S33, the set of the target cells is determined based on the one or more second available cells.

[0071] In some embodiments, the second available cells may be one or more second available cells with a same frequency priority.

[0072] In the embodiments of the present disclosure, a frequency priority can be determined based on the order of the frequency priority from high to low, where signal quality of at least one cell at this frequency priority exceeds the preset quality within the preset time period, and accordingly the at least one cell meets reselection requirements.

[0073] Still referring to Figure 2, in S22, the UE sorts the target cells in the set.

[0074] In some embodiments, said sorting the target cells in the set includes: determining an R value of each target cell in the set; and sorting the target cells according to the R value, wherein the ranking of the target cell becomes higher as the R value increases.

[0075] In some embodiments, the R value of the target cell is determined based on following formula,

$$R_n = Q_{meas,n} - Q_{offset} - Q_{offsettemp4},$$

where R_n represents the R value of the target cell, $Q_{meas,n}$ represents an RSRP measurement value of the target cell, Q_{offset} represents an offset value, and $Q_{offsettemp4}$ represents a fourth temporary offset.

[0076] $Q_{offsettemp4}$ may be configured by the network side for the UE, so that the R value of each target cell can be flexibly adjusted by setting $Q_{offsettemp4}$, which enables the UE to select a more appropriate target cell during reselection.

[0077] In S23, the UE selects the target cells that are ranked first successively to perform cell reselection.

[0078] In the embodiments of the present disclosure, in the case of inter-frequency or inter-system cells, the frequency priority of each available cell is determined, and the set of target cells is determined based on the frequency priorities of the available cells. Therefore, the target cells with relatively high frequency priority may be selected. As high-priority cells tend to have higher communication quality, the accuracy of determining the appropriate cell may be further improved.

[0079] In the embodiments of the present disclosure, by determining the set of target cells and sorting the target cells in the set, an appropriate cell is determined for cell reselection, thereby increasing a success rate of cell reselection, and further successfully initiating an RRC connection setup request or an RRC resume request.

[0080] In the embodiments of the present disclosure, in the case of inter-frequency or inter-system cells, based on the number of consecutive LBT failures exceeding a preset threshold, the frequency priority of a first available cell is reduced by a preset level.

[0081] In some embodiments, during cell selection and cell reselection, the UE may obtain absolute priorities of different frequencies or Radio Access Technologies (RAT) through system information or RRC signaling, or inherit an absolute priority configured in an original RAT based on the UE being selected to NR from the original RAT.

[0082] Prior to said determining the frequency priority of each available cell, the method further includes: determining a first available cell based on a frequency where a current serving cell is located; and decreasing the frequency priority of the first available cell located on the frequency by a preset level.

[0083] The available cells on frequencies of all unlicensed spectrums serve as the first available cell. Based on the current serving cell having consecutive LBT failures, the available cell located on the same frequency as the current serving cell may also be prone to have consecutive LBT failures, and thus it is not recommended to select this type of cell (i.e., the first available cell) as the reselected cell.

[0084] In the embodiments of the present disclosure, in the case of inter-frequency or inter-system cells, different frequencies have different priorities. Based on the number of consecutive LBT failures exceeding the preset threshold, the frequency priority of the first available cell is reduced by the preset level. Therefore, based on the second available cell being determined according to the order of the frequency priority subsequently, it is not prone to select other available cells on the frequency where the current serving cell is located, which helps to further improve the accuracy of determining the appropriate cell.

[0085] $Q_{offsettemp6}$ may be used to represent the preset level and referred to as a sixth temporary offset.

[0086] In some embodiments, an effective duration T2 may be set for $Q_{offsettemp6}$, so that the first available cell can be downgraded only within a certain time period to avoid impact of long-term downgrade. For T2, timing may start from the occurrence of N consecutive LBT failures,

or from the UE initiating cell selection or cell reselection.

[0087] Based on the number of consecutive LBT failures in multiple cells on a same frequency exceeding a preset threshold, the frequency priority of the first available cell is lowered by a preset level. Specifically, the number of consecutive LBT failures in multiple cells on the same frequency exceeding the preset threshold means that the number M of consecutive LBT failures in multiple cells on the same frequency exceeding the preset threshold, where M is configured by the network side.

[0088] Referring to Figure 4, Figure 4 is a structural diagram of a device for triggering cell reselection according to an embodiment. The device includes: a determining circuitry 41 configured to: based on an RRC connection setup request or an RRC resume request being initiated, determine whether a number of consecutive LBT failures exceeds a preset threshold; and a reselecting circuitry 42 configured to: based on the number of consecutive LBT failures exceeding the preset threshold, perform cell reselection.

[0089] With the above embodiments, the cell reselection is configured to be performed in response to the number of consecutive LBT failures exceeding the preset threshold. Compared with the existing techniques where when LBT fails consecutively, a UE continues to try LBT or continues to try LBT after a period of time, resulting in large delay in sending information, in the embodiments of the present disclosure, cell reselection may be triggered in time, which helps to reduce delay in sending information and effectively improve communication quality.

[0090] In an embodiment of the present disclosure, a storage medium having computer instructions stored therein is provided, wherein when the computer instructions are executed, any one of the above methods is performed. In some embodiments, the storage medium may be a computer readable storage medium, and may include a non-volatile or a non-transitory memory, or include an optical disk, a magnetic disk or a solid state disk.

[0091] In an embodiment of the present disclosure, a UE including a memory and a processor is provided, wherein the memory has computer instructions stored therein, and when the processor executes the computer instructions, any one of the above methods is performed. The UE may include but not limited to terminal devices such as mobile phones, computers or tablets.

[0092] It could be understood that the embodiments of the present disclosure are applicable to 5G NR communication systems, 4G and 3G communication systems, and various new communication systems in the future, such as 6G and 7G. The embodiments of the present disclosure are also applicable to different network architectures, including but not limited to relay network architecture, dual link architecture, Vehicle-to-Everything and V2X.

[0093] The network side in the embodiments of the present disclosure may include a core network equipment, where the core network may be an Evolved Packet Core (EPC), 5G Core Network or a new core network in future communication systems. The 5G Core Network is composed of a set of devices, implements Access and Mobility Management Function (AMF) providing functions such as mobility management function, User Plane Function (UPF) providing functions such as packet routing and forwarding and Quality of Service (QoS) management, and Session Management Function (SMF) providing functions such as session management and IP address allocation and management. EPC can be composed of MME that provides functions such as mobility management and gateway selection, Serving Gateway (S-GW) that provides functions such as data packet forwarding, and PDN Gateway (P-GW) that provides functions such as terminal address allocation and rate control.

[0094] The network side in the embodiments of the present disclosure may be a Base Station (BS) of a radio access network. The base station may also be referred to as a base station equipment, and is a device deployed in a wireless access network to provide wireless communication functions. For example, an equipment that provides a base station function in a 2G network includes a Base Transceiver Station (BTS) and a Base Station Controller (BSC). An equipment that provides the base station function in a 3G network includes a Node B and a Radio Network Controller (RNC). An equipment that provides the base station function in a 4G network includes an evolved node B (eNB). In a Wireless Local Area Network (WLAN), an equipment that provides the base station function is an Access Point (AP). An equipment that provides the base station function in a 5G New Radio (NR) includes gNB and a continuously evolved Node B (ng-eNB), where gNB and the terminal use NR technology for communication, ng-eNB and the terminal use Evolved Universal Terrestrial Radio Access (E-UTRA) technology for communication, and both gNB and ng-eNB can be connected to a 5G core network. And the base station also refers to an equipment that provides the base station function in a new communication system in the future.

[0095] The network side in the embodiments of the present disclosure may include a base station controller of a radio access network, which is a device for managing base stations, such as a base station controller (BSC) in a 2G network, a radio network controller (RNC) in a 3G network, or a device that controls and manages base stations in a new communication system in the future.

[0096] A terminal in the embodiments of the present disclosure may refer to various forms of User Equipment (UE), access terminal, user unit, user station, Mobile Station (MS), remote station, remote terminal, mobile equipment, user terminal, terminal equipment, wireless communication equipment, user agent or user device. The terminal equipment may further be a cellular phone, a cordless phone, a Session Initiation Protocol (SIP) phone, a Wireless Local Loop (WLL) station, a Personal Digital Assistant (PDA), a handheld device with a wireless communication function, a computing device or oth-

er processing devices connected to a wireless modems, an in-vehicle device, a wearable device, a terminal equipment in the future 5G network, or a terminal equipment in a future evolved Public Land Mobile Network (PLMN), which is not limited in the embodiments of the present disclosure.

[0097] It should be understood that the term "and/or" in the present disclosure is merely an association relationship describing associated objects, indicating that there can be three types of relationships, for example, A and/or B can represent "A exists only, both A and B exist, B exists only. In addition, the character "/" in the present disclosure represents that the former and latter associated objects have an "or" relationship.

[0098] The "plurality" in the embodiments of the present disclosure refers to two or more.

[0099] The descriptions of the first, second, etc. in the embodiments of the present disclosure are merely for illustrating and differentiating the objects, and do not represent the order or the particular limitation of the number of devices in the embodiments of the present disclosure, which do not constitute any limitation to the embodiments of the present disclosure.

[0100] The "connection" in the embodiments of the present disclosure refers to various connection ways such as direct connection or indirect connection to realize communication between devices, which is not limited in the embodiments of the present disclosure.

[0101] In the embodiments of the present disclosure, the processor may be a Central Processing Unit (CPU), or other general processors, Digital Signal Processors (DSPs), Application Specific Integrated Circuits (ASICs), Field Programmable Gate Arrays (FPGAs) or other Programmable logic devices, discrete gates or transistor logic devices, discrete hardware components, and the like. A general processor may be a microprocessor or the processor may be any conventional processor or the like.

[0102] It should also be understood that the memory in the embodiments of the present disclosure may be either volatile memory or nonvolatile memory, or may include both volatile and nonvolatile memories. The nonvolatile memory may be a Read-Only Memory (ROM), a Programmable ROM (PROM), an Erasable PROM (EPROM), an electrically Erasable EPROM (EEPROM), or a flash memory. The volatile memory may be a Random Access Memory (RAM) which functions as an external cache. By way of example but not limitation, various forms of RAM are available, such as Static Random Access Memory (SRAM), Dynamic Random Access Memory (DRAM), Synchronous Dynamic Random Access Memory (SDRAM), Double Data Rate Synchronous Dynamic Random Access Memory (DDR SDRAM), Enhanced SDRAM (ESDRAM), Synchronous connection to DRAM (SLDRAM), and Direct Rambus RAM (DR-RAM).

[0103] The above embodiments may be implemented in whole or in part by software, hardware, firmware or any combination thereof. When implemented in software,

the above embodiments may be implemented in whole or in part in the form of a computer program product. The computer program product includes one or more computer instructions or computer programs. The procedures or functions according to the embodiments of the present disclosure are wholly or partially generated when the computer instructions or the computer programs are loaded or executed on a computer. The computer may be a general purpose computer, a special purpose computer, a computer network, or other programmable device. The computer instructions may be stored in a computer readable storage medium or transmitted from one computer readable storage medium to another computer readable storage medium, for example, the computer instructions may be transmitted from one website, computer, server or data center to another website, computer, server or data center by wire (e.g., infrared, wireless, microwave and etc.). The computer readable storage medium may be any available medium that can be accessed by a computer or a data storage device such as a server or a data center that contains one or more sets of available media. The available medium may be a magnetic medium (e.g., floppy disk, hard disk or magnetic tape), an optical medium (e.g., DVD), or a semiconductor medium. The semiconductor medium may be a solid disk.

[0104] It should be understood that, in the various embodiments of the present disclosure, sequence numbers of the above-mentioned processes do not represent an execution sequence, and the execution sequence of each process should be determined by its function and inherent logic, which does not limit an implementation process of the embodiments of the present disclosure.

[0105] In the above embodiments of the present disclosure, it should be understood that the disclosed method, device and system may be implemented in other ways. For example, the above device embodiments are merely illustrative, and for example, division of units is merely one logical division, and other divisions may be realized in practice, for example, a plurality of units or components may be combined or integrated into another system, or some features may be omitted, or not executed. Further, the shown or discussed mutual coupling or direct coupling or communication connection may be an indirect coupling or communication connection via some interfaces, devices or units, and may be in an electrical, mechanical or other form.

[0106] The units described as separate parts may or may not be physically separate, and parts shown as units may or may not be physical units, that is, may be disposed in one place, or may be distributed on a plurality of network units. Some or all of the units can be selected according to practical requirements to achieve the purpose of the solutions of the embodiments.

[0107] In addition, functional units in the embodiments of the present disclosure may be integrated in one processing unit, or each unit may be physically separate, or two or more units may be integrated in one unit. The integrated units can be realized in a form of hardware,

or in a form of hardware plus a software functional unit.

[0108] The integrated units implemented in the form of the software functional unit may be stored in a computer readable storage medium. The software functional unit is stored in a storage medium and includes several instructions for causing a computer device (a personal computer, a server or a network device) to execute some steps of the methods in the embodiments of the present disclosure. And the storage medium may be a medium for storing program codes, such as a U disk, a removable hard disk, a ROM, a RAM, a magnetic disk or an optical disk.

[0109] Although the present disclosure has been disclosed above with reference to preferred embodiments thereof, it should be understood that the disclosure is presented by way of example only, and not limitation. Those skilled in the art can modify and vary the embodiments without departing from the scope of the present disclosure.

Claims

1. A method performed by a user equipment for triggering cell reselection, the method comprising:

   based on a Radio Resource Control, RRC, connection setup request or an RRC resume request being initiated, determining (S11) whether a number of consecutive Listen-Before-Talk, LBT, failures exceeds a preset threshold; and based on the number of consecutive LBT failures exceeding the preset threshold, performing (S12) cell reselection,
   wherein said performing cell reselection comprises determining (S21) a set of target cells, sorting (S22) the target cells in the set, and selecting (S23) the target cells that are ranked first successively to perform cell reselection;
   wherein said determining (S21) the set of target cells comprises:

   determining (S31) a frequency priority of each available cell;
   determining the set of target cells based on the frequency priorities of the available cells,

   wherein prior to said determining (S31) the frequency priority of each available cell, the method further comprises:

   determining a first available cell based on a frequency where a current serving cell is located; and
   decreasing the frequency priority of the first available cell located on the frequency by a preset level.

2. The method according to claim 1, **characterized in that** said determining the set of target cells comprises:
   determining cells whose cell selection reception level value and cell selection quality value are both greater than zero as the target cells.

3. The method according to claim 2, **characterized in that** said sorting the target cells in the set comprises:

   determining an R value of each target cell in the set; and
   sorting the target cells according to the R value, wherein the ranking of the target cell becomes higher as the R value increases.

4. The method according to claim 3, **characterized in that** the R value of the target cell is determined based on following formula,

$$R_n = Q_{meas,n} - Q_{offset} - Q_{offsettemp4},$$

   where R_n represents the R value of the target cell, $Q_{meas,n}$ represents a Reference Signal Receiving Power, RSRP, measurement value of the target cell, Q_{offset} represents an offset value, and $Q_{offsettemp4}$ represents a fourth temporary offset.

5. The method according to claim 2, **characterized in that** the cell selection reception level value and the cell selection quality value of the target cell are determined based on following formula,

$$S_{rxlev} = P - X - Q_{offsettemp1},$$

$$S_{qual} = Q - Y - Q_{offsettemp2},$$

   where S_{rxlev} represents the cell selection reception level value, P represents a measured target cell selection reception level value, X represents a cell selection reception level value threshold, $Q_{offsettemp1}$ represents a first temporary offset, S_{qual} represents the cell selection quality value, Q represents a measured cell selection quality value, Y represents a cell selection quality value threshold, and $Q_{offsettemp2}$ represents a second temporary offset.

6. The method according to claim 1, **characterized in that** said determining the set of target cells based on the frequency priorities of the available cells comprises:

   based on the frequency priorities from high to low, determining (S32) whether signal quality of the available cell exceeds preset quality within

a preset time period, until it is determined that one or more second available cells whose signal quality exceeds the preset quality within the time period are located on one frequency priority; and determining (S33) the set of the target cells based on the one or more second available cells.

7. The method according to claim 6, **characterized in that** said sorting the target cells in the set comprises:

   determining an R value of each target cell in the set; and
   sorting the target cells according to the R value, wherein the ranking of the target cell becomes higher as the R value increases.

8. The method according to claim 6, **characterized in that** the preset quality is determined based on following formula,

$$Thresh = Thresh_x - Q_{offsettemp5},$$

   where *Thresh* represents the preset quality, $Thresh_x$ represents a threshold condition under which the target cell is determined as a candidate cell, and $Q_{offsettemp5}$ represents a fifth temporary offset.

9. A storage medium having computer instructions stored therein which, when executed by a processor of a user equipment, causes the user equipment to perform the method of any one of claims 1 to 8.

10. A user equipment comprising a memory and a processor, wherein the memory has computer instructions stored therein which, when executed by a processor of the user equipment, causes the user equipment to perform the method of any one of claims 1 to 8.

Patentansprüche

1. Von einem Benutzergerät durchgeführtes Verfahren zum Auslösen einer Zellenneuauswahl, das Verfahren umfassend:

   basierend auf einer Initiierung einer Radio-Resource-Control-, RRC-, Verbindungsaufbauanforderung oder einer RRC-Wiederaufnahmeanforderung, Bestimmen (S11), ob eine Anzahl aufeinanderfolgender Listen-Before-Talk-, LBT-, Fehler einen voreingestellten Schwellenwert überschreitet; und
   basierend auf der Anzahl aufeinanderfolgender LBT-Fehler, die den voreingestellten Schwellenwert überschreiten, ein Durchführen (S12) der Zellenneuauswahl,

   wobei das besagte Durchführen der Zellenneuauswahl ein Bestimmen (S21) eines Satzes von Zielzellen, ein Sortieren (S22) der Zielzellen in dem Satz und ein Auswählen (S23) der Zielzellen, die nacheinander als erste eingestuft werden, um die Zellenneuauswahl durchzuführen, umfasst;
   wobei das besagte Bestimmen (S21) des Satzes von Zielzellen umfasst:

   ein Bestimmen (S31) einer Frequenzpriorität jeder verfügbaren Zelle;
   ein Bestimmen des Satzes von Zielzellen basierend auf den Frequenzprioritäten der verfügbaren Zellen,

   wobei das Verfahren vor dem besagten Bestimmen (S31) der Frequenzpriorität jeder verfügbaren Zelle weiter umfasst:

   ein Bestimmen einer ersten verfügbaren Zelle basierend auf einer Frequenz, wo sich eine aktuell bedienende Zelle befindet; und
   ein Verringern der Frequenzpriorität der ersten verfügbaren Zelle, die sich auf der Frequenz befindet, um einen voreingestellten Pegel.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das besagte Bestimmen des Satzes von Zielzellen umfasst:
   Bestimmen von Zellen, deren Zellenauswahl-Empfangspegelwert und Zellenauswahl-Qualitätswert beide größer als Null sind, als die Zielzellen.

3. Verfahren nach Anspruch 2, **dadurch gekennzeichnet, dass** das besagte Sortieren der Zielzellen im Satz umfasst:

   ein Bestimmen eines R-Werts von jeder Zielzelle im Satz; und
   ein Sortieren der Zielzellen nach dem R-Wert, wobei die Einstufung der Zielzelle mit zunehmendem R-Wert höher wird.

4. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass** der R-Wert der Zielzelle basierend auf der folgenden Formel bestimmt wird:

$$R_n Q_{meas,n} - Q_{offset} - Q_{offsettemp4},$$

   wobei R_n den R-Wert der Zielzelle darstellt, $Q_{meas,n}$ einen Reference-Signal-Receiving-Power-, RSRP-, Messwert der Zielzelle darstellt, Q_{offset} einen Offsetwert darstellt und $Q_{offsettemp4}$ einen vierten temporären Offset darstellt.

5. Verfahren nach Anspruch 2, **dadurch gekennzeichnet, dass** der Zellenauswahl-Empfangspegelwert und der Zellenauswahl-Qualitätswert der Zielzelle basierend auf der folgenden Formel bestimmt werden:

$$S_{rxlev} = P - X - Q_{offsettemp1,}$$

$$S_{qual} = Q - Y - Q_{offsettemp2,}$$

wobei S_{rxlev} den Zellenauswahl-Empfangspegelwert darstellt, P einen gemessenen Zielzellenauswahl-Empfangspegelwert darstellt, X einen Zellenauswahl-Empfangspegelschwellenwert darstellt, $Q_{offsettemp1}$, einen ersten temporären Offset darstellt, S_{qual} den Zellenauswahl-Qualitätswert darstellt, Q einen gemessenen Zellauswahl-Qualitätswert darstellt, Y einen Zellenauswahl-Qualitätsschwellenwert darstellt und $Q_{offsettemp2}$, einen zweiten temporären Offset darstellt.

6. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das besagte Bestimmen des Satzes von Zielzellen basierend auf den Frequenzprioritäten der verfügbaren Zellen umfasst:

ein Bestimmen (S32), basierend auf den Frequenzprioritäten von hoch nach niedrig, ob eine Signalqualität der verfügbaren Zelle eine voreingestellte Qualität innerhalb eines voreingestellten Zeitraums überschreitet, bis bestimmt wird, dass sich auf einer Frequenzpriorität eine oder mehrere zweite verfügbare Zellen befinden, deren Signalqualität die voreingestellte Qualität innerhalb des Zeitraums übersteigt; und
ein Bestimmen (S33) des Satzes der Zielzellen basierend auf der einen oder mehreren zweiten verfügbaren Zellen.

7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** das besagte Sortieren der Zielzellen im Satz umfasst:

das Bestimmen eines R-Werts von jeder Zielzelle im Satz; und
das Sortieren der Zielzellen nach dem R-Wert, wobei die Einstufung der Zielzelle mit zunehmendem R-Wert höher wird.

8. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** die voreingestellte Qualität basierend auf der folgenden Formel bestimmt wird:

$$Thresh = Thresh_x - Q_{offsettemp5,}$$

wobei *Thresh* die voreingestellte Qualität darstellt, $Thresh_x$ eine Schwellenwertbedingung darstellt, unter der die Zielzelle als Kandidatenzelle bestimmt wird, und $Q_{offsettemp5}$ einen fünften temporären Offset darstellt.

9. Speichermedium, in dem Computeranweisungen gespeichert sind, die, wenn sie von einem Prozessor eines Benutzergeräts ausgeführt werden, das Benutzergerät veranlassen, das Verfahren nach einem der Ansprüche 1 bis 8 durchzuführen.

10. Benutzergerät, umfassend einen Speicher und einen Prozessor, wobei in dem Speicher Computeranweisungen gespeichert sind, die, wenn sie von einem Prozessor des Benutzergeräts ausgeführt werden, das Benutzergerät veranlassen, das Verfahren nach einem der Ansprüche 1 bis 8 durchzuführen.

Revendications

1. Procédé réalisé par un équipement utilisateur pour déclencher une resélection de cellules, le procédé comprenant :

sur la base d'une demande d'établissement de connexion de commande de ressources radio, RRC, ou d'une demande de reprise RRC étant lancée, une détermination (S11) permettant de savoir si un nombre de défaillances consécutives de Listen-Before-Talk (écouter avant de parler), LBT, dépasse ou non un seuil prédéfini ; et
sur la base du nombre de défaillances consécutives de LBT dépassant le seuil prédéfini, une réalisation (S12) d'une resélection de cellules, dans lequel ladite réalisation de la resélection de cellules comprend une détermination (S21) d'un ensemble de cellules cibles, un tri (S22) des cellules cibles dans l'ensemble et une sélection (S23) successive des cellules cibles qui sont classées en premier pour réaliser la resélection de cellules ;
dans lequel ladite détermination (S21) de l'ensemble de cellules cibles comprend :

une détermination (S31) d'une priorité de fréquence de chaque cellule disponible ;
une détermination de l'ensemble de cellules cibles sur la base des priorités de fréquence des cellules disponibles,

dans lequel avant ladite détermination (S31) de la priorité de fréquence de chaque cellule disponible, le procédé comprend en outre :

une détermination d'une première cellule disponible sur la base d'une fréquence à laquelle se situe une cellule de desserte actuelle ; et

une diminution de la priorité de fréquence de la première cellule disponible située sur la fréquence d'un niveau prédéfini.

2. Procédé selon la revendication 1, **caractérisé en ce que** ladite détermination de l'ensemble de cellules cibles comprend :
une détermination de cellules dont la valeur de niveau de réception de sélection de cellules et la valeur de qualité de sélection de cellules sont toutes deux supérieures à zéro en tant que cellules cibles.

3. Procédé selon la revendication 2, **caractérisé en ce que** ledit tri des cellules cibles dans l'ensemble comprend :

une détermination d'une valeur R de chaque cellule cible dans l'ensemble ; et
un tri des cellules cibles selon la valeur R,
dans lequel le classement de la cellule cible augmente à mesure que la valeur R augmente.

4. Procédé selon la revendication 3, **caractérisé en ce que** la valeur R de la cellule cible est déterminée sur la base de la formule suivante,

$$R_n = Q_{meas,n} - Q_{offset} - Q_{offsettemp4},$$

où R_n représente la valeur R de la cellule cible, $Q_{meas,n}$ représente une valeur de mesure de puissance de réception de signal de référence, RSRP, de la cellule cible, Q_{offset} représente une valeur de décalage et $Q_{offsettemp4}$ représente un quatrième décalage temporaire.

5. Procédé selon la revendication 2, **caractérisé en ce que** la valeur de niveau de réception de sélection de cellules et la valeur de qualité de sélection de cellules de la cellule cible sont déterminées sur la base de la formule suivante,

$$S_{rxlev} = P - X - Q_{offsettemp1},$$

$$S_{qual} = Q - Y - Q_{offsettemp2},$$

où S_{rxlev} représente la valeur de niveau de réception de sélection de cellules, P représente une valeur de niveau de réception de sélection de cellules cibles mesurée, X représente un seuil de valeur de niveau de réception de sélection de cellules, $Q_{offsettemp1}$, représente un premier décalage temporaire, S_{qual}

représente la valeur de qualité de sélection de cellules, Q représente une valeur de qualité de sélection de cellules mesurée, Y représente un seuil de valeur de qualité de sélection de cellules, et $Q_{offsettemp2}$, représente un deuxième décalage temporaire.

6. Procédé selon la revendication 1, **caractérisé en ce que** ladite détermination de l'ensemble de cellules cibles sur la base des priorités de fréquence des cellules disponibles comprend :

sur la base des priorités de fréquence allant de haut en bas, une détermination (S32) permettant de savoir si la qualité de signal de la cellule disponible dépasse ou non la qualité prédéfinie dans une période de temps prédéfinie, jusqu'à ce qu'il soit déterminé qu'une ou plusieurs secondes cellules disponibles dont la qualité de signal dépasse la qualité prédéfinie dans la période de temps sont situées sur une priorité de fréquence ; et
une détermination (S33) de l'ensemble des cellules cibles sur la base des une ou plusieurs secondes cellules disponibles.

7. Procédé selon la revendication 6, **caractérisé en ce que** ledit tri des cellules cibles dans l'ensemble comprend :

la détermination d'une valeur R de chaque cellule cible dans l'ensemble ; et
le tri des cellules cibles selon la valeur R,
dans lequel le classement de la cellule cible augmente à mesure que la valeur R augmente.

8. Procédé selon la revendication 6, **caractérisé en ce que** la qualité prédéfinie est déterminée sur la base de la formule suivante,

$$Thresh = Thresh_x - Q_{offsettemp5},$$

où $Thresh$ représente la qualité prédéfinie, $Thresh_x$ représente une condition seuil sous laquelle la cellule cible est déterminée comme cellule candidate, et $Q_{offsettemp5}$ représente un cinquième décalage temporaire.

9. Support de stockage présentant des instructions informatiques stockées dans celui-ci, lorsqu'elles sont exécutées par un processeur d'un équipement utilisateur, amènent l'équipement utilisateur à effectuer le procédé selon l'une quelconque des revendications 1 à 8.

10. Équipement utilisateur comprenant une mémoire et un processeur, dans lequel la mémoire présente des instructions informatiques stockées dans celle-ci

qui, lorsqu'elles sont exécutées par un processeur de l'équipement utilisateur, amènent l'équipement utilisateur à réaliser le procédé selon l'une quelconque des revendications 1 à 8.

5

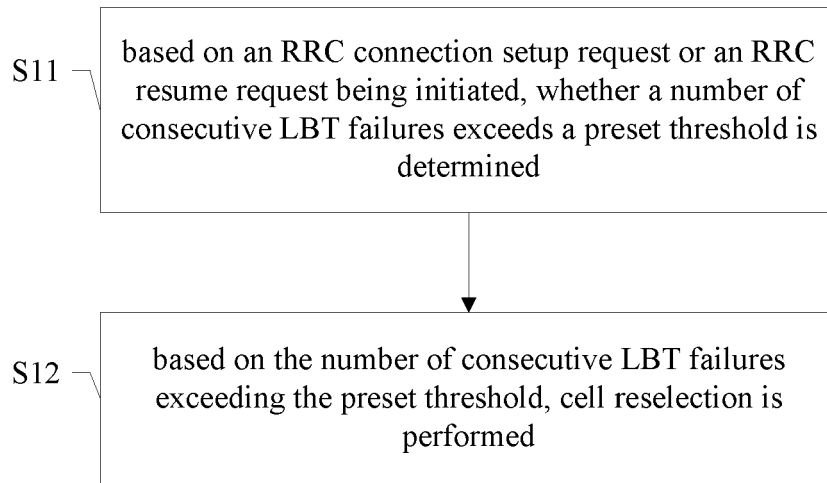10

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S11 — based on an RRC connection setup request or an RRC resume request being initiated, whether a number of consecutive LBT failures exceeds a preset threshold is determined

S12 — based on the number of consecutive LBT failures exceeding the preset threshold, cell reselection is performed

Figure 1

S21 — the UE determines a set of target cells

S22 — the UE sorts the target cells in the set

S23 — the UE selects the target cells that are ranked first successively to perform cell reselection

Figure 2

S31 ⌐| a frequency priority of each available cell is determined

S32 ⌐| based on the frequency priorities from high to low, whether signal quality of the available cell exceeds preset quality within a preset time period is determined, until it is determined that one or more second available cells whose signal quality exceeds the preset quality within the time period are located on one frequency priority

S33 ⌐| the set of the target cells is determined based on the one or more second available cells

Figure 3
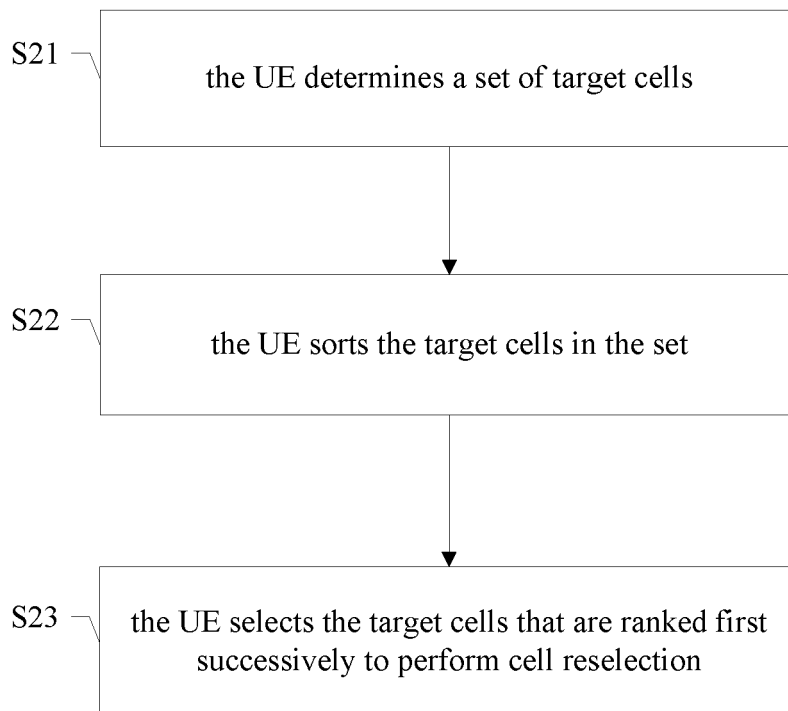
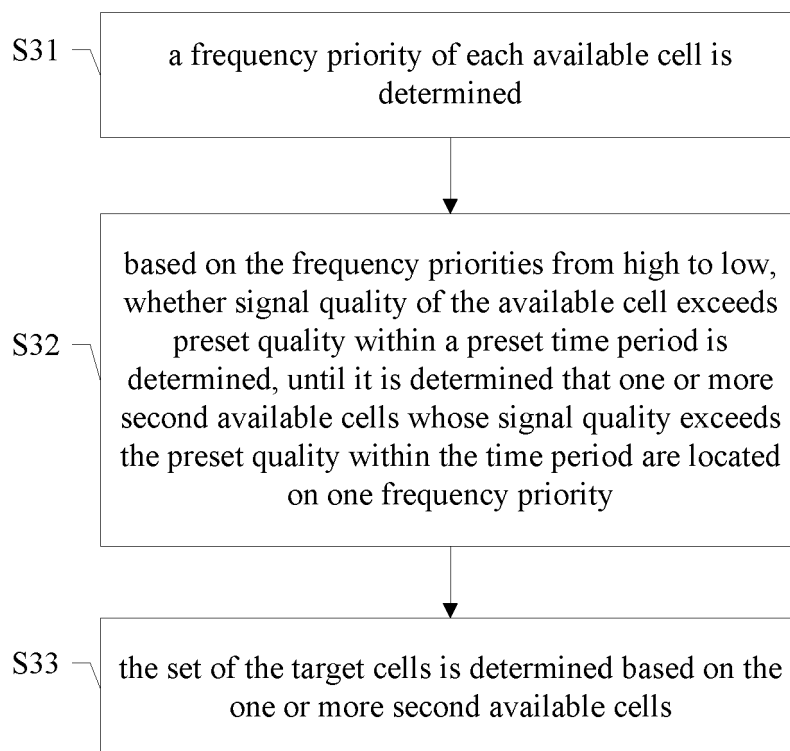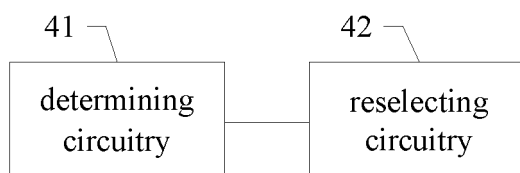41 ⌐| determining circuitry

42 ⌐| reselecting circuitry

Figure 4

REFERENCES CITED IN THE DESCRIPTION

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