

Method and Device for Discontinuous Transmission

Technical Field

Embodiments of the present application relate to the field of communication, and more particularly, to a method and device for Discontinuous Reception (DRX).

Background

A DRX mechanism is introduced for power saving of a terminal device. A network device may configure the terminal device to "wake up" at a time known in advance by the network device and to monitor a downlink control channel when the terminal device wakes up, or may configure the terminal device to "sleep" at a time known in advance by the network device and not to monitor the downlink control channel when the terminal device is sleeping. In this way, if the network device has data to transmit to the terminal device, the terminal device may be scheduled during a wake-up time of the terminal device, and the terminal device may reduce power consumption during a sleep time.

In a 5G system, durations and positions of waking-up and sleeping of a terminal device may be flexibly changed, which may affect monitoring of a control channel by the terminal device. Therefore, in the 5G system, how to ensure the terminal device to effectively monitor a downlink control channel becomes an urgent problem to be solved.

Summary

Embodiments of the present application provide a method and device for discontinuous reception, which may ensure a terminal device to effectively monitor a downlink control channel.

In a first aspect, a method for discontinuous reception is provided. The method includes that a terminal device monitors a physical downlink control channel (PDCCH) during a Discontinuous Reception (DRX) active time; wherein, if a DRX timer starts and/or expires in a PDCCH monitoring occasion, the DRX active time includes the PDCCH monitoring occasion,

or the DRX active time does not include the PDCCH monitoring occasion.

Therefore, when the DRX timer starts and/or expires in the PDCCH monitoring occasion, since the DRX active time of the terminal device includes the PDCCH monitoring occasion or the DRX active time does not include the PDCCH monitoring occasion, it can ensure that the
5 terminal device monitors the downlink control channel more effectively.

In one possible implementation, the PDCCH monitoring occasion includes one or more consecutive time domain symbols.

In one possible implementation, the PDCCH monitoring occasion is configured by a network device.

10 In one possible implementation, the DRX timer is any one of the following timers: a DRX onDuration Timer, a DRX Inactivity Timer, a DRX Retransmission TimerUL, a DRX Retransmission TimerDL, and a Contention Resolution Timer.

In one possible implementation, that the DRX timer starts and/or expires in the PDCCH monitoring occasion includes that a starting or expiry time of the DRX timer is located in the
15 PDCCH monitoring occasion except a starting time and an ending time of the PDCCH monitoring occasion.

In one possible implementation, that the DRX timer starts and/or expires in the PDCCH monitoring occasion includes that a starting time of the DRX timer is located after a starting time of the PDCCH monitoring occasion, and an expiry time of the DRX timer is located before
20 an ending time of the PDCCH monitoring occasion.

In one possible implementation, the method further includes that if the terminal device detects the PDCCH in the PDCCH monitoring occasion, the terminal device starts or restarts a DRX onDuration Timer.

In a second aspect, a terminal device is provided. The terminal device may perform
25 operations of the terminal device in the first aspect or any optional implementation of the first aspect. Specifically, the terminal device includes terminal devices for implementing the method in the above first aspect or any possible implementation of the above first aspect.

In a third aspect, a terminal device is provided. The terminal device includes a processor, a

transceiver, and a memory. The processor, the transceiver, and the memory communicate with each other through an internal connection path. The memory is used for storing instructions, and the processor is used for executing the instructions stored in the memory. When the processor executes the instructions stored in the memory, the execution causes the terminal
5 device to implement the method in the first aspect or any possible implementation of the first aspect, or the execution causes the terminal device to implement the terminal device provided in the second aspect.

In a fourth aspect, a system chip is provided. The system chip includes an input interface, an output interface, a processor, and a memory, wherein the processor is used for executing
10 instructions stored in the memory, and when the instructions are executed, the processor may implement the method in the first aspect or any possible implementation of the above first aspect.

In a fifth aspect, a computer program product containing instructions is provided. When the computer program product is run on a computer, the computer is caused to perform the
15 method in the first aspect or any possible implementation of the first aspect.

Brief Description of Drawings

FIG. 1 is a schematic diagram of a wireless communication system according to an embodiment of the present application.

20 FIG. 2 is a schematic diagram of a DRX cycle.

FIG. 3 is a schematic flow chart of a method for discontinuous reception according to an embodiment of the present application.

FIG. 4 is a schematic block diagram of a DRX active time according to an embodiment of the present application.

25 FIG. 5 is a schematic block diagram of a DRX active time according to an embodiment of the present application.

FIG. 6 is a schematic block diagram of a DRX active time according to an embodiment of the present application.

FIG. 7 is a schematic block diagram of a DRX active time according to an embodiment of the present application.

FIG. 8 is a schematic block diagram of a DRX active time according to an embodiment of the present application.

5 FIG. 9 is a schematic block diagram of a DRX active time according to an embodiment of the present application.

FIG. 10 is a schematic block diagram of a terminal device according to an embodiment of the present application.

10 FIG. 11 is a schematic diagram of structure of a terminal device according to an embodiment of the present application.

FIG. 12 is a schematic diagram of structure of a system chip according to an embodiment of the present application.

Detailed Description

15 Technical solutions of embodiments of the present application may be applied to various communication systems, such as, a Global System of Mobile communication (GSM) system, a Code Division Multiple Access (CDMA) system, a Wideband Code Division Multiple Access (WCDMA) system, a General Packet wireless Service (GPRS) system, a Long Term Evolution (LTE) system, a LTE Frequency Division Duplex (FDD) system, a LTE Time Division Duplex (TDD) system, a Universal Mobile Telecommunication System (UMTS) system, a Worldwide Interoperability for Microwave Access (WiMAX) communication system, or a future 5G system.

25 FIG. 1 shows a wireless communication system 100 to which an embodiment of the present application is applied. The wireless communication system 100 may include a network device 110. The network device 100 may be a device that communicates with a terminal device. The network device 100 may provide communication coverage for a specific geographical area, and may communicate with the terminal device (e.g., UE) in the coverage area. Optionally, the network device 100 may be a Base Transceiver Station (BTS) in a GSM system or a CDMA

system, a NodeB (NB) in a WCDMA system, an Evolutional Node B (eNB or eNodeB) in an LTE system, or a radio controller in a Cloud Radio Access Network (CRAN). Or the network device may be a relay station, an access point, a vehicle-mounted device, a wearable device, a network side device in a future 5G network, or a network device in a future evolved Public Land Mobile Network (PLMN), etc.

The wireless communication system 100 further includes at least one terminal device 120 in the coverage area of the network device 110. The terminal device 120 may be mobile or fixed. Optionally, the terminal device 120 may be referred to as an access terminal, a User Equipment (UE), a subscriber unit, a subscriber station, a mobile station, a mobile platform, a remote station, a remote terminal, a mobile device, a user terminal, a terminal, a wireless communication device, a user agent, or a user apparatus. The access terminal may 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 other processing device connected to a wireless modem, a vehicle-mounted device, a wearable device, a terminal device in a future 5G network, or a terminal device in a future evolved Public Land Mobile Network (PLMN), or the like.

Optionally, Device to Device (D2D) communication may be performed between the terminal devices 120.

Optionally, the 5G system or network may also be referred to as a New Radio (NR) system or network.

FIG. 1 exemplifies one network device and two terminal devices. Optionally, the wireless communication system 100 may include multiple network devices, and another quantity of terminal devices may be included within a coverage area of each network device, and embodiments of the present application do not limit these.

Optionally, the wireless communication system 100 may further include other network entities such as a network controller, a mobile management entity, and embodiments of the present application do not limit these.

In a LTE system, a Media Access Control (MAC) entity is configured with a

Discontinuous Reception (DRX) function by Radio Resource Control (RRC) to control a behavior of monitoring a Physical Downlink Control Channel (PDCCH) of a terminal device. For example, as shown in FIG. 2, in an RRC CONNECTED mode, if the terminal device is configured with the DRX function, the MAC entity may continuously monitor the PDCCH during an On Duration and not monitor the PDCCH during an Opportunity for DRX, thereby reducing power consumption of the terminal device. The network device may configure a set of DRX parameters for the MAC entity through RRC signaling, for example, configure a series of DRX timers, to manage wake-up and sleep states of the terminal device. According to values of these parameters, a DRX cycle as shown in FIG. 2 may be obtained.

In a 5G system, time and positions of wake-up and sleep states of a terminal device may be flexibly changed, which may affect monitoring of a control channel by the terminal device.

Therefore, in the embodiment of the present application, when a DRX timer starts and/or expires in a PDCCH monitoring occasion, since a DRX active time of a terminal device includes the PDCCH monitoring occasion or the DRX active time does not include the PDCCH monitoring occasion, it can ensure that the terminal device monitors the downlink control channel more effectively.

It should be understood that the term “monitoring” in embodiments of the present application may also be referred to as listening, sensing, detecting, checking, etc. In addition, an Active Time of the terminal device may be referred to as an active period, on duration, a wake-up time, etc.

FIG. 3 is a schematic flow chart of a method for discontinuous reception according to an embodiment of the present application. A terminal device shown in FIG. 3 may be, for example, the terminal device 120 shown in FIG. 1. As shown in FIG. 3, the method for discontinuous reception includes act 310.

In 310, a terminal device monitors a physical downlink control channel (PDCCH) during a discontinuous reception (DRX) active time.

Herein, if a DRX timer starts and/or expires in a PDCCH monitoring occasion, the DRX active time includes the PDCCH monitoring occasion, or the DRX active time does not include the PDCCH monitoring occasion.

Therefore, when the DRX timer starts and/or expires in the PDCCH monitoring occasion, since the DRX active time of the terminal device does not include the PDCCH monitoring occasion, or the DRX active time includes the PDCCH monitoring occasion, a process of monitoring the PDCCH by the terminal device is not affected.

5 Optionally, the PDCCH monitoring occasion may include one or more consecutive time domain symbols.

In addition, optionally, the PDCCH monitoring occasion is configured by a network device. For example, the network device may send configuration information to the terminal device to indicate a time domain location of the PDCCH.

10 Optionally, the DRX timer may be any one of the following timers: a DRX onDuration Timer (drx-onDurationTimer); a DRX Inactivity Timer (drx-InactivityTimer); a DRX Retransmission TimerUL (drx-RetransmissionTimerUL); a DRX Retransmission TimerDL (drx-RetransmissionTimerDL); and a Contention Resolution Timer (mac-ContentionResolutionTimer).

15 Optionally, in 310, that the DRX timer starts and/or expires in the PDCCH monitoring occasion includes that a starting or expiry time of the DRX timer is located in the PDCCH monitoring occasion except a starting time and an ending time of the PDCCH monitoring occasion.

20 That is, the starting or expiry time of the DRX timer is located after the starting time of the PDCCH monitoring occasion and before the ending time of the PDCCH monitoring occasion.

25 Optionally, in 310, that the DRX timer starts and/or expires in the PDCCH monitoring occasion includes that a starting time of the DRX timer is located after a starting time of the PDCCH monitoring occasion, and an expiry time of the DRX timer is located before an ending time of the PDCCH monitoring occasion.

Optionally, the method may further include that if the terminal device detects the PDCCH in the PDCCH monitoring occasion, the terminal device starts or restarts a DRX onDuration Timer.

Generally, if the DRX timer starts and/or expires in the PDCCH monitoring occasion, a process of monitoring the PDCCH by the terminal device may be affected. For example, if a drx-InactivityTimer expires in a PDCCH monitoring occasion of the terminal device, the terminal device will stop monitoring the PDCCH, thus affecting the process of monitoring the PDCCH by the terminal device.

However, in the embodiment of the present application, since it is determined that the DRX active time includes the PDCCH monitoring occasion, or the DRX active time does not include the PDCCH monitoring occasion, it can ensure that the terminal device monitors the downlink control channel more effectively.

For example, assuming that it is agreed that the DRX active time includes the PDCCH monitoring occasion, when the drx-InactivityTimer expires in a PDCCH monitoring occasion of the terminal device, since the DRX active time includes an entire time domain length corresponding to the PDCCH monitoring occasion, the terminal device still monitors the PDCCH in the PDCCH monitoring occasion, thus avoiding an influence on the process of monitoring the PDCCH.

Below, the case that the DRX active time includes the PDCCH monitoring occasion and the case that the DRX active time does not include the PDCCH monitoring occasion are described in detail by taking FIGs. 4 to 9 as examples.

As shown in FIG. 4, the DRX active time includes the PDCCH monitoring occasion. Assuming that a network device configures the PDCCH monitoring occasion to be the first three time domain symbols of a subframe, if a DRX timer starts in the second time domain symbol of the subframe, a terminal device needs to monitor the PDCCH in the first three time domain symbols until the DRX timer expires.

As shown in FIG. 5, the DRX active time does not include the PDCCH monitoring occasion. Assuming that the network device configures the PDCCH monitoring occasion to be the first three time domain symbols of a subframe, if a DRX timer starts in the second time domain symbol of the subframe, the terminal device needs to start monitoring the PDCCH from the fourth time domain symbol until the DRX timer expires.

As shown in FIG. 6, the DRX active time includes the PDCCH monitoring occasion.

Assuming that the network device configures the PDCCH monitoring occasion to be the first three time domain symbols of a subframe, if a DRX timer expires in the second time domain symbol of the subframe, the terminal device needs to continue monitoring the PDCCH in the three time domain symbols.

5 As shown in FIG. 7, the DRX active time does not include the PDCCH monitoring occasion. Assuming that the network device configures the PDCCH monitoring occasion to be the first three time domain symbols of a subframe, if a DRX timer expires in the second time domain symbol of the subframe, the terminal device stops monitoring the PDCCH on a symbol preceding the three time domain symbols, that is, the terminal device does not monitor the
10 PDCCH on the three time domain symbols.

As shown in FIG. 8, the DRX active time includes the PDCCH monitoring occasion. Assuming that the network device configures the PDCCH monitoring occasion to be the first three time domain symbols of a subframe, if a DRX timer starts in the first time domain symbol and expires in the third time domain symbol of the subframe, the terminal device monitors the
15 PDCCH in the three time domain symbols.

As shown in FIG. 9, the DRX active time does not include the PDCCH monitoring occasion. Assuming that the network device configures the PDCCH monitoring occasion to be the first three time domain symbols of a subframe, if a DRX timer starts in the first time domain symbol and expires in the third time domain symbol of the subframe, then the terminal device
20 may not have the DRX active time, that is, the terminal device does not monitor the PDCCH in the three time domain symbols.

Optionally, in FIGs. 6 and 8, if the terminal device detects the PDCCH in the PDCCH monitoring occasion, the terminal device may restart a DRX onDuration Timer, and at this time, the time for monitoring the PDCCH by the terminal device may be prolonged.

25 Methods for discontinuous reception according to the embodiments of the present application have been described in detail above. Devices according to embodiments of the present application will be described below with reference to FIGs. 10 to 12. Technical features described in the method embodiments are applicable to the following device embodiments.

FIG. 10 is a schematic block diagram of a terminal device 1000 according to an

embodiment of the present application. As shown in FIG. 10, the terminal device 1000 includes a monitoring unit 1010. The monitoring unit 1010 is configured to monitor a physical downlink control channel (PDCCH) during a DRX active time.

Herein, if a DRX timer starts and/or expires in the PDCCH monitoring occasion, the DRX active time includes the PDCCH monitoring occasion, or the DRX active time does not include the PDCCH monitoring occasion.

Therefore, when the DRX timer starts and/or expires in the PDCCH monitoring occasion, since the DRX active time of the terminal device includes the PDCCH monitoring occasion or the DRX active time does not include the PDCCH monitoring occasion, it can ensure that the terminal device monitors the downlink control channel more effectively.

Optionally, the PDCCH monitoring occasion includes one or more consecutive time domain symbols.

Optionally, the PDCCH monitoring occasion is configured by a network device.

Optionally, the DRX timer is any one of the following timers: a DRX onDuration Timer, a DRX Inactivity Timer, a DRX Retransmission TimerUL, a DRX Retransmission TimerDL, and a Contention Resolution Timer.

Optionally, that the DRX timer starts and/or expires in the PDCCH monitoring occasion includes that a starting or expiry time of the DRX timer is located in the PDCCH monitoring occasion except a starting time and an ending time of the PDCCH monitoring occasion.

Optionally, that the DRX timer starts and/or expires in the PDCCH monitoring occasion includes that a starting time of the DRX timer is located after a starting time of the PDCCH monitoring occasion, and an expiry time of the DRX timer is located before an ending time of the PDCCH monitoring occasion.

Optionally, the terminal device further includes a processing unit, the processing unit is configured to start or restart a DRX onDuration Timer if the PDCCH is detected by the monitoring unit 1010 in the PDCCH monitoring occasion.

It should be understood that the terminal device 1100 may perform corresponding operations performed by the terminal device in the above method 300, which will not be

described in detail herein for sake of brevity.

FIG. 11 is a schematic diagram of structure of a terminal device 1100 according to an embodiment of the present application. As shown in FIG. 11, the terminal device includes a processor 1110, a transceiver 1120, and a memory 1130, wherein the processor 1110, the transceiver 1120, and the memory 1130 communicate with each other through an internal connection path. The memory 1130 is used for storing instructions, and the processor 1110 is used for executing instructions stored in the memory 1130 to control the transceiver 1120 to send or receive signals.

Optionally, the processor 1110 may call program codes stored in the memory 1130 to perform corresponding operations performed by the terminal device in the method 300, which will not be described here repeatedly for sake of brevity.

It should be understood that the processor in the embodiment of the present application may be an integrated circuit chip with a capability for processing signals. In an implementation process, actions of the method embodiments described above may be accomplished by integrated logic circuits of hardware in the processor or instructions in the form of software. The above processor may be a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA), or other programmable logic device, discrete gate or transistor logic device, or discrete hardware component. The processor may implement or perform various methods, acts and logic block diagrams disclosed in embodiments of the present application. The general purpose processor may be a microprocessor, or the processor may be any conventional processor or the like. The acts of the methods disclosed in connection with the embodiments of the present application may be directly embodied by the execution of the hardware decoding processor, or by execution of a combination of hardware in a decoding processor and software modules. The software modules may be located in a storage medium commonly used in the art, such as a random access memory, flash memory, read-only memory, programmable read-only memory or electrically erasable programmable memory, or register. The storage medium is located in the memory, and the processor reads the information in the memory and completes the acts of the above method in combination with its hardware.

It should be understood that the memory in embodiments of the present application may be a transitory memory or non-transitory memory, or may include both transitory and non-transitory memories. The non-transitory memory may be a read-only memory (ROM), programmable ROM (PROM), an erasable programmable ROM (EPROM), an electrically erasable programmable ROM (EEPROM), or a flash memory. The transitory memory may be a random access memory (RAM) which serves as an external cache. As an example, but not as a limitation, many forms of RAMs are available, such as a static random access memory (SRAM), a dynamic random access memory (DRAM), a synchronous dynamic random access memory (SDRAM), a double data rate SDRAM (DDR SDRAM), an enhanced SDRAM (ESDRAM), a Synchlink DRAM (SLDRAM), and a Direct Rambus RAM (DR RAM). It should be noted that the memories of the systems and methods of the present application described herein are intended to include, but not limited to, these and any other suitable types of memories.

FIG. 12 is a schematic diagram of structure of a system chip according to an embodiment of the present application. The system chip 1200 of FIG. 12 includes an input interface 1201, an output interface 1202, at least one processor 1203, and a memory 1204. The input interface 1201, the output interface 1202, the processor 1203, and the memory 1204 are connected to each other through an internal connection path. The processor 1203 is used for executing codes in the memory 1204.

Optionally, when the codes are executed, the processor 1203 may implement the operations implemented by the terminal device in the method 300. For sake of brevity, it will not be repeated here.

Those of ordinary skill in the art will recognize that the exemplary elements and algorithm acts described in combination with the embodiments disclosed herein can be implemented in electronic hardware, or a combination of computer software and electronic hardware. Whether these functions are implemented in hardware or software depends on the specific application and design constraints of the technical solution. Skilled artisans may use different methods to implement the described functions in respect to each specific application, but such implementation should not be considered to be beyond the scope of the present application.

Those skilled in the art may clearly understand that for convenience and conciseness of

description, the specific working processes of the systems, apparatuses and units described above may refer to the corresponding processes in the method embodiments and will not be described repeatedly here.

5 In several embodiments provided by the present application, it should be understood that the disclosed systems, apparatuses and methods may be implemented in other ways. For example, the apparatus embodiment described above is only illustrative, for example, the division of the unit is only a logical function division, and there may be other ways of division in actual implementations, for example, multiple units or components may be combined or integrated into another system, or some features may be ignored or not executed. On the other
10 hand, the mutual coupling or direct coupling or communication connection shown or discussed may be indirect coupling or communication connection through some interfaces, apparatuses or units, and may be in electrical, mechanical or other forms.

The unit described as a separate component may or may not be physically separated, and the component shown as a unit may or may not be a physical unit, i.e., it may be located in one
15 place or may be distributed over multiple network units. Some or all of the units may be selected according to actual needs to achieve the purpose of the solution of the embodiments.

In addition, various functional units in various embodiments of the present application may be integrated in one monitoring unit, or the various units may be physically present separately, or two or more units may be integrated in one unit.

20 The functions may be stored in a computer readable storage medium if realized in a form of software functional units and sold or used as a separate product. Based on this understanding, the technical solution of the present application, in essence, or the part contributing to the prior art, or the part of the technical solution, may be embodied in the form of a software product stored in a storage medium, including a number of instructions for causing a computer device
25 (which may be a personal computer, a server, or a network device and the like) to perform all or part of the acts of the method described in various embodiments of the present application. The aforementioned storage medium includes various media capable of storing program codes, such as a U disk, a mobile hard disk, a read-only memory (ROM), a random access memory (RAM), a magnetic disk, or an optical disk.

What are described above are merely exemplary embodiments of the present application, but the protection scope of the present application is not limited thereto. Any variation or substitution that may be easily conceived by a person skilled in the art within the technical scope disclosed by the present application shall be included within the protection scope of the present application. Therefore, the protection scope of the present application shall be subjected to the protection scope of the claims.

What is claimed is:

1. A method for discontinuous reception (DRX), comprising:

when a DRX active time comprises an entire time domain length corresponding to a physical downlink control channel (PDCCH) monitoring occasion, monitoring, by a terminal
5 device, the PDCCH in the PDCCH monitoring occasion;

wherein, if a DRX timer starts and/or expires in the PDCCH monitoring occasion, the DRX active time does not comprises the entire time domain length corresponding to the PDCCH monitoring occasion.

2. The method of claim 1, wherein the PDCCH monitoring occasion comprises one or
10 more consecutive time domain symbols.

3. The method of claim 1 or 2, wherein the PDCCH monitoring occasion is configured by a network device.

4. The method of any one of claims 1 to 3, wherein the DRX timer is any one of the following timers:

15 a DRX onDuration Timer, a DRX Inactivity Timer, a DRX Retransmission TimerUL, a DRX Retransmission TimerDL, and a Contention Resolution Timer.

5. The method of any one of claims 1 to 4, wherein that the DRX timer starts and/or expires in the PDCCH monitoring occasion comprises:

a starting or expiry time of the DRX timer is located in the PDCCH monitoring occasion
20 except a starting time and an ending time of the PDCCH monitoring occasion.

6. The method of any one of claims 1 to 4, wherein that the DRX timer starts and/or expires in the PDCCH monitoring occasion comprises:

a starting time of the DRX timer is located after a starting time of the PDCCH monitoring occasion, and an expiry time of the DRX timer is located before an ending time of the PDCCH
25 monitoring occasion.

7. The method of any one of claims 1 to 6, the method further comprising:

if the terminal device detects the PDCCH in the PDCCH monitoring occasion, starting or

restarting, by the terminal device, a DRX onDuration Timer.

8. A terminal device, comprising:

a monitoring unit, configured to, when a discontinuous reception (DRX) active time comprises an entire time domain length corresponding to a physical downlink control channel (PDCCH) monitoring occasion, monitor the PDCCH in the PDCCH monitoring occasion;

wherein, if a DRX timer starts and/or expires in the PDCCH monitoring occasion, the DRX active time does not comprises the entire time domain length corresponding to the PDCCH monitoring occasion.

9. The terminal device of claim 8, wherein the PDCCH monitoring occasion comprises one or more consecutive time domain symbols.

10. The terminal device of claim 8 or 9, wherein the PDCCH monitoring occasion is configured by a network device.

11. The terminal device of any one of claims 8 to 10, wherein the DRX timer is any one of the following timers:

a DRX onDuration Timer, a DRX Inactivity Timer, a DRX Retransmission TimerUL, a DRX Retransmission TimerDL, and a Contention Resolution Timer.

12. The terminal device of any one of claims 8 to 11, wherein that the DRX timer starts and/or expires in the PDCCH monitoring occasion comprises:

a starting or expiry time of the DRX timer is located in the PDCCH monitoring occasion except a starting time and an ending time of the PDCCH monitoring occasion.

13. The terminal device of any one of claims 8 to 12, wherein that the DRX timer starts and/or expires in the PDCCH monitoring occasion comprises:

a starting time of the DRX timer is located after a starting time of the PDCCH monitoring occasion, and an expiry time of the DRX timer is located before an ending time of the PDCCH monitoring occasion.

14. The terminal device of any one of claims 8 to 13, further comprising a processing unit; wherein the processing unit is configured to, if the PDCCH is detected by the monitoring unit in the PDCCH monitoring occasion, start or restart a DRX onDuration Timer.