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(71) Applicant: **LENOVO (BEIJING) LIMITED** [CN/CN]; 6 Shangdi West Road, Haidian District, Beijing 100085 (CN).

(72) Inventors: **YU, Xiaodong**; Room 452, Building 6, Qinghuayuan, Haidian District, Beijing 100084 (CN). **SUN, Zhennian**; Xiu Ju Yuan 21-2208, Bei Yuan Jia Yuan, Chaoyang District, Beijing 100012 (CN). **LEI, Haipeng**; Room 702, Building 9, Honglianbeicun, Haidian District, Beijing 100082 (CN). **GUO, Xin**; Room 503, Unit 2, Build-

ing 1, Mei Li Fang, Shuang Ying Road 11, Chaoyang District, Beijing (CN).

(74) Agent: **LEE AND LI - LEAVEN IPR AGENCY LTD.**;

Unit 2202, Tower A, Beijing Marriott Center, No. 7, Jian Guo Men South Avenue, Dongcheng District, Beijing 100005 (CN).

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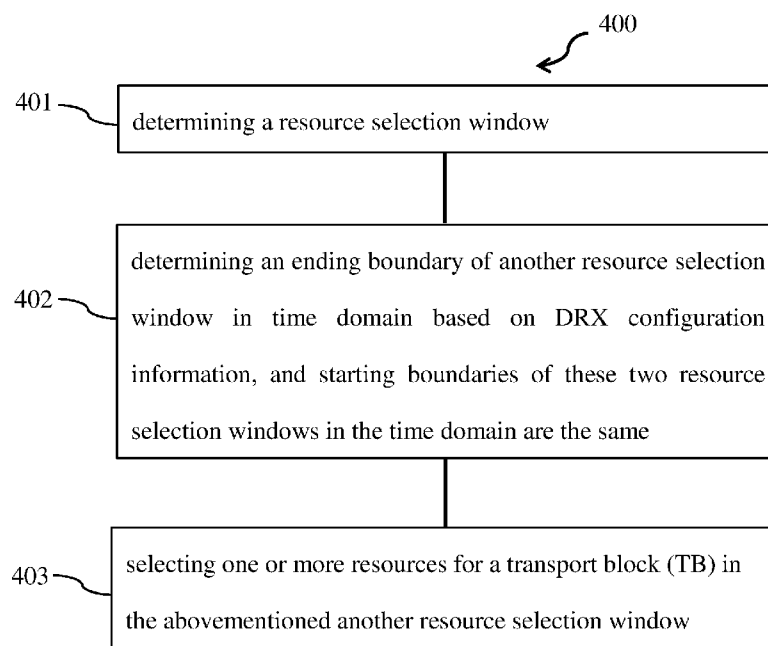


FIG. 4

(57) Abstract: Embodiments of the present disclosure relate to methods and apparatuses for a sidelink transmission in a discontinuous reception (DRX) mechanism. According to an embodiment of the present disclosure, a method includes: determining a resource selection window; determining an ending boundary of another resource selection window in time domain based on DRX configuration information, wherein a starting boundary of the resource selection window in the time domain is a starting boundary of the abovementioned another resource selection window in the time domain; and selecting one or more resources for a transport block (TB) in the abovementioned another resource selection window.

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METHODS AND APPARATUSES FOR A SIDELINK TRANSMISSION IN A DRX MECHANISM

TECHNICAL FIELD

[0001] Embodiments of the present application are related to wireless communication technology, and more particularly, related to methods and apparatuses for a sidelink transmission in a discontinuous reception (DRX) mechanism.

BACKGROUND

[0002] Vehicle to everything (V2X) has been introduced into 5G wireless communication technology. In terms of a channel structure of V2X communication, the direct link between two user equipments (UEs) is called a sidelink. A sidelink is a long-term evolution (LTE) feature introduced in 3GPP (3rd Generation Partnership Project) Release 12, and enables a direct communication between proximal UEs, and data does not need to go through a base station (BS) or a core network.

[0003] 3GPP 5G and/or new radio (NR) networks are expected to increase network throughput, coverage, and robustness and reduce latency and power consumption. With the development of 5G and NR networks, various aspects need to be studied and developed to perfect the 5G and/or NR technology.

SUMMARY

[0004] Some embodiments of the present application provide a method, which may be performed by a user equipment (UE), e.g., a sidelink transmission UE. The method includes: determining a resource selection window; determining an ending boundary of another resource selection window in time domain based on DRX

configuration information, wherein a starting boundary of the resource selection window in the time domain is a starting boundary of the limited resource selection window in the time domain; and selecting one or more resources for a transport block (TB) in the limited resource selection window.

[0005] Some embodiments of the present application provide an apparatus. The apparatus includes: a non-transitory computer-readable medium having stored thereon computer-executable instructions, a receiving circuitry; a transmitting circuitry; and a processor coupled to the non-transitory computer-readable medium, the receiving circuitry and the transmitting circuitry, wherein the computer-executable instructions cause the processor to implement the abovementioned method performed by a transmission UE.

[0006] Some embodiments of the present application provide a method which may be performed by a UE, e.g., a sidelink reception UE. The method includes: receiving a transmission of a TB during an on-duration of a DRX cycle; receiving resource reservation information during the on-duration of the DRX cycle, wherein the resource reservation information indicates a reserved resource in an off-duration of the DRX cycle; and determining whether to receive one or more transmissions on the reserved resource in the off-duration of the DRX cycle based on a decoding result of the transmission.

[0007] Some embodiments of the present application provide an apparatus. The apparatus includes: a non-transitory computer-readable medium having stored thereon computer-executable instructions, a receiving circuitry; a transmitting circuitry; and a processor coupled to the non-transitory computer-readable medium, the receiving circuitry and the transmitting circuitry, wherein the computer-executable instructions cause the processor to implement the abovementioned method performed by a reception UE.

[0008] The details of one or more examples are set forth in the accompanying

drawings and the description below. Other features, objects, and advantages will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In order to describe the manner in which advantages and features of the present application can be obtained, a description of the present application is rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. These drawings depict only exemplary embodiments of the present application and are not therefore intended to limit the scope of the present application.

[0010] FIG. 1 illustrates an exemplary V2X communication system in accordance with some embodiments of the present application.

[0011] FIG. 2 illustrates an exemplary timing diagram of DRX cycles according to some embodiments of the present application.

[0012] FIG. 3A illustrates an exemplary diagram of a resource reservation mechanism for a subsequent TB according to some embodiments of the present application.

[0013] FIG. 3B illustrates an exemplary diagram of a sensing window and a resource selection window according to some embodiments of the present application.

[0014] FIG. 4 illustrates a flow chart of a method for determining a resource selection window according to some embodiments of the present application.

[0015] FIG. 5 illustrates an exemplary diagram of a limited resource selection window according to some embodiments of the present application.

[0016] FIG. 6 illustrates a further exemplary diagram of a limited resource selection

window according to some embodiments of the present application.

[0017] FIG. 7 illustrates another exemplary diagram of a limited resource selection window according to some embodiments of the present application.

[0018] FIG. 8 illustrates a further flow chart of a method for receiving a transmission of a TB in a sidelink communication system according to some embodiments of the present application.

[0019] FIG. 9 illustrates an additional exemplary diagram of a limited resource selection window according to some embodiments of the present application.

[0020] FIG. 10 illustrates an exemplary block diagram of an apparatus according to some embodiments of the present application.

DETAILED DESCRIPTION

[0021] The detailed description of the appended drawings is intended as a description of preferred embodiments of the present application and is not intended to represent the only form in which the present application may be practiced. It should be understood that the same or equivalent functions may be accomplished by different embodiments that are intended to be encompassed within the spirit and scope of the present application.

[0022] Reference will now be made in detail to some embodiments of the present application, examples of which are illustrated in the accompanying drawings. To facilitate understanding, embodiments are provided under specific network architecture and new service scenarios, such as 3GPP 5G, 3GPP LTE Release 8, B5G, 6G, and so on. It is contemplated that along with developments of network architectures and new service scenarios, all embodiments in the present application are also applicable to similar technical problems; and moreover, the terminologies

recited in the present application may change, which should not affect the principle of the present application.

[0023] FIG. 1 illustrates an exemplary V2X communication system in accordance with some embodiments of the present application.

[0024] As shown in FIG. 1, a wireless communication system 100 includes at least one user equipment (UE) 101 and at least one base station (BS) 102. In particular, the wireless communication system 100 includes two UEs 101 (e.g., UE 101a and UE 101b) and one BS 102 for illustrative purpose. Although a specific number of UEs 101 and BS 102 are depicted in FIG. 1, it is contemplated that any number of UEs 101 and BSs 102 may be included in the wireless communication system 100.

[0025] The UE(s) 101 may include computing devices, such as desktop computers, laptop computers, personal digital assistants (PDAs), tablet computers, smart televisions (e.g., televisions connected to the Internet), set-top boxes, game consoles, security systems (including security cameras), vehicle on-board computers, network devices (e.g., routers, switches, and modems), or the like. According to some embodiments of the present application, the UE(s) 101 may include a portable wireless communication device, a smart phone, a cellular telephone, a flip phone, a device having a subscriber identity module, a personal computer, a selective call receiver, or any other device that is capable of sending and receiving communication signals on a wireless network.

[0026] In some embodiments of the present application, a UE is a pedestrian UE (P-UE or PUE) or a cyclist UE. In some embodiments of the present application, the UE(s) 101 includes wearable devices, such as smart watches, fitness bands, optical head-mounted displays, or the like. Moreover, the UE(s) 101 may be referred to as a subscriber unit, a mobile, a mobile station, a user, a terminal, a mobile terminal, a wireless terminal, a fixed terminal, a subscriber station, a user terminal, or a device, or described using other terminology used in the art. The UE(s) 101 may communicate

directly with BSs 102 via LTE or NR Uu interface.

[0027] In some embodiments of the present application, each of the UE(s) 101 may be deployed an IoT application, an eMBB application and/or a URLLC application. For instance, UE 101a may implement an IoT application and may be named as an IoT UE, while UE 101b may implement an eMBB application and/or a URLLC application and may be named as an eMBB UE, an URLLC UE, or an eMBB/URLLC UE. It is contemplated that the specific type of application(s) deployed in the UE(s) 101 may be varied and not limited.

[0028] In a V2X communication system, a transmission UE may also be named as a transmitting UE, a Tx UE, a sidelink Tx UE, a sidelink transmission UE, or the like. A reception UE may also be named as a receiving UE, a Rx UE, a sidelink Rx UE, a sidelink reception UE, or the like.

[0029] According to some embodiments of FIG. 1, UE 101a functions as a Tx UE, and UE 101b functions as a Rx UE. UE 101a may exchange V2X messages with UE 101b through a sidelink, for example, PC5 interface as defined in 3GPP TS 23.303. UE 101a may transmit information or data to other UE(s) within the V2X communication system, through sidelink unicast, sidelink groupcast, or sidelink broadcast. For instance, UE 101a transmits data to UE 101b in a sidelink unicast session. UE 101a may transmit data to UE 101b and other UEs in a groupcast group (not shown in FIG. 1) by a sidelink groupcast transmission session. Also, UE 101a may transmit data to UE 101b and other UEs (not shown in FIG. 1) by a sidelink broadcast transmission session.

[0030] Alternatively, according to some other embodiments of FIG. 1, UE 101b functions as a Tx UE and transmits V2X messages, UE 101a functions as a Rx UE and receives the V2X messages from UE 101b.

[0031] Both UE 101a and UE 101b in the embodiments of FIG. 1 may transmit

information to BS(s) 102 and receive control information from BS(s) 102, for example, via LTE or NR Uu interface. The BS(s) 102 may be distributed over a geographic region. In certain embodiments of the present application, each of the BS(s) 102 may also be referred to as an access point, an access terminal, a base, a base unit, a macro cell, a Node-B, an evolved Node B (eNB), a gNB, a Home Node-B, a relay node, or a device, or described using other terminology used in the art. The BS(s) 102 is generally a part of a radio access network that may include one or more controllers communicably coupled to one or more corresponding BS(s) 102.

[0032] The wireless communication system 100 may be compatible with any type of network that is capable of sending and receiving wireless communication signals. For example, the wireless communication system 100 is compatible with a wireless communication network, a cellular telephone network, a Time Division Multiple Access (TDMA)-based network, a Code Division Multiple Access (CDMA)-based network, an Orthogonal Frequency Division Multiple Access (OFDMA)-based network, an LTE network, a 3GPP-based network, a 3GPP 5G network, a satellite communications network, a high altitude platform network, and/or other communications networks.

[0033] In some embodiments of the present application, the wireless communication system 100 is compatible with the 5G NR of the 3GPP protocol, wherein the BS(s) 102 transmit data using an OFDM modulation scheme on the downlink (DL) and the UE(s) 101 transmit data on the uplink (UL) using a Discrete Fourier Transform-Spread-Orthogonal Frequency Division Multiplexing (DFT-S-OFDM) or cyclic prefix-OFDM (CP-OFDM) scheme. More generally, however, the wireless communication system 100 may implement some other open or proprietary communication protocols, for example, WiMAX, among other protocols.

[0034] In some embodiments of the present application, the BS(s) 102 may communicate using other communication protocols, such as the IEEE 802.11 family of wireless communication protocols. Further, in some embodiments of the present

application, the BS(s) 102 may communicate over licensed spectrums, whereas in other embodiments, the BS(s) 102 may communicate over unlicensed spectrums. The present application is not intended to be limited to the implementation of any particular wireless communication system architecture or protocol. In yet some embodiments of present application, the BS(s) 102 may communicate with the UE(s) 101 using the 3GPP 5G protocols.

[0035] The UE(s) 101 may access the BS(s) 102 to receive data packets from the BS(s) 102 via a downlink channel and/or transmit data packets to the BS(s) 102 via an uplink channel. In normal operation, since the UE(s) 101 does not know when the BS(s) 102 will transmit data packets to it, the UE(s) 101 has to be awake all the time to monitor the downlink channel (e.g., a Physical Downlink Control Channel (PDCCH)) to get ready for receiving data packets from the BS(s) 102. However, if the UE(s) 101 keeps monitoring the downlink channel all the time even when there is no traffic between the BS(s) 102 and the UE(s) 101, it would result in significant power waste, which is problematic to a power limited or power sensitive UE.

[0036] Discontinuous reception (DRX) can be used to resolve the above issue. DRX is a mechanism in which a UE gets into a sleep mode for a certain period of time (which is referred to as "OFF time," "OFF period," "OFF duration," "off-duration" or "DRX-off duration" interchangeably herein), wakes up for another period of time (which is referred to as "ON time," "ON period," "ON duration", "on-duration" or "DRX-on duration" interchangeably herein), and periodically repeats this cycle. When the UE gets into the sleep mode, the UE is in an OFF state. When the UE wakes up, the UE is in an ON state. To synchronize the UE-wakeup timing with the transmission timing of the BS for the UE, the BS may configure DRX parameters for the UE and signal the DRX parameters to the UE using a Radio Resource Control (RRC) message.

[0037] DRX parameters may indicate to the UE when and how long it should be awake to monitor a downlink channel. The following Table 1 shows some

exemplary DRX parameters and their respective meanings.

Table 1

DRX Parameter	Description
DRX Cycle	The duration of one 'ON time' + one 'OFF time'. (This value is not explicitly specified in RRC messages. This is calculated by the subframe time and longdrx-CycleStartOffset.)
onDurationTimer	The duration of 'ON time' within one DRX cycle.
drx-InactivityTimer	Specifying how long the UE should remain 'ON' after the reception of a PDCCH. When this timer is on, UE remains in 'ON state' which may extend UE ON period into the period which is 'OFF period' otherwise.
drx-Retransmission Timer	Specifying the maximum number of consecutive PDCCH subframes the UE should remain active to wait for an incoming retransmission after the first available retransmission time.
shortDrxCycle	DRX cycle which can be implemented within the 'OFF period' of a long DRX cycle.
drxShortCycleTimer	The consecutive number of subframes the UE shall follow the short DRX cycle after the DRX Inactivity Timer has expired.

[0038] FIG. 2 illustrates an exemplary timing diagram of DRX cycles according to some embodiments of the present application.

[0039] Specifically, FIG. 2 illustrates a scenario where only long DRX cycle type is configured for a UE (two exemplary long DRX cycles are shown, i.e., 1st DRX cycle

and 2nd DRX cycle), and no PDCCH is received during the DRX cycles.

[0040] As shown in FIG. 2, 1st DRX cycle is from T1 to T3, and 2nd DRX cycle is from T3 to T5. 1st ON duration in the 1st DRX cycle is from T1 to T2, in which the UE remains in the ON state to monitor and receive PDCCH if any; and the OFF duration in the 1st DRX cycle is from T2 to T3, in which the UE remains in the OFF state to save power. Similarly, 2nd ON duration in the 2nd DRX cycle is from T3 to T4, and the OFF duration in the 2nd DRX cycle is from T4 to T5. 3rd ON duration is of the same time length.

[0041] The cases of DRX cycles in FIG. 2 are provided only for illustration purposes. Those skilled in the art will understand that there can be an infinite number of different combinations of these embodiments.

[0042] As discussed above, in the legacy DRX mechanism, the DRX parameters are configured by a BS for the UE. Accordingly, the BS well knows the reception state of the UE and can transmit data to the UE via a downlink channel during the ON duration of the UE. When the DRX mechanism is applied to sidelink communication between a Tx UE and a Rx UE, the BS may configure DRX parameters for each UE.

[0043] Currently, a DRX mechanism is supported in downlink and will be introduced into 5G NR sidelink. A resource reservation mechanism for a different TB is supported in 3GPP Release 16 of a NR V2X communication system. Sidelink DRX may be used for broadcast, groupcast, and unicast scenarios.

[0044] When sidelink DRX configuration is introduced or designed to 5G NR sidelink, a sidelink UE will perform a blind detection for sidelink control information (SCI) which is during a DRX-on duration, and the UE will not perform a blind detection for sidelink SCI which is out of the DRX-on duration (e.g., a DRX-off duration). In this way, if the UE does not successfully receive the sidelink

transmission (e.g., SCI and its associated data) during the DRX-on duration, the UE will miss a potential re-transmission that is out of the DRX-on duration, if any. However, performing a blind detection out of the DRX-on duration for the re-transmission will increase power consumption of a Rx UE. Thus, there is a need to consider an enhanced mechanism for a power sensitive UE who is configured with sidelink DRX configuration information. For example, a mechanism is needed so that a Rx UE, which is power sensitive and configured with a DRX mechanism, can perform sidelink reception with reduced power.

[0045] Embodiments of the present application provide mechanisms of sidelink resource reservation and power saving for a sidelink communication system, and will be specifically described below. Some embodiments may be combined with a DRX mechanism to implement solutions of sidelink resource reservation and power saving.

[0046] FIG. 3A illustrates an exemplary diagram of a resource reservation mechanism for a subsequent TB according to some embodiments of the present application.

[0047] As shown in FIG. 3A, two windows are marked as "W1" and W2, respectively, and each window includes three transmissions. Specifically, the window W1 includes an initial transmission of TB1 and two reserved re-transmissions for the same TB (i.e., TB1). The initial transmission of TB1 includes SCI, and the SCI indicates a resource reserved for each of the two reserved re-transmissions in window W1. The window W2 includes three reserved transmissions for another TB, i.e., TB2 as shown in FIG. 3A, which is a subsequent TB of TB1. As shown in FIG. 3A, the SCI in the initial transmission of TB1 in window W1 also indicates resources reserved for the three reserved transmissions for TB2 in window W2.

[0048] Currently, under a 3GPP 5G system or the like, there are the following agreements. On a per resource pool basis, when enabling a sidelink resource reservation for an initial transmission of a TB (e.g., TB2 as shown in FIG. 3A) at least

by an SCI associated with a different TB (e.g., TB1 as shown in FIG. 3A):

- (1) A period is additionally signaled in the SCI (for example, a period shown in FIG. 3A). The same reservation is applied with respect to resources indicated within a window W at subsequent periods.
- (2) A set of possible period values of the period is: { 0, [1:99], 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 } ms.
 - A field in the SCI (e.g., ≤ 4 bits) may be used to indicate the value of the period.
 - An actual set of values of the period may be pre-configured or configured.
- (3) Regarding the number of period(s)
 - The number of remaining periodic reservations is not explicitly indicated in the SCI.

[0049] Referring back to FIG. 3A, the SCI in the initial transmission of TB1 in window W1 also indicates a period between two windows W1 and W2. As can be seen from FIG. 3A, the period is from a starting point of the initial transmission in window W1 to a starting point of the first reserved transmission in window W2. As described above, a value of the period in the embodiments of FIG. 3A may be selected from the group: { 0, [1:99], 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 } ms.

[0050] FIG. 3B illustrates an exemplary diagram of a sensing window and a resource selection window according to some embodiments of the present application.

[0051] The embodiments of FIG. 3B show a sensing procedure described for a Tx UE side according to working agreements of a 3GPP meeting [98b-NR-16]. In particular, a sensing window is started at time instance "n - T0" and ended at time

instance " $n - T_{\text{proc},0}$ ". That is to say, a sensing window is defined by time interval $[n - T_0, n - T_{\text{proc},0}]$. Triggering time " n " is between the sensing window and a resource selection window. The resource selection window is started at time instance " $n + T_1$ " and ended at time instance " $n + T_2$ ". The resource selection window may include resource(s) selected or re-selected based on the triggering time " n ". That is to say, for a given time instance " n ", when a resource (re-)selection and re-evaluation procedure is triggered, the resource selection window starts at time instance " $n + T_1$ ", wherein $T_1 \geq 0$, and ends at time instance " $n + T_2$ ".

[0052] According to the working agreements of the 3GPP meeting [98b-NR-16]:

- the value of T_0 is (pre-)configured, $T_0 > T_{\text{proc},0}$, and T_0 is (pre-)configured between: $[1000+100]$ ms and $[100]$ ms;
- the starting time instance of the resource selection window is up to a UE's implementation, and $T_1 \leq T_{\text{proc},1}$; and
- the value of T_2 depends upon a UE's implementation and T_2 shall fulfil a latency requirement: $T_2 \leq$ the remaining packet delay budget (PDB). A UE is expected to select resource(s) for all intended (re-)transmissions within the PDB, i.e., the number of intended (re-)transmissions is an input to the resource (re-)selection procedure.

[0053] In some embodiments of the present application, a Tx UE may predict or forecast the generation time of its periodic traffic. In that way, the Tx UE may configure a DRX-on duration to a Rx UE based on the generation time of its periodic traffic. That is to say, the triggering time of the packet should be before or during the DRX-on duration of the Rx UE. Thus, the embodiments of the present application assume that an ending time instance of the DRX-on duration is always later than the time instance of " $n - T_{\text{proc},0}$ " in time domain.

[0054] FIG. 4 illustrates a flow chart of a method for determining a resource

selection window according to some embodiments of the present application. The embodiments of FIG. 4 may be performed by a UE or a Tx UE (e.g., UE 101a or UE 101b illustrated and shown in FIG. 1). Although described with respect to a UE, it should be understood that other devices may be configured to perform a method similar to that of FIG. 4.

[0055] In the exemplary method 400 as shown in FIG. 4, in operation 401, a UE determines a resource selection window (e.g., the resource selection window in time interval $[n + T1, n + T2]$ illustrated and shown in FIG. 3B). In operation 402, the UE determines an ending boundary of another resource selection window in time domain based on DRX configuration information. For instance, the abovementioned another resource selection window may be named as "a limited resource selection window" (e.g., the resource selection window in time interval $[n + T1, n + T2]$ illustrated and shown in FIG. 5). A starting boundary in time domain of the resource selection window determined in operation 401 may be the same as a starting boundary in the time domain of the limited resource selection window determined in operation 402.

[0056] According to some embodiments, the DRX configuration information in operation 402 may explicitly or implicitly indicate an ending boundary of an on-duration of a DRX cycle in time domain. For example, "explicitly indicate" means that the DRX configuration information includes "a field" to indicate an absolute time in time domain of an ending boundary of an on-duration of a DRX cycle. "Implicitly indicate" means that the DRX configuration information does not include a specific field to indicate the absolute time in time domain of an ending boundary of an on-duration. However, based on other configuration information in the DRX configuration information, the UE can calculate the absolute time in time domain of an ending boundary of an on-duration of a DRX cycle. In particular, there may be the following options in these embodiments:

[0057] Option 1: The DRX configuration information includes a field to indicate

the absolute time in time domain of a starting boundary of an on-duration of a DRX cycle, and the length of the on-duration, then, the UE can calculate the ending boundary based on the starting boundary and the length.

[0058] Option 2: The DRX configuration information includes a field to indicate the absolute time in time domain of a starting boundary of a DRX cycle, a time offset (e.g., *drxStartOffset*) between the starting boundary of the DRX cycle and a starting boundary of an on-duration of the DRX cycle, and the length of the on-duration.

[0059] Option 3: The UE can calculate the absolute time in time domain of a starting boundary of a DRX cycle based on a pre-defined formula, e.g., a formula defined in 3GPP TS36.321 for downlink described as below. The DRX configuration information includes a field to indicate: time offset (e.g., *drxStartOffset*) between the starting boundary of the DRX cycle and a starting boundary of on-duration of the DRX cycle, and the length of the on-duration.

[0060] The formula, which is defined in TS 36.321 for downlink, is used to calculate an absolute time in time domain of a starting boundary of a DRX cycle.

- If the short DRX cycle is used, the formula is $[(\text{SFN} * 10) + \text{subframe number}] \bmod (\text{shortDRX-Cycle}) = (\text{drxStartOffset}) \bmod (\text{shortDRX-Cycle})$, wherein SFN is a system frame number; or
- if the long DRX cycle is used, the formula is $[(\text{SFN} * 10) + \text{subframe number}] \bmod (\text{longDRX-Cycle}) = \text{drxStartOffset}$.

[0061] According to some embodiments, the UE determines the ending boundary (e.g., $n + T2'$ as illustrated and shown in FIG. 3B) of the limited resource selection window, which is determined in operation 402, based on at least one of the remaining PDB of the TB and an ending boundary (e.g., $n + T2$ as illustrated and shown in FIG. 3B) of the resource selection window, which is determined in operation 401, in the time domain.

[0062] In an embodiment, the UE determines the ending boundary of the limited resource selection window by the following steps: the UE determines an earlier time between "the ending boundary of the on-duration of the DRX cycle" and "the ending boundary of the resource selection window determined in operation 401"; and the UE selects the determined earlier time as the ending boundary of the limited resource selection window determined in operation 402. For example, in the embodiments of FIG. 3B, the value of T2' is determined by a formula: $\min \{\text{Ending boundary of the corresponding DRX-on duration, T2}\}$.

[0063] In a further embodiment, the UE determines the ending boundary of the limited resource selection window by the following steps: the UE determines an earlier time between "the ending boundary of the on-duration of the DRX cycle" and "the remaining PDB of the TB"; and the UE selects the determined earlier time as the ending boundary of the limited resource selection window. For example, in the embodiments of FIG. 3B, the value of T2' is determined by a formula: $\min \{\text{Ending boundary of the corresponding DRX-on duration, Remaining PDB}\}$.

[0064] Referring back to FIG. 4, in operation 403, the UE selects one or more resources for a TB in the limited resource selection window. For instance, the UE selects at least one transmission resource for one or more transmissions of the TB in the limited resource selection window. During a resource selection procedure, at least one sidelink resource for a transmission of a TB should be selected within the DRX-on duration of the UE.

[0065] According to some embodiments, the UE determines an additional resource selection window. For instance, this additional resource selection window may be named as "a residual selection window." Starting and ending boundaries of the residual resource selection window may be determined by the following examples.

[0066] In an example, a starting boundary of the residual resource selection window in time domain is the same as the ending boundary (e.g., $n + T2'$ as illustrated and

shown in FIG. 5) of the limited resource selection window, which is determined in operation 402. An ending boundary of the residual resource selection window in the time domain is the same as the ending boundary (e.g., $n + T_2$ as illustrated and shown in FIG. 5) of the resource selection window, which is determined in operation 401.

[0067] In a further example, the residual resource selection window is the same as the resource selection window determined in operation 401, and their boundaries are overlapped. That is to say, a starting boundary of the residual resource selection window in time domain is the same as the starting boundary of the resource selection window determined in operation 401. An ending boundary of the residual resource selection window in the time domain is the same as the ending boundary of the resource selection window determined in operation 401. In other words, in this further example, the residual resource selection window and the resource selection window cover the same range in time domain, and the residual resource selection window includes the limited resource selection window.

[0068] In an embodiment, the UE may select one or more resources for one or more re-transmissions of the TB in the residual resource selection window. For instance, the UE may transmit resource reservation information on the one or more resources selected in the limited resource selection window determined in operation 402. The UE may transmit SCI including resource reservation information. The resource reservation information is indication information and is used to indicate the one or more resources for the one or more re-transmissions of the TB which are selected in the residual resource selection window.

[0069] Details described in the embodiments as illustrated and shown in FIGS. 1-3 and 5-10, especially, contents related to specific operations for saving power of a UE in a sidelink communication system, are applicable for the embodiments as illustrated and shown in FIG. 4. Moreover, details described in the embodiments of FIG. 4 are applicable for all the embodiments of FIGS. 1-3 and 5-10.

[0070] FIG. 5 illustrates an exemplary diagram of a limited resource selection window according to some embodiments of the present application. FIG. 5 shows configurations of a sensing window and a resource selection window in a Tx UE side similar to those in the embodiments of FIG. 3B, and also shows DRX cycles configurations in a Rx UE side similar to those in the embodiments of FIG. 2.

[0071] The embodiments of FIG. 5 assume that the time instance of an ending boundary of the corresponding DRX-on duration (i.e., 1st ON duration of the 1st DRX cycle as shown in FIG. 5) is less than the remaining PDB or the time instance of the ending boundary of the corresponding DRX-on duration is less than the value of T2. Based on such assumption, an ending boundary of a limited resource selection window, i.e., time instance " $n + T2'$ " as shown in FIG. 5, is earlier than an ending boundary of a resource selection window, i.e., time instance " $n + T2$ " which is out of the 1st ON duration. A starting boundary of the limited resource selection window is the same as that of the resource selection window, i.e., time instance " $n + T1$ " as shown in FIG. 5, wherein the value of T1 is greater than or equal to 0.

[0072] Specifically, according to the embodiments of FIG. 5, a Tx UE selects at least one transmission resource for one or more transmissions of a TB in the limited resource selection window, which starts at time instance " $n + T1$ " and ends at time instance " $n + T2'$ ". After selecting at least one transmission resource in the limited resource selection window, the Tx UE may transmit resource reservation information to indicate resource reservation result(s) in a residual selection window. As described above for FIG. 4, the residual selection window may be defined to cover different ranges in time domain according to different embodiments. For one example, a residual selection window starts at time instance " $n + T2'$ " and ends at time instance " $n + T2$ ". For a further example, the residual selection window starts at time instance " $n + T1$ " and ends at time instance " $n + T2$ ".

[0073] FIG. 6 illustrates a further exemplary diagram of a limited resource selection window according to some embodiments of the present application. FIG. 6 shows

similar configurations in a Tx UE side and in a Rx UE side to those in the embodiments of FIGS. 2, 3B, and 5.

[0074] The embodiments of FIG. 6 assume that the time instance of an ending boundary of the corresponding DRX-on duration (i.e., 1st ON duration of the 1st DRX cycle) is greater than a remaining PDB or the time instance of the ending boundary of the corresponding DRX-on duration is greater than the value of T2. Based on such assumption, a limited resource selection window and a resource selection window cover the same range in time domain.

[0075] In particular, as shown in FIG. 6, a starting boundary of a limited resource selection window is the same as a starting boundary of a resource selection window, i.e., time instance " $n + T1$ ", wherein the value of T1 is greater than or equal to 0. An ending boundary of the limited resource selection window is the same as an ending boundary of the resource selection window, i.e., time instance " $n + T2$ " which is within the 1st ON duration. That is to say, the time instance " $n + T2'$ " is the same as time instance " $n + T2$ " in the embodiments of FIG. 6.

[0076] According to the embodiments of FIG. 6, a Tx UE selects at least one transmission resource for one or more transmissions of a TB in the limited resource selection window, which starts at time instance " $n + T1$ " and ends at time instance " $n + T2$ ".

[0077] With reference to the embodiments of FIG. 4, for one example, there is no residual selection window in the embodiments of FIG. 6; and for another example, a residual selection window in the embodiments of FIG. 6 starts at time instance " $n + T1$ " and ends at time instance " $n + T2$ ". After selecting at least one transmission resource in the limited resource selection window, the Tx UE may transmit resource reservation information to indicate resource reservation result(s) in the residual selection window in time interval $[n + T1, n + T2]$.

[0078] FIG. 7 illustrates another exemplary diagram of a limited resource selection window according to some embodiments of the present application. FIG. 7 shows similar configurations in a Tx UE side and in a Rx UE side to those in the embodiments of FIGS. 2, 3B, and 5.

[0079] Similar to FIG. 5, the embodiments of FIG. 7 assume that the time instance of an ending boundary of the corresponding DRX-on duration (i.e., 1st ON duration of the 1st DRX cycle) is less than a remaining PDB or the time instance of the ending boundary of the corresponding DRX-on duration is less than the value of T2. An ending boundary of a limited resource selection window as shown in FIG. 7, i.e., time instance " $n + T2'$ ", is earlier than an ending boundary of a resource selection window, i.e., time instance " $n + T2$ " which is out of the 1st ON duration. A starting boundary of the limited resource selection window is the same as that of the resource selection window, i.e., time instance " $n + T1$ " as shown in FIG. 7, wherein the value of T1 is greater than or equal to 0. Similar to FIG. 5, in one example, a residual selection window in FIG. 7 is in time interval $[n + T2', n + T2]$; and in another example, a residual selection window in FIG. 7 is in time interval $[n + T1, n + T2]$.

[0080] Specifically, similar to the embodiments of FIG. 3A, in some embodiments of FIG. 7, the limited resource selection window includes an initial transmission of a TB, and the residual selection window in time interval $[n + T2', n + T2]$ includes two reserved re-transmissions for the same TB. For example, the initial transmission of the TB includes SCI, and the SCI includes resource reservation information to indicate a resource reserved for each of these two reserved re-transmissions in the residual selection window in time interval $[n + T2', n + T2]$.

[0081] In some other embodiments of FIG. 7, the limited resource selection window includes an initial transmission of a TB, and the residual selection window in time interval $[n + T1, n + T2]$ includes the initial transmission of the TB and two reserved re-transmissions for the same TB. For example, the initial transmission of the TB includes SCI, and the SCI includes resource reservation information to indicate a

resource reserved for each of these two reserved re-transmissions in the residual selection window in time interval $[n + T1, n + T2]$.

[0082] FIG. 8 illustrates a further flow chart of a method for receiving a transmission of a TB in a sidelink communication system according to some embodiments of the present application.

[0083] The embodiments of FIG. 8 may be performed by a UE or a Rx UE (e.g., UE 101a or UE 101b illustrated and shown in FIG. 1). Although described with respect to a UE, it should be understood that other devices may be configured to perform a method similar to that of FIG. 8.

[0084] As shown in FIG. 8, in operation 801, a UE receives a transmission of a TB during an on-duration of a DRX cycle. In operation 802, the UE receives, during the on-duration of the DRX cycle, resource reservation information indicating a reserved resource in an off-duration of the DRX cycle. In operation 803, the UE determines whether to receive one or more transmissions on the reserved resource in the off-duration of the DRX cycle based on a decoding result of the transmission received in operation 801. The one or more transmissions may include at least one of "a re-transmission of the transmission of the TB" and "an initial transmission of another TB". The resource reservation information may be included in SCI.

[0085] According to some embodiments, if the UE successfully decodes the transmission received in operation 801 and/or the UE transmits a positive acknowledgement (ACK) corresponding to the transmission, the UE determines not to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle.

[0086] According to some other embodiments, if the UE does not successfully decode the transmission received in operation 801 and/or the UE transmits a negative acknowledgement (NACK) corresponding to the transmission, the UE determines to

receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle. For example, the UE only monitors the reserved resource in the off-duration of the DRX cycle to receive the one or more transmissions.

[0087] More specifically, when a sidelink transmission (e.g., control transmission and/or data transmission) is transmitted within a DRX-on duration of a Rx UE, and the sidelink transmission indicates one or more reserved resource(s) for one or more subsequent sidelink transmission(s) (e.g., control transmission and/or data transmission) out of the DRX-on duration (e.g., a DRX-off duration) of the Rx UE, if the Rx UE successfully decodes the current transmission of a TB (within the DRX-on duration) and/or feedbacks ACK corresponding to the current transmission, the Rx UE may not expect to receive any sidelink transmissions (of the same TB or a different TB) on the reserved resource(s) out of the DRX-on duration. For example, in a sidelink groupcast scenario, the Rx UE, who successfully receives an initial transmission or a re-transmission, can skip receiving the re-transmission of the same TB. If the Rx UE incorrectly decodes the transmission of a TB (within the DRX-on duration) and/or feedbacks NACK corresponding to the transmission, the Rx UE should keep "reception-on" state and receives the one or more subsequent sidelink transmission(s) (e.g., control transmission and/or data transmission) on the reserved resource out of the DRX-on duration. Furthermore, the Rx UE only monitors the reserved resource for a potential transmission out of the DRX-on duration. That is to say, the Rx UE does not perform a blind detection out of the DRX-on duration.

[0088] According to some embodiments, a priority-based detection rule is defined for the Rx UE. For example, the Rx UE determines whether to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle is further based on a comparing result between a priority of the transmission received in operation 801 and a pre-defined priority threshold. In one example, the UE receives SCI which indicates the priority of the transmission. The pre-defined priority threshold may be determined based on at least one of: a UE's capability, a UE's

battery power, and a UE's implementation.

[0089] In one embodiment, if the UE does not successfully decode the transmission received in operation 801 and/or the UE transmits an NACK corresponding to the transmission, the UE determines the comparing result between the priority of the transmission and the pre-defined priority threshold. According different comparing results, the UE may adopt different operations as below.

[0090] In an example, if the priority of the transmission is higher than or equal to the pre-defined priority threshold, the UE receives the one or more transmissions on the reserved resource in the off-duration of the DRX cycle. In a further example, if the priority of the transmission is higher than or equal to the pre-defined priority threshold, the UE receives the one or more transmissions in an extended on-duration of the DRX cycle. The extended on-duration of the DRX cycle may be defined by a timer. For example, the timer is configured or pre-configured.

[0091] Otherwise, in an example, if the priority of the transmission is lower than the pre-defined priority threshold, the UE determines not to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle. In a further example, if the priority of the transmission is lower than the pre-defined priority threshold, the UE determines not to receive the one or more transmissions on all resources in the off-duration of the DRX cycle.

[0092] More specifically, if there is a reserved resource (e.g., which is indicated by SCI transmitted in a DRX-on duration) out of the DRX-ON duration and a Rx UE incorrectly decodes the transmission within the DRX-on duration and/or if the Rx UE feedbacks NACK corresponding to the transmission, the Rx UE further determines whether a priority of the transmission (e.g., based on the priority indication in SCI) is higher than or equal to a pre-defined priority threshold. If the priority of the transmission is higher than or equal to the pre-defined priority threshold:

- **Case 1:** the Rx UE should keep the reception-on state and receive one or more subsequent sidelink transmission(s) on the reserved resource out of the DRX-on duration; or
- **Case 2:** the Rx UE should keep the reception-on state for a defined timer "T", and receive one or more subsequent sidelink transmission(s) on resource(s) out of the DRX-on duration until the time instance "m + T", wherein "m" is an ending boundary of the DRX-on duration in time domain. A specific example is described in FIG. 9.

[0093] Otherwise, if the priority of the transmission is lower than the pre-defined priority threshold:

- **Case A:** the Rx UE should not receive the sidelink transmissions on the reserved resource out of the DRX-on duration; or
- **Case B:** the Rx UE should not receive the sidelink transmissions on any resource out of the DRX-on duration.

[0094] According to some additional embodiments, the UE determines not to receive subsequent re-transmission(s) of the TB in a DRX-off duration and transmits an indicator corresponding to the transmission in a DRX-on duration. For instance, the UE transmits the indicator "ACK", to indicate the determination of not to receive subsequent re-transmission(s) of the TB in the DRX-off duration.

[0095] Details described in the embodiments as illustrated and shown in FIGS. 1-7, 9, and 10, especially, contents related to specific operations for saving power of a UE in a sidelink communication system, are applicable for the embodiments as illustrated and shown in FIG. 8. Moreover, details described in the embodiments of FIG. 8 are applicable for all the embodiments of FIGS. 1-7, 9, and 10.

[0096] FIG. 9 illustrates an additional exemplary diagram of a limited resource

selection window according to some embodiments of the present application. FIG. 9 shows similar configurations in a Tx UE side and in a Rx UE side to those in the embodiments of FIGS. 2, 3B, and 5-7.

[0097] Similar to the embodiments of FIGS. 5 and 7, in the Tx UE side, a limited resource selection window in the embodiments of FIG. 9 is in time interval $[n + T1, n + T2']$; and a residual selection window in the embodiments of FIG. 9 may be in time interval $[n + T2', n + T2]$ or time interval $[n + T1, n + T2]$ according to different embodiments. Similar to the embodiments of FIGS. 3A and 7, in the embodiments of FIG. 9, the limited resource selection window includes an initial transmission of a TB.

[0098] For one example, the residual selection window in time interval $[n + T2', n + T2]$ includes two reserved re-transmissions for the same TB. SCI in the initial transmission of the TB may include resource reservation information to indicate resource(s) reserved for these two reserved re-transmissions in the residual selection window.

[0099] For another example, the residual selection window in time interval $[n + T1, n + T2]$ includes the initial transmission of the TB and two reserved re-transmissions for the same TB. SCI in the initial transmission of the TB may include resource reservation information to indicate resource(s) reserved for these two reserved re-transmissions in the residual selection window.

[00100] The embodiments of FIG. 9 further show a timer "T", which defines that a Rx UE receives one or more subsequent sidelink transmission(s) on resource(s) out of the DRX-on duration during the timer "T", i.e., from time instance "m" to the time instance "m + T" as shown in FIG. 9. The time instance "m" is an ending boundary of a DRX-on duration in time domain from the Rx UE side. In other words, the resource(s) out of the DRX-on duration indicate resource(s) in a DRX-off duration.

[00101] In particular, according to the embodiments of FIG. 9, when there is a reserved resource, which is indicated by SCI transmitted in a DRX-on duration, in the DRX-off duration, if the Rx UE incorrectly decodes the transmission within the DRX-on duration and/or if the Rx UE feedbacks NACK corresponding to the transmission, the Rx UE can determine whether to receive a subsequent transmission during the timer "T", based on the Rx UE's category, remaining battery power of the Rx UE, and/or depend on the Rx UE's implementation. The subsequent transmission may be received on a reserved resource in the DRX-off duration.

[00102] FIG. 10 illustrates an exemplary block diagram of an apparatus according to some embodiments of the present application. In some embodiments of the present application, the apparatus 1000 may be a UE (e.g., a Tx UE), which can at least perform the method illustrated in FIG. 4. In some embodiments of the present application, the apparatus 1000 may be a UE (e.g., a Rx UE), which can at least perform the method illustrated in FIG. 8.

[00103] As shown in FIG. 10, the apparatus 1000 may include at least one receiver 1002, at least one transmitter 1004, at least one non-transitory computer-readable medium 1006, and at least one processor 1008 coupled to the at least one receiver 1002, the at least one transmitter 1004, and the at least one non-transitory computer-readable medium 1006.

[00104] Although in FIG. 10, elements such as the at least one receiver 1002, the at least one transmitter 1004, the at least one non-transitory computer-readable medium 1006, and the at least one processor 1008 are described in the singular, the plural is contemplated unless limitation to the singular is explicitly stated. In some embodiments of the present application, the at least one receiver 1002 and the at least one transmitter 1004 are combined into a single device, such as a transceiver. In certain embodiments of the present application, the apparatus 1000 may further include an input device, a memory, and/or other components.

[00105] In some embodiments of the present application, the at least one non-transitory computer-readable medium 1006 may have stored thereon computer-executable instructions which are programmed to implement the operations of the methods, for example as described in view of FIG. 4 or FIG. 8, with the at least one receiver 1002, the at least one transmitter 1004, and the at least one processor 1008.

[00106] Those having ordinary skills in the art would understand that the operations of a method described in connection with the aspects disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module may reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, a hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. Additionally, in some aspects, the operations of a method may reside as one or any combination or set of codes and/or instructions on a non-transitory computer-readable medium, which may be incorporated into a computer program product.

[00107] While this disclosure has been described with specific embodiments thereof, it is evident that many alternatives, modifications, and variations may be apparent to those skilled in the art. For example, various components of the embodiments may be interchanged, added, or substituted in the other embodiments. Also, all of the elements of each figure are not necessary for operation of the disclosed embodiments. For example, those having ordinary skills in the art would be enabled to make and use the teachings of the disclosure by simply employing the elements of the independent claims. Accordingly, embodiments of the disclosure as set forth herein are intended to be illustrative, not limiting. Various changes may be made without departing from the spirit and scope of the disclosure.

[00108] In this document, the terms "includes," "including," or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that includes a list of elements does not include only those

elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "a," "an," or the like does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that includes the element. Also, the term "another" is defined as at least a second or more. The term "having" and the like, as used herein, are defined as "including."

What is claimed is:

1. A method, comprising:
 - determining a first resource selection window;
 - determining an ending boundary of a second resource selection window in time domain based on discontinuous reception (DRX) configuration information, wherein a starting boundary of the first resource selection window in the time domain is a starting boundary of the second resource selection window in the time domain; and
 - selecting one or more resources for a transport block (TB) in the second resource selection window.
2. The method of Claim 1, wherein the DRX configuration information explicitly or implicitly indicates an ending boundary of an on-duration of a DRX cycle in the time domain.
3. The method of Claim 2, wherein the ending boundary of the second resource selection window is determined further based on at least one of remaining packet delay budget (PDB) of the TB and an ending boundary of the first resource selection window in the time domain.
4. The method of Claim 3, wherein determining the ending boundary of the second resource selection window comprises:
 - determining an earlier time between the ending boundary of the on-duration of the DRX cycle and the ending boundary of the first resource selection window;
 - and
 - selecting the earlier time as the ending boundary of the second resource selection window.

5. The method of Claim 3, wherein determining the ending boundary of the second resource selection window comprises:
 - determining an earlier time between the ending boundary of the on-duration of the DRX cycle and the remaining PDB of the TB; and
 - selecting the earlier time as the ending boundary of the second resource selection window.
6. The method of Claim 1, wherein selecting the one or more resources for the TB further comprises:
 - selecting at least one transmission resource for one or more transmissions of the TB in the second resource selection window.
7. The method of Claim 1, further comprising:
 - determining a third resource selection window, wherein the ending boundary of the second resource selection window is a starting boundary of the third resource selection window in the time domain, and the ending boundary of the first resource selection window is an ending boundary of the third resource selection window in the time domain.
8. The method of Claim 1, further comprising:
 - determining a third resource selection window, wherein the starting boundary of the first resource selection window is a starting boundary of the third resource selection window in the time domain, and the ending boundary of the first resource selection window is an ending boundary of the third resource selection window in the time domain.
9. The method of Claim 7 or Claim 8, further comprising:
 - selecting one or more resources for one or more re-transmissions of the TB in the third resource selection window.

10. The method of Claim 9, further comprising:

transmitting resource reservation information on the one or more resources selected in the second resource selection window,

wherein the resource reservation information indicates the one or more resources for the one or more re-transmissions of the TB selected in the third resource selection window.

11. A method, comprising:

receiving a transmission of a transport block (TB) during an on-duration of a discontinuous reception (DRX) cycle;

receiving resource reservation information during the on-duration of the DRX cycle, wherein the resource reservation information indicates a reserved resource in an off-duration of the DRX cycle; and

determining whether to receive one or more transmissions on the reserved resource in the off-duration of the DRX cycle based on a decoding result of the transmission.

12. The method of Claim 11, wherein the one or more transmissions include at least one of:

a re-transmission of the transmission of the TB; and

an initial transmission of a second TB.

13. The method of Claim 11, wherein the resource reservation information is included in sidelink control information (SCI).

14. The method of Claim 11, further comprising:

in response to at least one of successfully decoding the transmission and transmitting a positive acknowledgement (ACK) corresponding to the

transmission, determining not to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle.

15. The method of Claim 11, further comprising:

in response to at least one of not successfully decoding the transmission and transmitting a negative acknowledgement (NACK) corresponding to the transmission, determining to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle.

16. The method of Claim 15, further comprising:

only monitoring the reserved resource in the off-duration of the DRX cycle to receive the one or more transmissions.

17. The method of Claim 11, wherein determining whether to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle is further based on a comparing result between a priority of the transmission and a pre-defined priority threshold.

18. The method of Claim 17, further comprising:

receiving sidelink control information (SCI), wherein the SCI indicates the priority of the transmission.

19. The method of Claim 17, wherein the pre-defined priority threshold is associated with at least one of: a capability of a user equipment (UE), battery power of the UE, and an implementation of the UE.

20. The method of Claim 17, further comprising:

in response to at least one of not successfully decoding the transmission and transmitting an NACK corresponding to the transmission, determining the

comparing result between the priority of the transmission and the pre-defined priority threshold.

21. The method of Claim 20, further comprising:

in response to the priority of the transmission being higher than or equal to the pre-defined priority threshold, receiving the one or more transmissions on the reserved resource in the off-duration of the DRX cycle.

22. The method of Claim 20, further comprising:

in response to the priority of the transmission being higher than or equal to the pre-defined priority threshold, receiving the one or more transmissions in an extended on-duration of the DRX cycle,

wherein the extended on-duration of the DRX cycle is defined by a timer.

23. The method of Claim 22, wherein the timer is configured or pre-configured.

24. The method of Claim 20, further comprising:

in response to the priority of the transmission being lower than the pre-defined priority threshold, determining not to receive the one or more transmissions on the reserved resource in the off-duration of the DRX cycle.

25. The method of Claim 20, further comprising:

in response to the priority of the transmission being lower than the pre-defined priority threshold, determining not to receive the one or more transmissions on all resources in the off-duration of the DRX cycle.

26. The method of Claim 11, further comprising:

determining not to receive a subsequent re-transmission of the TB in the off-duration of the DRX cycle; and

transmitting an indicator corresponding to the transmission in the on-duration of the DRX cycle.

27. The method of Claim 26, wherein the indicator is a positive acknowledgement (ACK).

28. An apparatus, comprising:

- a non-transitory computer-readable medium having stored thereon computer-executable instructions;

- a receiving circuitry;

- a transmitting circuitry; and

- a processor coupled to the non-transitory computer-readable medium, the receiving circuitry and the transmitting circuitry,

wherein the computer-executable instructions cause the processor to implement the method of any of Claims 1-10.

29. An apparatus, comprising:

- a non-transitory computer-readable medium having stored thereon computer-executable instructions;

- a receiving circuitry;

- a transmitting circuitry; and

- a processor coupled to the non-transitory computer-readable medium, the receiving circuitry and the transmitting circuitry,

wherein the computer-executable instructions cause the processor to implement the method of any of Claims 11-27.

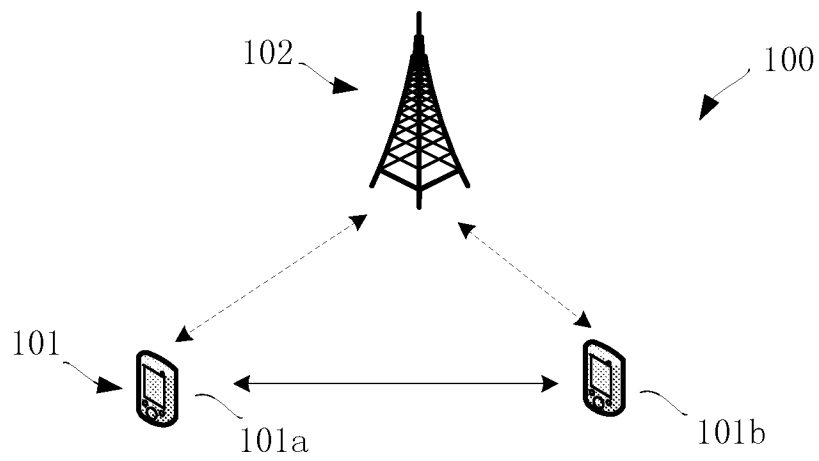


FIG. 1

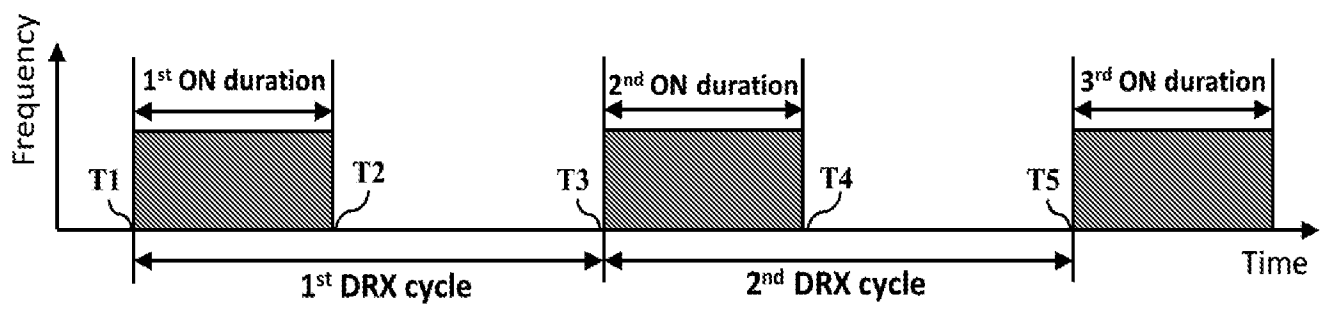


FIG. 2

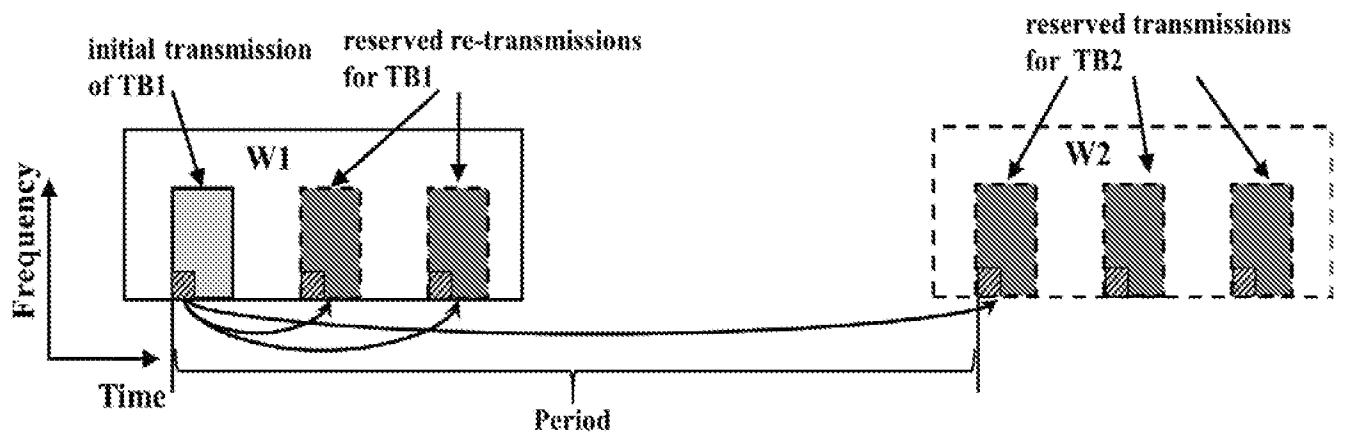


FIG. 3A

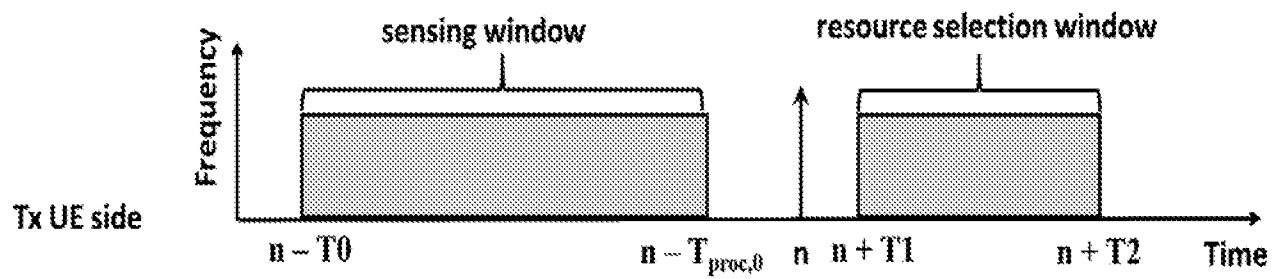


FIG. 3B

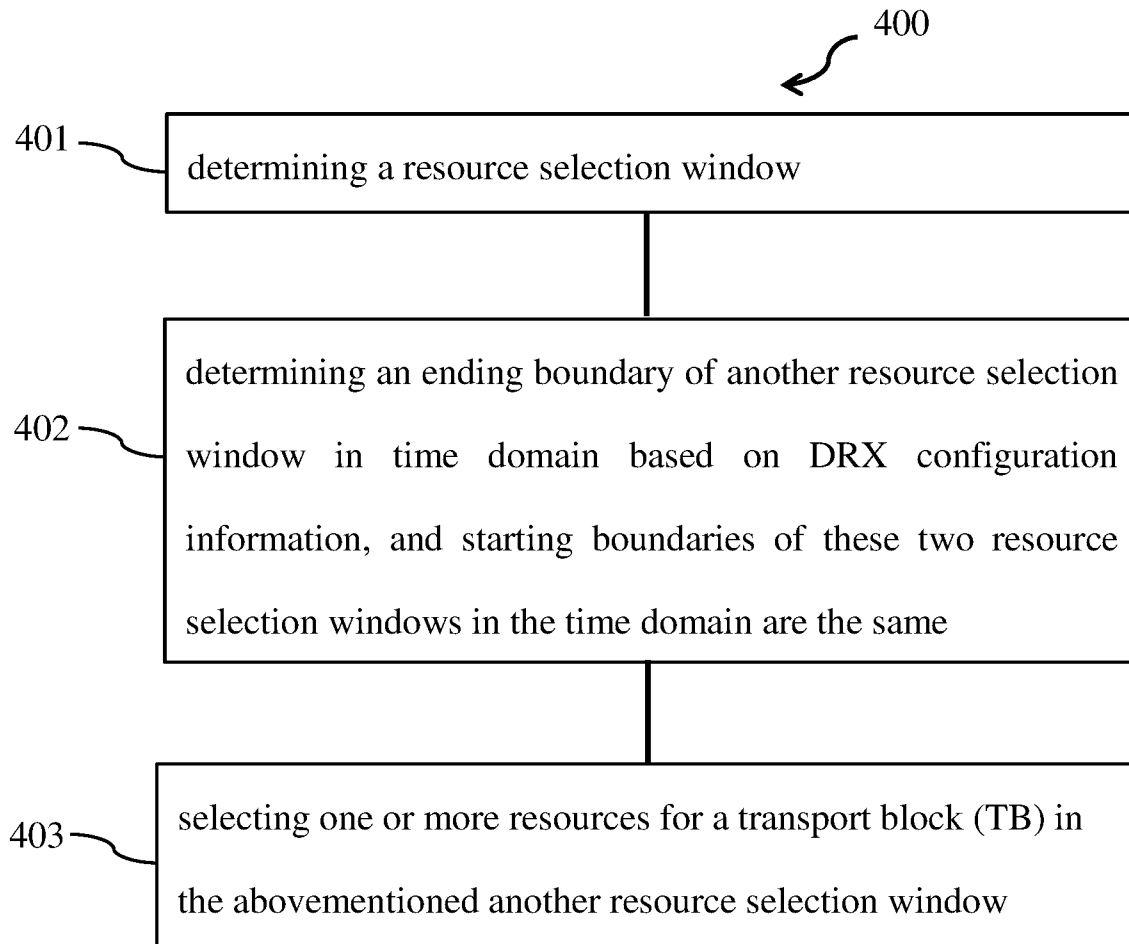


FIG. 4

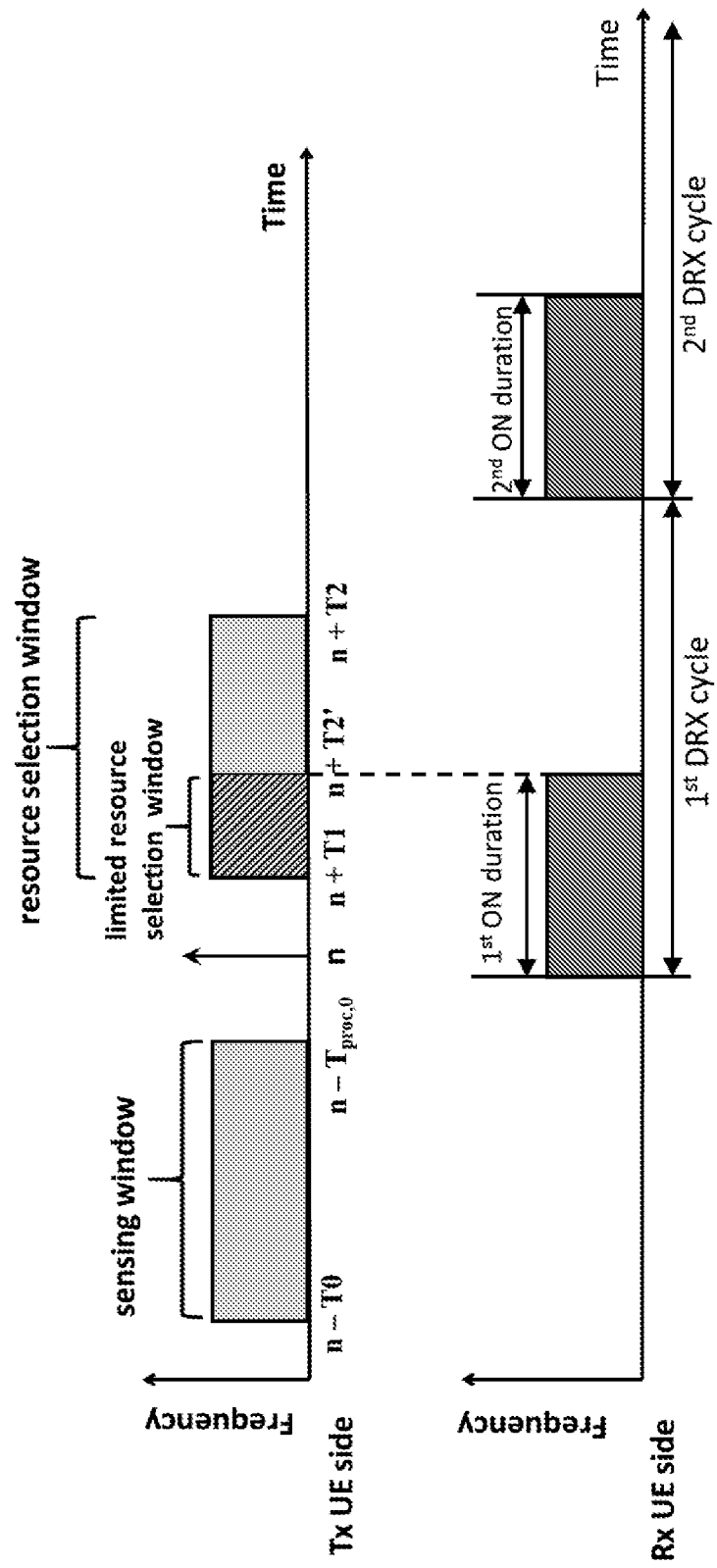


FIG. 5

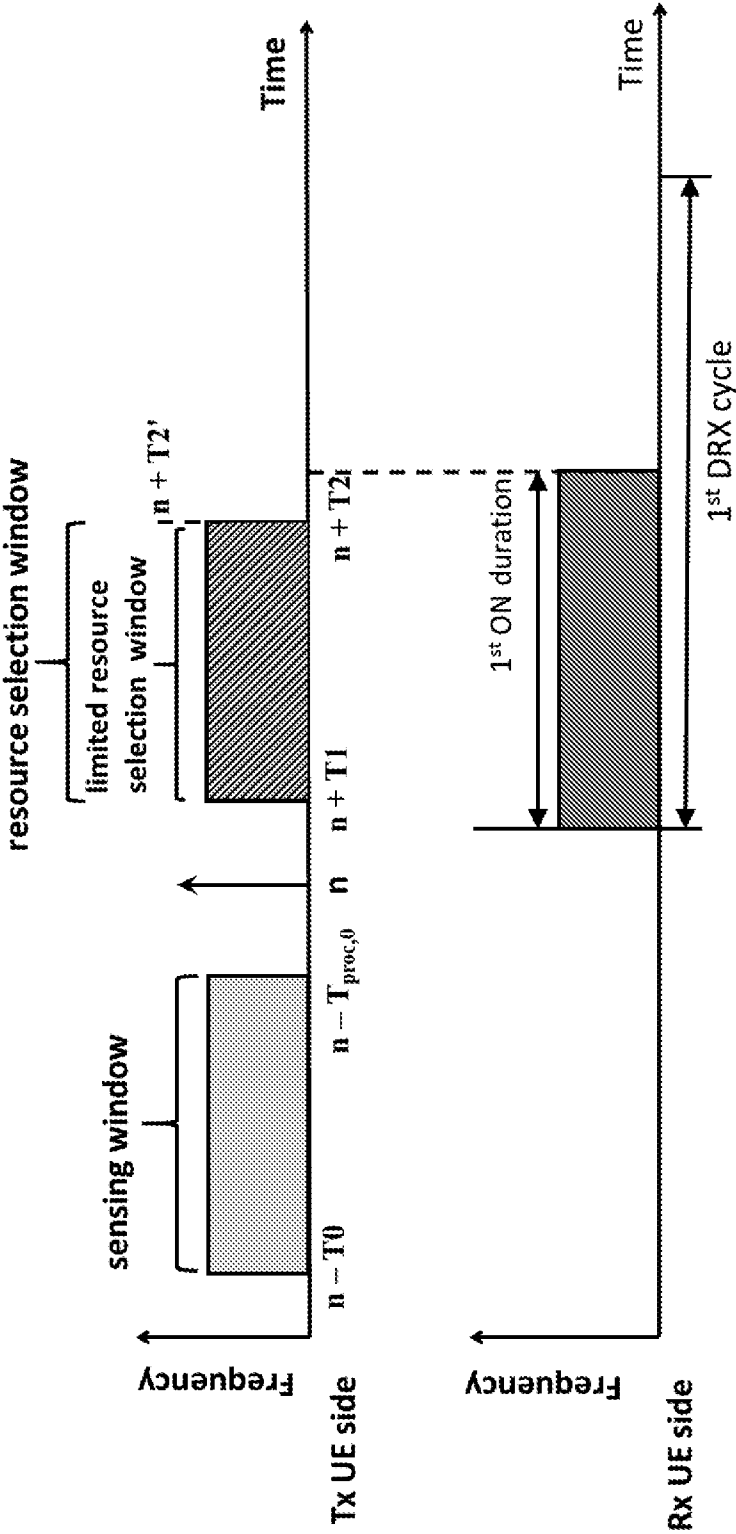


FIG. 6

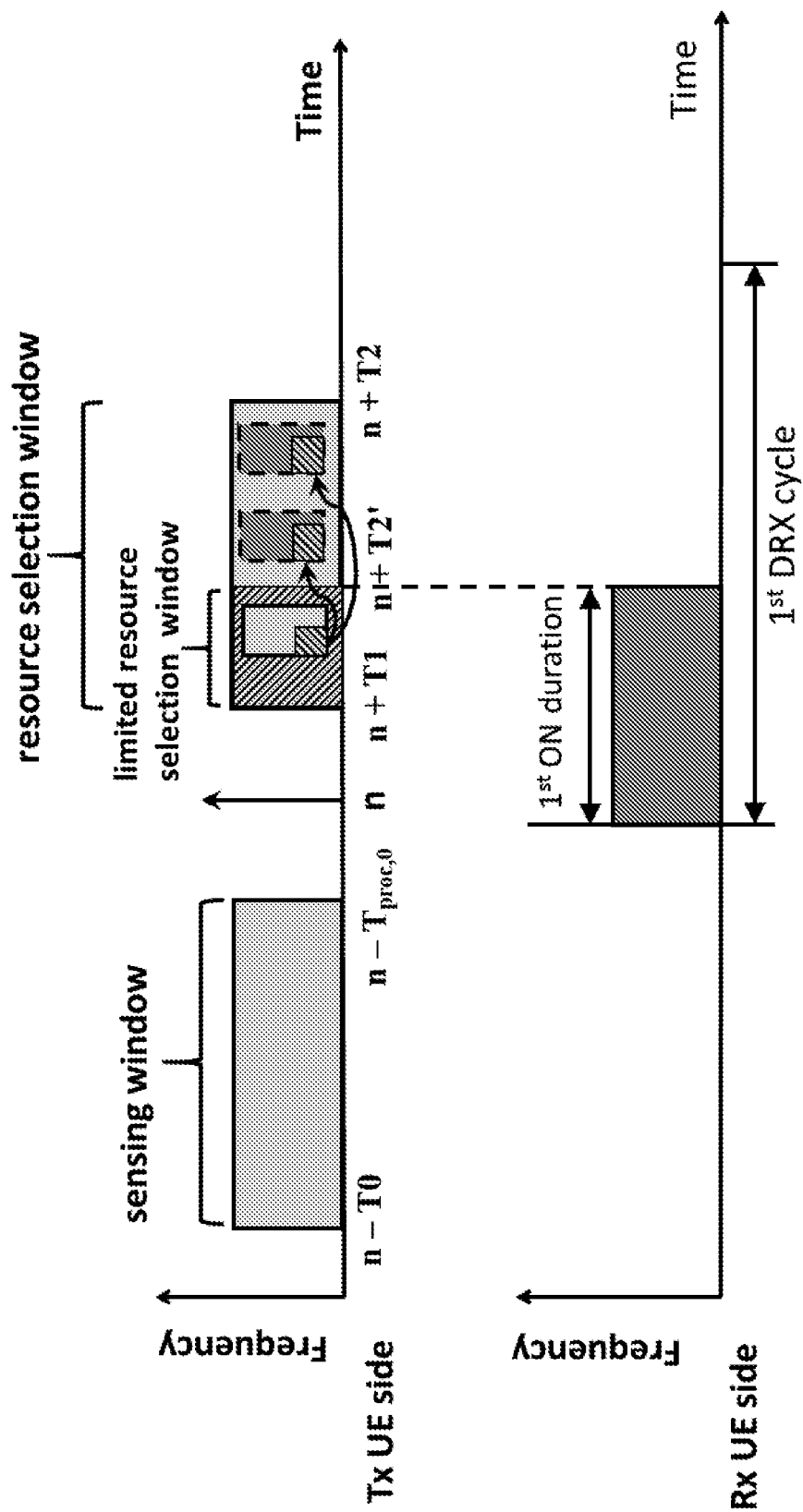


FIG. 7

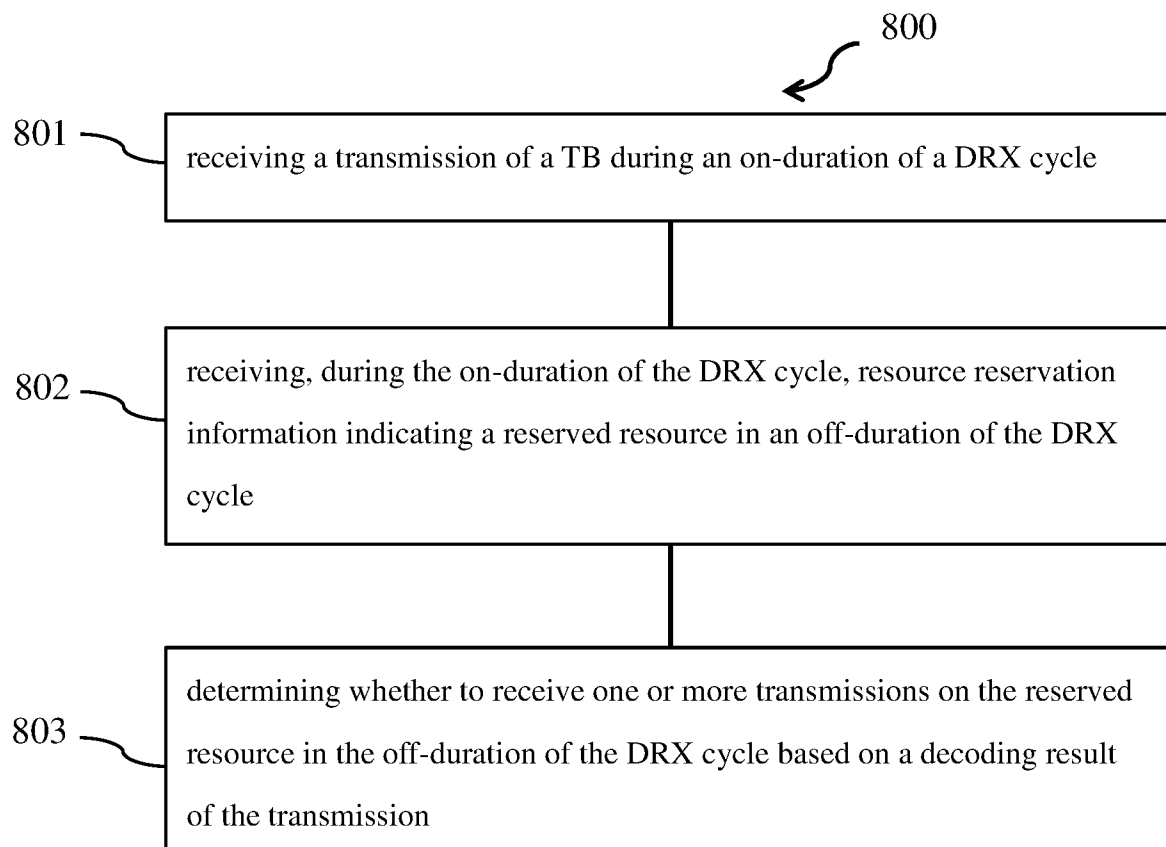


FIG. 8

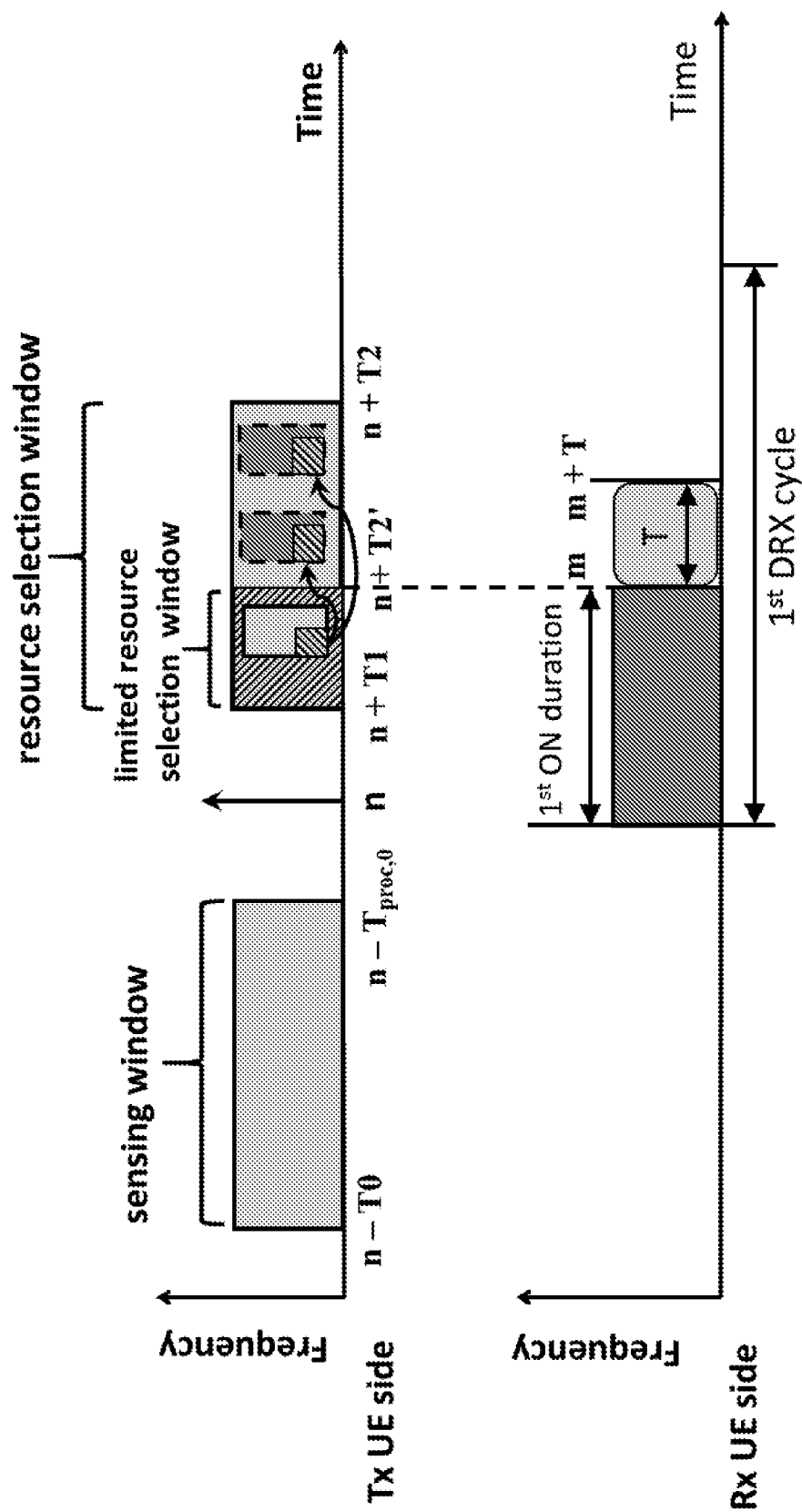


FIG. 9

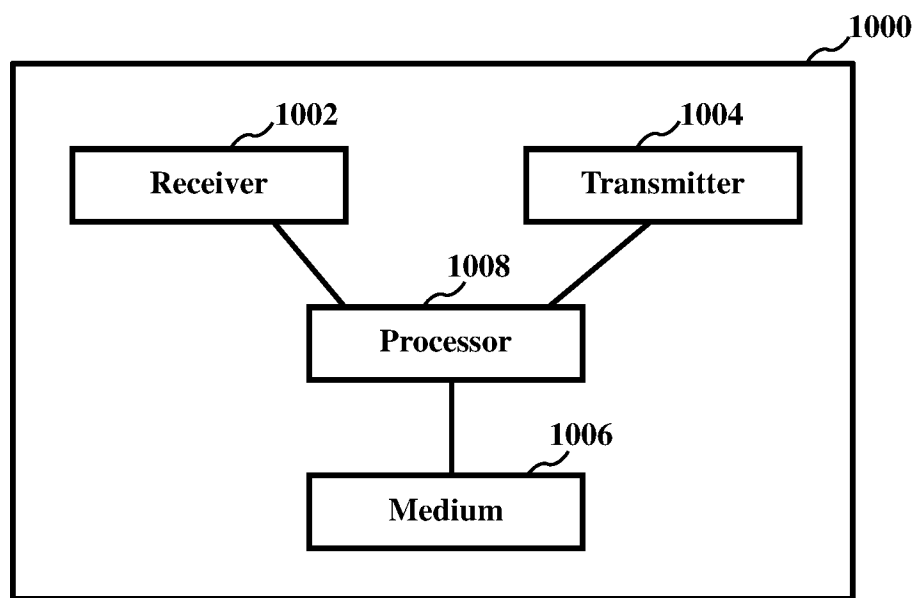


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/102065

A. CLASSIFICATION OF SUBJECT MATTER

H04W 72/04(2009.01)i; H04W 76/28(2018.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W; H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, CNPAT, WPI, EPODOC, 3GPP: sidelink, side link, SL, resource, select, start, end, window, DRX, discontinuous reception, active, inactive, outside, wake up, sleep, reserve, decode, period, time

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 3439215 A1 (LG ELECTRONICS INC.) 06 February 2019 (2019-02-06) description, paragraphs [0067]-[0099]	1-29
A	EP 3468268 A1 (LG ELECTRONICS INC.) 10 April 2019 (2019-04-10) the whole document	1-29
A	CN 111095853 A (QUALCOMM INC.) 01 May 2020 (2020-05-01) the whole document	1-29
A	CN 102257859 A (HUAWEI TECHNOLOGIES CO., LTD.) 23 November 2011 (2011-11-23) the whole document	1-29
A	QUALCOMM INCORPORATED, "PDCCH-based power saving channel design, R1-1907294," 3GPP TSG-RAN WG1 #97, 17 May 2019 (2019-05-17), the whole document	1-29
A	SAMSUNG, "PDCCH-based power saving signal/channel, R1-1906980," 3GPP TSG RAN WG1 #97, 17 May 2019 (2019-05-17), the whole document	1-29



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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Name and mailing address of the ISA/CN

National Intellectual Property Administration, PRC
6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing
100088
China

Facsimile No. (86-10)62019451

Authorized officer

LI, Xiaoli

Telephone No. 86-(10)-53961772

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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