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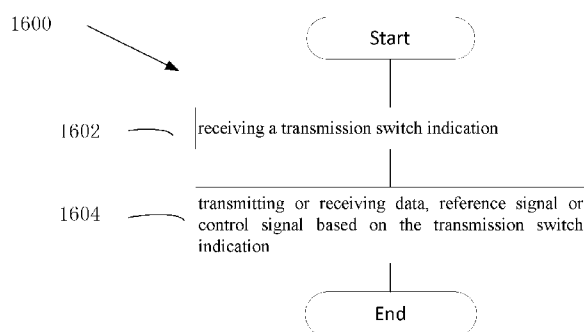


Figure 16

(57) Abstract: Methods and apparatuses for UE and base station behaviors in slot and/or symbol which are configured as transmission ON or OFF are disclosed. In one embodiment, a UE comprises a transceiver; and a processor, wherein the processor is configured to receive, via the transceiver, a transmission switch indication; and transmit or receive, via the transceiver, data, reference signal or control signal based on the transmission switch indication.



NETWORK TRANSMISSION ON AND OFF

FIELD

[0001] The subject matter disclosed herein generally relates to wireless communications, and more particularly relates to methods and apparatuses for UE and base station behaviors in slot and/or symbol which are configured as transmission ON or OFF.

BACKGROUND

[0002] The following abbreviations are herewith defined, at least some of which are referred to within the following description: New Radio (NR), Very Large Scale Integration (VLSI), Random Access Memory (RAM), Read-Only Memory (ROM), Erasable Programmable Read-Only Memory (EPROM or Flash Memory), Compact Disc Read-Only Memory (CD-ROM), Local Area Network (LAN), Wide Area Network (WAN), User Equipment (UE), Evolved Node B (eNB), Next Generation Node B (gNB), Uplink (UL), Downlink (DL), Central Processing Unit (CPU), Graphics Processing Unit (GPU), Field Programmable Gate Array (FPGA), Orthogonal Frequency Division Multiplexing (OFDM), Radio Resource Control (RRC), User Entity/Equipment (Mobile Terminal), Transmitter (TX), Receiver (RX), Frequency Division Duplex (FDD), Time Division Duplex (TDD), Downlink Control Information (DCI), Channel Occupancy Time (COT), Resource Block (RB), Slot Format Indicator (SFI), Physical Downlink Control Channel (PDCCH), Physical Downlink Shared Channel (PDSCH), subcarrier spacing (SCS), bandwidth part (BWP), Physical Broadcast Channel (PBCH), Synchronization Signal (SS), Synchronization Signal and PBCH block (SSB), monitoring occasion (MO), Demodulation Reference Signal (DMRS), Transmission Configuration Indicator (TCI), Phase Tracking Reference Signal (PTRS), Radio Network Temporary Identifier (RNTI).

[0003] In NR, slot format indicates how each of slots within frames or within super frames or symbols within a single slot is used. For TDD, there are some possible combinations of DL symbol(s), UL symbol(s), flexible symbol(s) within a slot or even longer time duration (e.g., frame). A DL symbol is used to transmit DL signals; a UL symbol is used to transmit UL signals; and a flexible symbol can be configured to a DL symbol or a UL symbol by higher layer signaling.

[0004] NR slot format indication includes cell-specific configuration (which means that all UEs in a cell are indicated with a specific slot format), UE-specific configuration (which

means each UE is indicated with a separate slot format), and DCI indication (which means that the slot format of a UE can be indicated by a DCI).

[0005] For the cell-specific configuration, the slot format is configured in a periodic manner. All UEs within a cell are cell-specifically configured with several DL slots (D1) plus several DL symbols (d1) at the beginning of a period P, and several UL symbol (u1) plus several UL slots (U1) in the end of the period P, where the remaining slots and symbols in the period P (between DL slots and/or symbols and UL slots and/or symbols) are assumed to be “flexible”. This configuration can be referred to as slot format P. As shown in Figure 1, in a DL-UL-Periodicity (P) (from slot 0 to slot n), slot 0, slot 1, ... slot k-2 (not shown) are DL slots (labeled as “nrofDLSlots (D1)”), several symbols at the beginning of slot k-1 are DL symbols (labeled as “nrofDLSyms (d1)”), several symbols in the end of slot k+1 are UL symbols (labeled as “nrofULSyms (u1)”), slot k+2 (not shown), ..., slot n-1 and slot n are UL slots (labeled as “nrofULSlots (U1)”), while several symbols in the end of slot k-1 (i.e. after DL symbols in slot k-1), all symbols in slot k, and several symbols at the beginning of slot k+1 (i.e. before UL symbols in slot k+1) are flexible symbols. Each slot (e.g. slot k-1, slot k and slot k+1) that contains flexible symbols is a flexible slot.

[0006] Optionally, for the cell-specific configuration, at most two slot formats with period of P and with period of P2 can be combined-configured. All UEs within a cell may be further cell-specifically configured with another several DL slots (D2) plus several DL symbols (d2) at the beginning of a period P2, and several UL symbol (u2) plus several UL slots (U2) in the end of the period P2, where the remaining slots and symbols (between DL slots and/or symbols and UL slots and/or symbols) in the period P2 are assumed to be “flexible”. This configuration can be referred to as slot format P2. The slot format P2 has the same structure as the slot format P, except that each of D2, d2, u2 and U2 can be configured differently from each of D1, d1, u1 and U1. Figure 2 illustrates a slot format combination with a period P (slot format P1) and another period P2 (slot format P2).

[0007] The slot format is cyclically repeated with a period of P+P2 (i.e. two slot formats P and P2) in two frames (i.e. 20ms). It implies that $20\text{ms}/(P+P2)$ should be an integer. As shown in Figure 3, the slot format combination (of two slot formats P and P2) starts from the first symbol (of the first slot) of every even frame, and cyclically repeated in two frames (i.e. in 20ms). In other words, two frames (20ms) include an integer number ($=N$) of (P+P2) period. It can be seen from Figure 3 that, in the two frames (20ms), there are several non-consecutive DL

slots/symbols (e.g. D1 and/or d1, D2 and/or d2). Hereinafter, slots/symbols mean slot(s) (e.g. D1 if d1 is configured as 0) or symbol(s) (e.g. d1 if D1 is configured as 0) or slot(s) and symbol(s) (e.g. D1 and d1). These DL slots/symbols are split by flexible slots/symbols and uplink slots/symbols. For example, DL slots/symbols (D1 and d1) and DL slots/symbols (D2 and d2) are split by flexible slots/symbols (in slot k-1, slot k and slot k+1) and uplink slots/symbols (u1 and U1).

[0008] For the UE-specific configuration, slots/symbols configured as “flexible” cell-specifically can be optionally configured to DL or UL via dedicated signaling (e.g. dedicated RRC signaling). The configured “flexible” slot is labeled via the slot index configured by higher layer. Each slot that includes flexible symbols is flexible slot. For example, in the example of Figure 1, each of slot k-1, slot k and slot k+1 is a flexible slot. The flexible slot format indication, which indicates each of the flexible symbols in a single flexible slot is a DL slot or a UL slot, is done slot by slot.

[0009] The flexible symbol(s) in a flexible slot can be indicated as all downlink symbols, all uplink symbols, or a part of uplink symbols and a part of downlink symbols. Figure 4 illustrates an example of flexible slots/symbols indication. For a particular slot, for example, slot k or slot k+1, which is configured to be the flexible slot by cell-specific signaling, in option 1, all symbols are indicated as DL symbols; in option 2, all symbols are indicated as UL symbols; and in option 3, a part of symbols are indicated as DL symbols (e.g. 8 symbols are indicated as DL symbols) and a part of symbols are indicated as UL symbols (e.g. 6 symbols are indicated as UL symbols). Note that in slot k-1 (flexible slot k-1), the first seven (7) symbols are cell-specifically configured as DL symbols. So, it is not allowed to reconfigure these seven DL symbols. For example, it is not allowed to reconfigure slot k-1 to have 8 DL symbols and 6 UL symbols.

[0010] In addition to cell-specific configuration and UE-specific configuration for slot format indication, the slot format can be dynamically indicated, e.g. by DCI format 2_0 in NR. DCI format 2_0, which is scrambled by SFI_RNTI, is used for notifying following information to UE: slot format; COT (Channel Occupancy Time) duration, available RB set, and search space set group switching. If the higher layer parameter *slotFormatCombToAddModList* is configured, slot format indicator (SFI), i.e. a bit string indicating Slot format indicator 1, Slot format indicator 2, ..., Slot format indicator N, is defined.

[0011] DCI format 2_0 includes one or multiple SFI Index fields, where each SFI Index field carries an SFI indication (i.e. an Slot Format Combination ID). As shown in Figure 5, UE is

expected to get the SFI indication (e.g. SFI Index 1) via the *positionInDCI* higher layer parameter. The value of the SFI indication (e.g. SFI Index 1) indicates an Slot Format Combination ID that indicates a combination of slot formats. For example, as shown in Figure 5, when SFI Index 1 = 2, it indicates the Slot Format Combination ID being equal to 2 that indicates a combination of slot formats 3, 3, 3, 3, 6, 7, 8 (that is configured by higher layer signaling). Each slot format is defined in TS 38.213 v15.7 Table 11.1.1-1 (only slot formats 0 to 13 are illustrated in Figure 5). For example, slot format 3 means that symbols 0 to 12 in this slot are downlink (DL) symbols and symbol 13 in this slot is flexible symbol. For another example, slot format 8 means that symbols 0 to 12 in this slot are flexible symbols and symbol 13 in this slot is uplink (UL) symbol.

[0012] Each Slot Format Combination ID indicates a combination of slot formats configured by higher layer signaling. For example, Slot Format Combination ID being equal to 2 indicates a combination of slot formats 3, 3, 3, 3, 6, 7, 8, which means that seven consecutive slots sequentially have the slot formats 3, 3, 3, 3, 6, 7, 8.

[0013] As a whole, based on at least one of cell-specific configuration, UE-specific configuration and DCI indication, an NR slot format is configured, in which slots/symbols in a time duration are configured as downlink (DL), or uplink (UL) or flexible. In DL slots/symbols, the base station (e.g. gNB) can transmit data or signal to UE(s).

[0014] Network energy saving is widely discussed. To save power from network side, some slots/symbols may be configured to OFF (maybe referred to as “switch off slots/symbols” or “mute slots/symbols”). It means that the base station (e.g. gNB) is not allowed to transmit data or signal in the DL slots/symbols that are configured to OFF, except for the signals that must be transmitted in these DL slots/symbols.

[0015] This invention targets UE and base station behaviors in slot and/or symbol which are configured as transmission ON or OFF.

BRIEF SUMMARY

[0016] Methods and apparatuses for UE and base station behaviors in slot and/or symbol which are configured as transmission ON or OFF are disclosed.

[0017] In a first solution, a UE comprises a transceiver; and a processor, wherein the processor is configured to receive, via the transceiver, a transmission switch indication; and transmit or receive, via the transceiver, data, reference signal or control signal based on the transmission switch indication.

[0018] In a second solution, the transmission switch indication is based on one of a configured subcarrier spacing, minimal subcarrier spacing of a set of bands, a subcarrier spacing used for determination slot format, a configured time unit, a configured reference numerology, and minimal numerology for a set of bands.

5 [0019] In a third solution, the processor is further configured to assume that transmission is OFF in a time duration indicated as transmission OFF by the transmission switch indication except that the time duration contains transmission of at least one of synchronization signal, broadcast signal, and paging message. It means that the processor is further configured to receive, via the transceiver, at least one of synchronization signal, broadcast signal, and paging message
10 in a time duration indicated as transmission OFF by the transmission switch indication. In particular in a fourth solution, the time duration containing transmission of at least one of synchronization signal, broadcast signal, and paging message is assumed to be transmission ON even if being indicated as transmission OFF by the transmission switch indication.

[0020] In a fifth solution, the control signal includes a time duration offset indicating a
15 time duration between the control signal and the data, the time duration offset excluding the time duration indicated as transmission OFF by the transmission switch indication.

[0021] In a sixth solution, if the time duration in which the data is to be received is indicated as transmission OFF by the transmission switch indication, the data is postponed to a next available time duration. For example, in a seventh solution, the data is postponed to a next
20 available time duration within a time slot.

[0022] In an eighth solution, the processor is configured to terminate receiving the data in the time duration that is indicated as transmission OFF by the transmission switch indication.

[0023] In a ninth solution, the processor is configured to terminate receiving the data if an unavailable time duration number or an unavailable time duration rate for the data
25 transmission is larger than a first threshold. In particular, in a tenth solution, the unavailable time duration rate for the data is determined by the unavailable time duration number, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[0024] In an eleventh solution, the TBS of the data is determined by the unavailable time
30 duration number for the data, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[0025] In a twelfth solution, the TBS of the data is determined by the maximal or minimal resource elements among resource elements corresponding to different TCI states.

[0026] In a thirteenth solution, the processor is further configured to monitor a search space of the control signal even if a resource of the search space is overlapped in time domain with the time duration indicated as transmission OFF by the transmission switch indication.

[0027] In a fourteenth solution, the reference signal in a time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration. For example, in a fifteenth solution, the reference signal is postponed to a next available time duration within a time slot.

[0028] In a sixteenth solution implementation of the UE, the processor is configured to terminate receiving the reference signal in a time duration indicated as transmission OFF by the transmission switch indication. In particular, in a seventeenth solution, the processor is configured to terminate receiving a reference signal pair if the time duration for any of the reference signal pair transmission is indicated as transmission OFF by the transmission switch indication.

[0029] In an eighteenth solution, the processor is configured to terminate receiving the reference signal if the unavailable time duration number or an unavailable time duration rate for the reference signal transmission is larger than a second threshold.

[0030] In a nineteenth solution, depending on the available time duration number for the reference signal transmission, the processor is configured to terminate receiving the reference signal in a time duration indicated as transmission OFF by the transmission switch indication, or the reference signal transmission is postponed to a next available time duration within a time slot.

[0031] In a twentieth solution, the reference signal is received from a start time duration with a time interval, and the reference signal reception in the time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration.

[0032] In one embodiment, a method at a UE comprises receiving a transmission switch indication; and transmitting or receiving data, reference signal or control signal based on the transmission switch indication.

[0033] In another embodiment, a base unit comprises a transceiver; and a processor, wherein the processor is configured to transmit, via the transceiver, a transmission switch

indication; and transmit or receive, via the transceiver, data, reference signal or control signal based on the transmission switch indication.

[0034] In yet another embodiment, a method at a base unit comprises transmitting a transmission switch indication; and transmitting or receiving, data, reference signal or control signal based on the transmission switch indication

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] A more particular description of the embodiments briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only some embodiments, and are not therefore to be considered to be limiting of scope, the embodiments will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

[0036] Figure 1 illustrates slot format P;

[0037] Figure 2 illustrates slot format P and slot format P2;

[0038] Figure 3 illustrates slot format P and slot format P2 in a period of two frames;

[0039] Figure 4 illustrates an example of flexible slots/symbols indication;

[0040] Figure 5 illustrates an example of indicating slot format by DCI format 2_0;

[0041] Figure 6 illustrates an example of the first sub-embodiment of the first embodiment;

[0042] Figures 7(a) and 7(b) illustrate two examples of the third sub-embodiment of the first embodiment;

[0043] Figure 8 illustrates an example of one solution according to the fourth sub-embodiment of the first embodiment;

[0044] Figures 9(a) and 9(b) illustrate two examples of another solution according to the fourth sub-embodiment of the first embodiment;

[0045] Figure 10 illustrates an example of the sixth sub-embodiment of the first embodiment;

[0046] Figure 11 illustrates an example of one solution according to the third sub-embodiment of the second embodiment;

[0047] Figure 12 illustrates an example of TBS determination according to the third sub-embodiment of the second embodiment;

[0048] Figures 13(a), 13(b) and 13(c) illustrate two examples of one solution according to the fifth sub-embodiment of the second embodiment;

[0049] Figure 14 illustrates an example of another solution according to the fifth sub-embodiment of the second embodiment;

[0050] Figure 15 illustrates an example of the sixth sub-embodiment of the second embodiment;

5 [0051] Figure 16 is a schematic flow chart diagram illustrating an embodiment of a method;

[0052] Figure 17 is a schematic flow chart diagram illustrating another embodiment of a method; and

10 [0053] Figure 18 is a schematic block diagram illustrating apparatuses according to one embodiment.

[0054] DETAILED DESCRIPTION

[0055] As will be appreciated by one skilled in the art that certain aspects of the embodiments may be embodied as a system, apparatus, method, or program product. Accordingly, embodiments may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may generally all be referred to herein as a “circuit”, “module” or “system”. Furthermore, embodiments may take the form of a program product embodied in one or more computer readable storage devices storing machine-readable code, computer readable code, and/or program code, referred to hereafter as “code”.
15 The storage devices may be tangible, non-transitory, and/or non-transmission. The storage devices may not embody signals. In a certain embodiment, the storage devices only employ signals for accessing code.

[0056] Certain functional units described in this specification may be labeled as “modules”, in order to more particularly emphasize their independent implementation. For example, a module may be implemented as a hardware circuit comprising custom very-large-scale integration (VLSI) circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module may also be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.
25

30 [0057] Modules may also be implemented in code and/or software for execution by various types of processors. An identified module of code may, for instance, include one or more physical or logical blocks of executable code which may, for instance, be organized as an object,

procedure, or function. Nevertheless, the executables of an identified module need not be physically located together, but, may include disparate instructions stored in different locations which, when joined logically together, include the module and achieve the stated purpose for the module.

5 [0058] Indeed, a module of code may contain a single instruction, or many instructions, and may even be distributed over several different code segments, among different programs, and across several memory devices. Similarly, operational data may be identified and illustrated herein within modules and may be embodied in any suitable form and organized within any suitable type of data structure. This operational data may be collected as a single data set, or may
10 be distributed over different locations including over different computer readable storage devices. Where a module or portions of a module are implemented in software, the software portions are stored on one or more computer readable storage devices.

[0059] Any combination of one or more computer readable medium may be utilized. The computer readable medium may be a computer readable storage medium. The computer readable
15 storage medium may be a storage device storing code. The storage device may be, for example, but need not necessarily be, an electronic, magnetic, optical, electromagnetic, infrared, holographic, micromechanical, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing.

[0060] A non-exhaustive list of more specific examples of the storage device would
20 include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, random access memory (RAM), read-only memory (ROM), erasable programmable read-only memory (EPROM or Flash Memory), portable compact disc read-only memory (CD-ROM), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer-readable storage
25 medium may be any tangible medium that can contain or store a program for use by or in connection with an instruction execution system, apparatus, or device.

[0061] Code for carrying out operations for embodiments may include any number of lines and may be written in any combination of one or more programming languages including an object-oriented programming language such as Python, Ruby, Java, Smalltalk, C++, or the
30 like, and conventional procedural programming languages, such as the "C" programming language, or the like, and/or machine languages such as assembly languages. The code may be executed entirely on the user's computer, partly on the user's computer, as a stand-alone software

package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the very last scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through
5 the Internet using an Internet Service Provider).

[0062] Reference throughout this specification to “one embodiment”, “an embodiment”, or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, appearances of the phrases “in one embodiment”, “in an embodiment”, and similar language throughout this
10 specification may, but do not necessarily, all refer to the same embodiment, but mean “one or more but not all embodiments” unless expressly specified otherwise. The terms “including”, “comprising”, “having”, and variations thereof mean “including but are not limited to”, unless otherwise expressly specified. An enumerated listing of items does not imply that any or all of the items are mutually exclusive, otherwise unless expressly specified. The terms “a”, “an”, and
15 “the” also refer to “one or more” unless otherwise expressly specified.

[0063] Furthermore, described features, structures, or characteristics of various embodiments may be combined in any suitable manner. In the following description, numerous specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules,
20 hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments. One skilled in the relevant art will recognize, however, that embodiments may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid any obscuring of aspects of an embodiment.

[0064] Aspects of different embodiments are described below with reference to
25 schematic flowchart diagrams and/or schematic block diagrams of methods, apparatuses, systems, and program products according to embodiments. It will be understood that each block of the schematic flowchart diagrams and/or schematic block diagrams, and combinations of blocks in the schematic flowchart diagrams and/or schematic block diagrams, can be implemented by code.
30 This code may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which are executed via the processor of the computer or other programmable data

processing apparatus, create means for implementing the functions specified in the schematic flowchart diagrams and/or schematic block diagrams for the block or blocks.

[0065] The code may also be stored in a storage device that can direct a computer, other programmable data processing apparatus, or other devices, to function in a particular manner, such that the instructions stored in the storage device produce an article of manufacture including instructions which implement the function specified in the schematic flowchart diagrams and/or schematic block diagrams block or blocks.

[0066] The code may also be loaded onto a computer, other programmable data processing apparatus, or other devices, to cause a series of operational steps to be performed on the computer, other programmable apparatus or other devices to produce a computer implemented process such that the code executed on the computer or other programmable apparatus provides processes for implementing the functions specified in the flowchart and/or block diagram block or blocks.

[0067] The schematic flowchart diagrams and/or schematic block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of apparatuses, systems, methods and program products according to various embodiments. In this regard, each block in the schematic flowchart diagrams and/or schematic block diagrams may represent a module, segment, or portion of code, which includes one or more executable instructions of the code for implementing the specified logical function(s).

[0068] It should also be noted that in some alternative implementations, the functions noted in the block may occur out of the order noted in the Figures. For example, two blocks shown in succession may substantially be executed concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more blocks, or portions thereof, to the illustrated Figures.

[0069] Although various arrow types and line types may be employed in the flowchart and/or block diagrams, they are understood not to limit the scope of the corresponding embodiments. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the depicted embodiment. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted embodiment. It will also be noted that each block of the block diagrams and/or flowchart diagrams, and combinations of blocks in the block diagrams and/or flowchart diagrams, can be implemented by special

purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and code.

[0070] The description of elements in each Figure may refer to elements of proceeding figures. Like numbers refer to like elements in all figures, including alternate embodiments of like elements.

[0071] As mentioned in the background part, some DL slots/symbols may be configured to OFF to save power from network side. The base station (e.g. gNB) indicates to the UE(s) which DL slot(s)/symbol(s) are configured to OFF, and which DL slot(s)/symbol(s) are configured to ON. Such indication can be referred to as DL transmission ON/OFF indication.

[0072] In order to save network energy for reception, some UL slots/symbols may also be configured to OFF (i.e. UL transmission OFF). Similar to DL transmission ON/OFF indication, the gNB may indicate to the UE(s) which UL slot(s)/symbol(s) are configured to OFF, and which UL slot(s)/symbol(s) are configured to ON. Such indication can be referred to as UL transmission ON/OFF indication.

[0073] The DL transmission ON/OFF indication and the UL transmission ON/OFF indication can be collectively referred to as transmission ON/OFF indication.

[0074] Incidentally, if a slot or a symbol configured as transmission OFF (either DL transmission OFF or UL transmission OFF), it is expected that no transmission or reception is in the slot or the symbol.

[0075] In the following description, ‘data transmission’ may refer to data transmission on downlink from base station (e.g. gNB) to UE, or data transmission on uplink from UE to base station. The data transmission from base station to UE can be regarded as data reception at UE side. However, the data transmission from base station to UE can be also regarded as data transmission (by base station) from UE point of view.

[0076] The transmission ON/OFF indication can be made slot-based and/or symbol-based or based on other time units.

[0077] A first embodiment relates to UE and base station behaviors in slot-based transmission ON/OFF indication.

[0078] As disclosed in a previous application PCT/CN2021/123982 owned by the same applicant, the slot-based DL transmission ON/OFF indication only counts the downlink slot(s) and the flexible slot(s) (which means that the uplink slot(s) are not counted in the slot-based DL transmission ON/OFF indication). Similarly, the slot-based UL transmission ON/OFF indication

only counts the uplink slot(s) and the flexible slot(s) (which means that the downlink slot(s) are not counted in the slot-based UL transmission ON/OFF indication).

[0079] A first sub-embodiment of the first embodiment is related to the time interval (or time granularity) (e.g. SCS) used for determining slot-based transmission ON/OFF.

[0080] According to the first sub-embodiment of the first embodiment, the time interval used for determining slot-based transmission ON/OFF can be based on a configured reference SCS (e.g. 15KHz) or based on the minimal SCS for all configured BWPs or based on a configured time unit (e.g. time granularity of 1ms). The configured reference SCS can be a RRC configured parameter or contained in SIB message.

[0081] The SCS (subcarrier spacing, Δf) has a relation with the numerology μ for a bandwidth part (BWP) as shown in Table 1.

μ	$\Delta f = 2^{\mu} * 15 [\text{kHz}]$
0	15
1	30
2	60
3	120
4	240

Table 1

[0082] So, the configured reference SCS or the minimal SCS for all configured BWPs can be represented by a configured reference numerology, or the minimal numerology for all configured BWPs.

[0083] Figure 6 illustrates an example of the first sub-embodiment of the first embodiment. As shown in Figure 6, the SCS (e.g. SCS#1) for BWP#1 is 30KHz, and the SCS (e.g. SCS#2) for BWP#2 is 15KHz. According to the first sub-embodiment, the SCS used for determining slot-based transmission ON/OFF is 15KHz (which can be a configured reference SCS, or which can be the minimal SCS for BWP#1 and BWP#2).

[0084] Transmission ON and OFF can be configured in several consecutive slots. For example, within the consecutive slots, some slot(s) may be configured as transmission OFF. In particular, in a period of X consecutive slots, the Y^{th} symbol within the period of X can be configured as transmission OFF. As shown in Figure 6, if slot index $\#n \bmod X = Y$ is configured as Transmission OFF based on SCS=15KHz and X=5 and Y=3, then, for BWP#2 with SCS#2 of 15KHz, slot 3 is Transmission OFF according to the configuration. On the other hand, for BWP#1 with SCS#1 of 30KHz, the slot 3 in BWP#2 correspond to slot 6 and slot 7 in BWP#1 in time domain. Therefore, according to the first sub-embodiment of the first embodiment, slot 6

and slot 7 in BWP#1 with SCS#1 of 30KHz are Transmission OFF according to the configuration.

[0085] For FDD, the slot-based UL transmission ON/OFF and the slot-based DL transmission ON/OFF are separately configured. It means that the SCS used for determining slot-based DL transmission ON/OFF and the SCS used for determining slot-based UL transmission ON/OFF are separately configured.

[0086] For TDD, the time domain boundaries in UL-DL pattern are determined according to a configured SCS. Accordingly, the reference SCS used for determination slot transmission ON/OFF can be the same as the configured SCS used to determine time domain boundaries in UL-DL pattern in consideration of signaling overhead and alignment with TDD slot formation configuration. So, the same numerology is aligned with the TDD slot format configuration.

[0087] A second sub-embodiment of the first embodiment relates to whether synchronization signal, broadcast signal and paging message (e.g. SSB, i.e. SS/PBCH block) are transmitted in a slot that is configured as transmission OFF (e.g. DL transmission OFF).

[0088] According to the second sub-embodiment of the first embodiment, SS/PBCH block is transmitted in a slot (e.g. DL slot) even if the slot is configured as transmission OFF (e.g. DL transmission OFF). In other words, the slot configured as transmission OFF is assumed to terminate all downlink transmission except that the slot contains transmission of synchronization signal, broadcast signal and/or paging message (e.g. SS, PBCH block and/or SIB1).

[0089] More specifically, a slot corresponding to SS/PBCH blocks with candidate SS/PBCH block indices corresponding to the SS/PBCH block indexes indicated to a UE by *ssb-PositionsInBurst* in *SIB1*, or by *ssb-PositionsInBurst* in *ServingCellConfigCommon* is assumed as transmission ON which overrides the transmission ON/OFF configuration.

[0090] From UE point of view, the UE is not expected to terminate the reception of SS, PBCH block, and/or SIB1 in a slot configured as transmission OFF.

[0091] Moreover, in a variety of the second sub-embodiment of the first embodiment, if there is any DL signal scheduled in a slot, the slot is assumed as transmission ON which overrides the transmission ON/OFF configuration.

[0092] A third sub-embodiment of the first embodiment relates to PDSCH transmission scheduled in slot(s) being indicated as transmission OFF (e.g. DL transmission OFF).

[0093] A control signal (e.g. DCI) transmitted in slot N schedules a PDSCH transmission with a scheduling offset (or slot time offset) K_0 . It means that the PDSCH transmission will be transmitted in slot $N+K_0$. If there are any slot(s) indicated as DL transmission OFF between slots $N+1$ and $N+K_0-1$, it is necessary to specify the slot(s) in which the PDSCH transmission will be transmitted. At least two solutions 131 and 132 are proposed.

[0094] Solution 131: the slot(s) configured as transmission OFF are not counted in the slot time offset K_0 .

[0095] Solution 132: both the slot(s) configured as transmission ON and the slot(s) configured as transmission OFF are counted in the slot time offset K_0 . However, If the target slot (i.e. slot $N+K_0$) determined according to the scheduling slot (i.e. N) and the scheduling offset (i.e. K_0) is configured as transmission OFF, the PDSCH transmission will be postponed to be transmitted in the first available slot (e.g. the first available DL slot, or the first DL slot configured as transmission ON).

[0096] Figures 7(a) and 7(b) illustrates two examples of the third sub-embodiment of the first embodiment. DCI is transmitted in slot 0 (e.g. $N=0$). The scheduling offset is 3 slots (e.g. $K_0=4$). So, the PDSCH transmission is scheduled to be transmitted in slot 4 ($= N+K_0 = 0+4$). Slot 3 and slot 4 are configured as transmission OFF.

[0097] As shown in Figure 7(a), according to Solution 131, both slot 3 and slot 4 are not counted in the scheduling offset K_0 . So, the scheduling offset ($=4$ slots) includes slot 0, slot 1, slot 2 and slot 5. So, according to Solution 131, the PDSCH transmission is transmitted in slot 6.

[0098] As shown in Figure 7(b), according to Solution 132, the scheduling offset ($=4$ slots) includes slot 0, slot 1, slot 2 and slot 3. The target slot is slot 4, which is configured as transmission OFF. So, according to Solution 132, the PDSCH transmission is postponed to be transmitted in the first available slot (after slot 4), that is slot 5.

[0099] A fourth sub-embodiment of the first embodiment relates to PDSCH transmission with repetition scheduled in slot(s) being indicated as DL transmission OFF.

[00100] PDSCH transmission with repetition was scheduled. The repetition number is configured as N, where $N>1$. That is, N PDSCH transmission occasions are to be transmitted in N consecutive slots. Each of the N slots is referred to as a target slot. A PDSCH transmission occasion is to be transmitted in a target slot. Within the N slots, some slot(s) are configured as DL transmission OFF.

[00101] Solution 141: If a target slot is PDSCH transmission as DL transmission OFF, the PDSCH transmission occasion to be transmitted in the target slot is postponed to be transmitted in the next available slot (e.g. the next available DL slot). In other words, the slot(s) indicated as DL transmission OFF are not counted in the PDSCH transmission occasions or not counted in the PDSCH transmission repetition.

[00102] Figure 8 illustrates an example of Solution 141 according to the fourth sub-embodiment of the first embodiment. A PDSCH transmission with 4 repetitions is scheduled to be transmitted in slots 2 to 5. Slots 3 and 4 are configured as transmission OFF. Accordingly, Slots 3 and 4 are not counted in the PDSCH transmission occasions. So, the PDSCH transmission with 4 repetitions will be transmitted in Slot 2, Slot 5, Slot 6 and Slot 7.

[00103] Solution 142: If a target slot is PDSCH transmission as transmission OFF, the PDSCH transmission occasion to be transmitted in the target slot is dropped or punctured (i.e. not transmitted). In addition, if the dropping rate is larger than a threshold (e.g. larger than 60% of the configured repetition number) for the scheduled PDSCH transmission with repetition, the whole scheduled PDSCH transmission is dropped or punctured (i.e. not transmitted).

[00104] Figures 9(a) and 9(b) illustrates two examples of Solution 142 according to the fourth sub-embodiment of the first embodiment.

[00105] In Figure 9(a), a PDSCH transmission with 4 repetitions is scheduled to be transmitted in slots 2 to 5. Slots 3 and 4 are configured as transmission OFF. Accordingly, the PDSCH transmission occasions to be transmitted in slot 3 and slot 4 are dropped. The dropping rate is equal to $2/4 = 50\%$, which is not larger than 60% of the configured repetition number. So, the PDSCH transmission occasions to be transmitted in slot 2 and slot 5 are transmitted.

[00106] In Figure 9(b), a PDSCH transmission with 8 repetitions is scheduled to be transmitted in slots 2 to 9. Slots 3 and 4 are configured as transmission OFF. Slots 6 to 9 are configured as UL slots. So, the PDSCH transmission occasions to be transmitted in slot 3, slot 4 and slots 6 to 9 are dropped. The dropping rate is equal to $6/8 = 75\%$, which is larger than 60% of the configured repetition number. So, the whole PDSCH transmission is dropped, which means that in addition to the PDSCH transmission occasions to be transmitted in slot 3, slot 4 and slots 6 to 9 being dropped, the PDSCH transmission occasions to be transmitted in slot 2 and slot 5 are dropped.

[00107] If the whole scheduled PDSCH transmission is dropped due to larger dropping rate, the waste of unnecessary power consumption by gNB can be prevented. For

example, in the example of Figure 9(b), only two occasions of the PDSCH transmission with 8 repetitions can be transmitted. If the two occasions are transmitted, there is a high possibility that the PDSCH transmission cannot be successfully received, which would cause that the power consumption by gNB for transmitting the two occasions will be wasted. In this condition, if the two occasions are not transmitted (i.e. dropped), the waste of unnecessary power consumption by gNB can be prevented.

[00108] The dropping of the whole scheduled PDSCH transmission can be determined according to other criteria as described below.

[00109] Criterion 11: available slot rate, which means the rate of the number of slot(s) in which the scheduled PDSCH transmission can be transmitted (e.g. 2 slots in Figure 9(b)) relative to the number of slots in which the PDSCH transmission is scheduled to be transmitted (e.g. 8 slots in Figure 9(b)). If the available slot rate is smaller than an available slot rate threshold, the whole scheduled PDSCH transmission is dropped or punctured (i.e. not transmitted). Take Figure 9(b) as an example, the available slot rate (which is $2/8 = 0.25$) is smaller than an available slot threshold rate (e.g. 0.4), the whole scheduled PDSCH transmission is dropped.

[00110] Criterion 12: actual number of transmission slot(s), which means the number of slot(s) in which the scheduled PDSCH transmission can be transmitted (e.g. 2 slots in Figure 9(b)). If the actual number of transmission slot(s) is smaller than an actual number of transmission slots threshold, the whole scheduled PDSCH transmission is dropped or punctured (i.e. not transmitted). Take Figure 9(b) as an example, the actual number of transmission slot(s) (which is 2) is smaller than an actual number of transmission slots threshold (e.g. 3), the whole scheduled PDSCH transmission is dropped. The actual number of transmission slot(s) can be alternatively referred to as actual number of PDSCH transmission occasion(s), or actual repetition number.

[00111] A fifth sub-embodiment of the first embodiment relates to paging monitoring related to slot(s) being indicated as transmission OFF.

[00112] The UE monitors paging message in monitoring occasions (MOs), where each MO can be configured in several consecutive symbols (e.g. 3 symbols). If any slot in which an MO is located is configured as transmission OFF, different solutions are proposed regarding the MO.

[00113] Solution 151: In order to be compatible with legacy UE (e.g., UE based on NR Release 17), paging message is expected to be transmitted in an MO even if any slot in which the MO is located is configured as transmission OFF. That is, UE is not expected to terminate the reception of MO (i.e. UE continues to monitor MO) in slot configured as transmission OFF.

[00114] Solution 152: UE is not expected to monitor MO (or receive paging message) in any slot configured as transmission OFF.

[00115] Solution 153: The paging message is not transmitted in any slot configured as transmission OFF. If any slot in which an MO is located is configured as transmission OFF, the paging message to be transmitted in the MO is postponed to be transmitted in a next available MO.

[00116] A sixth sub-embodiment of the first embodiment relates to UE-specific PDCCH monitoring related to slot(s) being indicated as transmission OFF.

[00117] UE is not expected to monitor (i.e. UE terminates monitoring or stops monitoring) the PDCCH candidates or the search space, if the coreset of the PDCCH candidates or the search space is overlapped in time domain with slot configured as transmission OFF.

[00118] Figure 10 illustrates an example of the sixth sub-embodiment of the first embodiment. Slot 3 and slot 4 are configured as transmission OFF. So, the coreset of the PDCCH candidate in slot 4 in search space#0 is overlapped with slot 4 configured as transmission OFF. So, the PDCCH candidate in slot 4 in search space#0 is not monitored by the UE. Similarly, the coreset of the PDCCH candidate in the slot 3 in search space#1 is overlapped with slot 3 configured as transmission OFF. So, the PDCCH candidate in the slot 3 in search space#1 is not monitored by the UE.

[00119] A seventh sub-embodiment of the first embodiment relates to reference signal reception related to slot(s) being indicated as DL transmission OFF.

[00120] UE is not expected to receive (i.e. UE terminates receiving or UE stops receiving) reference signal (e.g. DMRS, PTRS) in slot configured as DL transmission OFF.

[00121] A second embodiment relates to UE and base station behaviors in symbol-based transmission ON/OFF indication.

[00122] In a first sub-embodiment of the second embodiment, the time interval used for determining symbol-based transmission ON/OFF is based on a configured reference SCS (e.g. 15KHz) or a configured time unit (e.g. time granularity of 1ms) or a configured

numerology (e.g. numerology $\mu = 0$) or based on the minimal SCS or minimal numerology for all configured BWPs.

[00123] A second sub-embodiment of the second embodiment relates to whether synchronization signal, broadcast signal and paging message (e.g. SS/PBCH block) are transmitted in a symbol that is configured transmission OFF.

[00124] According to the second sub-embodiment of the second embodiment, SS/PBCH block is transmitted in a symbol (e.g. DL symbol) even if the symbol is configured as transmission OFF. In other words, UE is not expected to terminate the reception (i.e. UE continues reception) of SS, PBCH block and/or SIB1 in symbols configured as transmission OFF.

[00125] Moreover, in a variety of the second sub-embodiment of the second embodiment, if there is any DL signal scheduled in a symbol, the symbol is assumed as transmission ON which overrides the transmission ON/OFF configuration.

[00126] A third sub-embodiment of the second embodiment relates to PDSCH transmission scheduled in symbols(s) being indicated as DL transmission OFF. At least different solutions 231 and 232 are proposed.

[00127] Solution 231: if a symbol in which the PDSCH transmission is scheduled to be transmitted is configured as transmission OFF, the PDSCH transmission scheduled in the symbol is postponed to next available symbol (e.g. a next DL symbol configured as transmission ON) within the slot until the end of the slot. If there are not enough available symbol(s) within the slot for the symbol(s) configured as transmission OFF, the remaining symbol(s), each of which is without an available symbol within the slot, are dropped.

[00128] Figure 11 illustrates an example of Solution 231 according to the third sub-embodiment of the second embodiment. Suppose PDSCH transmission is scheduled to be transmitted in 4 symbols (i.e. $L=4$) in slot 1, starting from symbol 9 (i.e. $S=9$). That is, the PDSCH transmission shall be transmitted in symbols 9 to 12 of slot 1. It is supposed that symbols 11 and 12 are configured as transmission OFF. Accordingly, the PDSCH transmission cannot be transmitted in symbols 11 and 12. So, the PDSCH transmission scheduled in symbol 11 will be postponed to symbol 13 (the next available symbol in slot 1). On the other hand, the PDSCH transmission scheduled in symbol 12 will be dropped (or punctured), since there is no available symbol for symbol 12 within slot 1 (considering that symbol 13 is the last symbol (i.e. the end) of slot 1).

[00129] Solution 232: if a symbol in which the PDSCH transmission is scheduled to be transmitted is configured as transmission OFF, the PDSCH transmission scheduled in the symbol is dropped. In addition, if the dropping rate is larger than a threshold for the scheduled PDSCH transmission in one slot, the whole PDSCH transmission is dropped.

5 [00130] The dropping of the whole scheduled PDSCH transmission can be determined according to other criteria as described below.

[00131] Criterion 21: available symbol rate, which means the rate of the number of symbol(s) in which the scheduled PDSCH transmission can be transmitted relative to the number of symbols in which the PDSCH transmission is scheduled to be transmitted. If the available
10 symbol rate is smaller than an available symbol rate threshold, the whole scheduled PDSCH transmission is dropped or punctured (i.e. not transmitted).

[00132] Criterion 22: actual number of transmission symbol(s), which means the number of symbol(s) in which the scheduled PDSCH transmission can be transmitted. If the actual number of transmission symbol (s) is smaller than an actual number of transmission
15 symbols threshold, the whole scheduled PDSCH transmission is dropped or punctured (i.e. not transmitted).

[00133] Criterion 23: actual code rate. The code rate is determined according to the number of transmission symbols. If some symbols are configured as transmission OFF, the code rate will be increased. If the actual code rate is larger than an actual code rate threshold (e.g. 0.93
20 which implies decoding is not possible), the whole scheduled PDSCH transmission is dropped or punctured (i.e. not transmitted).

[00134] According to TS38.214 section 5.1.3.2, a UE determines the number of REs allocated for PDSCH within a PRB (N'_{RE}) by $N'_{RE} = N_{sc}^{RB} \cdot N_{symp}^{sh} - N_{DMRS}^{PRB} - N_{oh}^{PRB}$, where $N_{sc}^{RB} = 12$ is the number of subcarriers in a physical resource block, N_{symp}^{sh} is the number of
25 symbols of the PDSCH allocation within the slot, N_{DMRS}^{PRB} is the number of REs for DM-RS per PRB in the scheduled duration including the overhead of the DM-RS CDM groups without data, as indicated by DCI format 1_1 or as described for format 1_0 in Subclause 5.1.6.2, and N_{oh}^{PRB} is the overhead configured by higher layer parameter *xOverhead* in *PDSCH-ServingCellConfig*. If the *xOverhead* in *PDSCH-ServingCellconfig* is not configured (a value from 0, 6, 12, or 18), the
30 N_{oh}^{PRB} is set to 0. If the PDSCH is scheduled by PDCCH with a CRC scrambled by SI-RNTI, RA-RNTI or P-RNTI, N_{oh}^{PRB} is assumed to be 0.

[00135] According to the third sub-embodiment of the second embodiment, the number of symbols (N_{off}) configured as transmission OFF within the time domain allocation shall be subtracted for TBS determination. It means that the above mentioned equation is amended to

$$N'_{RE} = N_{sc}^{RB} \cdot (N_{symp}^{sh} - N_{off}) - N_{DMRS}^{PRB} - N_{oh}^{PRB}, \text{ where } N_{off} \text{ is the number of symbols configured as}$$

5 transmission OFF.

[00136] For PDSCH transmission with repetition number larger than 1 (e.g. repetition number is equal to 2), two PDSCHs are transmitted from two TRPs of a serving cell, where a first PDSCH is transmitted from TRP#1 by applying a first TCI state and a second PDSCH is transmitted from TRP#2 by applying a second TCI state, and the first PDSCH and the
10 second PDSCH are scheduled to be transmitted in a TDM manner, i.e. the first PDSCH and the second PDSCH are transmitted with the same number of symbols in one slot while the symbols in which the first PDSCH is transmitted is different from (i.e. not overlapped with) the symbols in which the second PDSCH is transmitted. Some symbols in the one slot may be configured as transmission OFF. In this condition, the TBS calculation is determined by the maximal or
15 minimal available symbols between the 2 PDSCHs corresponding to 2 TCI states.

[00137] Figure 12 illustrates an example of the third sub-embodiment of the second embodiment. A PDSCH with 2 repetitions (i.e. PDSCH#1 and PDSCH#2) is scheduled to be transmitted in one slot. Each of PDSCH#1 (i.e. PDSCH corresponding to the first TCI state) and PDSCH#2 (i.e. PDSCH corresponding to the second TCI state) is transmitted in 5 symbols
20 in the one slot. PDSCH#1 is transmitted in symbols 2 to 6, PDSCH#2 is transmitted in symbols 9 to 13. Slots 3 and 4 are configured as transmission OFF. So, the actual symbols for transmitting PDSCH#1 is 3 (the minimal available symbols), and the actual symbols for transmitting PDSCH#2 is 5 (the maximal available symbols). According to the third sub-embodiment of the second embodiment, the TBS calculation for the PDSCH with 2 repetitions is determined by the
25 maximal or minimal available symbols between PDSCH#1 and PDSCH#2 (i.e. 5 symbols or 3 symbols).

[00138] A fourth sub-embodiment of the second embodiment relates to PDCCH monitoring related to symbol(s) being indicated as DL transmission OFF.

[00139] UE is not expected to monitor the PDCCH candidates or the search space,
30 if any symbols of the coresets of the PDCCH candidates or the search space are overlapped in time domain with symbol configured as transmission OFF.

[00140] A fifth sub-embodiment of the second embodiment relates to DMRS related to symbol(s) being indicated as transmission OFF.

[00141] Solution 251: the DMRS transmission in the symbol configured as transmission OFF is postponed to the next available symbol(s). Solution 251 may apply to PDSCH mapping type B.

[00142] Figure 13(a), 13(b) and 13(c) illustrate three examples of Solution 251 according to the fifth sub-embodiment of the second embodiment. In Figure 13(a), DMRS is scheduled to be transmitted in symbols l_0 , 4 and 7 (PDSCH mapping type B) within 10 symbols ($L=10$), in which l_0 is the first symbol the PDSCH is scheduled (symbol 2 in Figure 13(a), symbols 4 and 7 are counted from the first symbol (symbol 2) the PDSCH is scheduled (i.e. actual symbols 6 ($=2+4$) and 9 ($=2+7$)). Due to symbol 6 being configured as transmission OFF, the DMRS (e.g. single symbol DMRS) transmission in symbol 6 is postponed to the next available symbol (i.e. symbol 7).

[00143] In Figure 13(b), DMRS is scheduled to be transmitted in symbols l_0 and 2 (PDSCH mapping type B) within 4 symbols ($L=4$), in which l_0 is the first symbol the PDSCH is scheduled (symbol 5 in Figure 13(b), symbol 2 is counted from the first symbol (symbol 5) the PDSCH is scheduled (i.e. actual symbol 7 ($=5+2$)). Symbol is being configured as transmission OFF. In the example of Figure 13(b), PDSCH transmission is postponed due to slot 6. It means that the four slots for PDSCH transmission will be slot 5, slot 7, slot 8 and slot 9. So, the DMRS transmission in slot 7 is also postponed to slot 8 because slot 6 being configured as transmission OFF is not counted in the calculation of the position of DMRS symbol.

[00144] In Figure 13(c), double symbol DMRS is scheduled to be transmitted in symbols 5 and 6. Due to symbol 6 being configured as transmission OFF, double symbol DMRS transmission in symbols 5 and 6 is postponed to the next available symbols (i.e. symbols 7 and 8).

[00145] Solution 252: the DMRS transmission in the symbol configured as transmission OFF is dropped. For double symbol DMRS, the double symbol DMRS transmission is dropped if any of the DMRS symbols is configured as transmission OFF. In addition, if the available DMRS number is smaller than a threshold (e.g. 1), the whole TB transmission is dropped. Solution 252 may apply to PDSCH mapping type A.

[00146] Figure 14 illustrates an example of Solution 252 according to the fifth sub-embodiment of the second embodiment. In Figure 14, DMRS is scheduled to be transmitted in symbols l_0 , 6 and 9 (PDSCH mapping type A) within 10 symbols ($L=10$), in which l_0 is the first

symbol the PDSCH is scheduled (symbol 2 in Figure 13(a), symbols 6 and 9 are actual symbols 6 and 9. Due to symbol 6 being configured as transmission OFF, the DMRS transmission in symbol 6 is dropped. Since there are still two (2) DMRS transmissions (i.e. in slot 2 and in slot 9), the TB transmission in the slot is maintained (not dropped).

5 [00147] Solution 253: The behavior is determined by the available DMRS symbols in a slot. For example, suppose the DMRS (single symbol DMRS or double symbol DMRS) transmission in the symbol configured as transmission OFF is dropped (the double symbol DMRS transmission is dropped if any of the DMRS symbols is configured as transmission OFF), the number of the symbol(s) in which the DMRS transmission is possible (referred to as
10 available DMRS symbol(s)) is calculated. If the number of the available DMRS symbol(s) is larger than or equal to a dropping threshold (e.g. 1), the DMRS transmission in the symbol configured as transmission OFF is dropped (e.g. according to Solution 252). On the other hand, if the number of the available DMRS symbol(s) is smaller than the dropping threshold, the first
15 DMRS (single symbol DMRS or double symbol DMRS) transmission in the symbol configured as transmission OFF is postponed to the next available symbol(s) (e.g. according to Solution 251).

 [00148] A sixth sub-embodiment of the second embodiment relates to PTRS related to symbol(s) being indicated as DL transmission OFF.

 [00149] From the start symbol of PDSCH, the interval of PTRS is configured as 1
20 or 2 or 4}. If PTRS in target symbol is overlapping with symbol configured as transmission OFF, the PTRS is restarted in the next available symbol.

 [00150] Figure 15 illustrates an example of the sixth sub-embodiment of the second embodiment. The interval of PTRS is configured as 4 symbols. When there is no symbol configured as transmission OFF, the PTRS symbols are symbols 4, 8 and 13. Symbol 0 is DMRS.
25 The 4th symbol counted from symbol 1 is PTRS (in symbol 4). The 4th symbol counted from symbol 5 is PTRS (in symbol 8). Symbol 9 is DMRS. The 4th symbol counted from symbol 10 is PTRS (in symbol 13). If symbol 4 is configured as transmission OFF. Symbol 0 is DMRS. The 4th symbol counted from symbol 1 is symbol 4 which is configured as transmission OFF. So, PTRS is restarted in the next available symbol (i.e. symbol 5). The 4th symbol counted from
30 symbol 6 is DMRS (in symbol 9). The 4th symbol counted from symbol 10 is PTRS (in symbol 13).

[00151] Figure 16 is a schematic flow chart diagram illustrating an embodiment of a method 1600 according to the present application. In some embodiments, the method 1600 is performed by an apparatus, such as a remote unit (UE). In certain embodiments, the method 1600 may be performed by a processor executing program code, for example, a microcontroller, a microprocessor, a CPU, a GPU, an auxiliary processing unit, a FPGA, or the like.

[00152] The method 1600 may include 1602 receiving a transmission switch indication; and 1604 transmitting or receiving data, reference signal or control signal based on the transmission switch indication.

[00153] In a first implementation of the method 1600, the transmission switch indication is based on one of a configured subcarrier spacing, minimal subcarrier spacing of a set of bands, a subcarrier spacing used for determination slot format, a configured time unit, a configured reference numerology, and minimal numerology for a set of bands.

[00154] In a second implementation of the method 1600, it is assumed that transmission is OFF in a time duration indicated as transmission OFF by the transmission switch indication except that the time duration contains transmission of at least one of synchronization signal, broadcast signal, and paging message. It means the method comprises receiving at least one of synchronization signal, broadcast signal, and paging message in a time duration indicated as transmission OFF by the transmission switch indication. In particular, the time duration containing transmission of at least one of synchronization signal, broadcast signal, and paging message is assumed to be transmission ON even if being indicated as transmission OFF by the transmission switch indication.

[00155] In a third implementation of the method 1600, the control signal includes a time duration offset indicating a time duration between the control signal and the data, the time duration offset excluding the time duration indicated as transmission OFF by the transmission switch indication.

[00156] In a fourth implementation of the method 1600, if the time duration in which the data is to be received is indicated as transmission OFF by the transmission switch indication, the data is postponed to a next available time duration. For example, the data is postponed to a next available time duration within a time slot.

[00157] In a fifth implementation of the method 1600, the method comprises terminating receiving the data in the time duration that is indicated as transmission OFF by the transmission switch indication.

[00158] In a sixth implementation of the method 1600, the method comprises terminating receiving the data if an unavailable time duration number or an unavailable time duration rate for the data transmission is larger than a first threshold. In particular, the unavailable time duration rate for the data is determined by the unavailable time duration number, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00159] In a seventh implementation of the method 1600, the TBS of the data is determined by the unavailable time duration number for the data, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00160] In an eighth implementation of the method 1600, the TBS of the data is determined by the maximal or minimal resource elements among resource elements corresponding to different TCI states.

[00161] In a ninth implementation of the method 1600, the method further comprises monitoring a search space of the control signal even if a resource of the search space is overlapped in time domain with the time duration indicated as transmission OFF by the transmission switch indication.

[00162] In a tenth implementation of the method 1600, the reference signal in a time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration. For example, the reference signal is postponed to a next available time duration within a time slot.

[00163] In an eleventh implementation of the method 1600, the method comprises terminating receiving the reference signal in a time duration indicated as transmission OFF by the transmission switch indication. In particular, the method comprises terminating receiving a reference signal pair if the time duration for any of the reference signal pair transmission is indicated as transmission OFF by the transmission switch indication.

[00164] In a twelfth implementation of the method 1600, the method comprises terminating receiving the reference signal if the unavailable time duration number or an unavailable time duration rate for the reference signal transmission is larger than a second threshold.

[00165] In a thirteenth implementation of the method 1600, depending on the available time duration number for the reference signal transmission, the method comprises terminating receiving the reference signal in a time duration indicated as transmission OFF by

the transmission switch indication, or the reference signal transmission is postponed to a next available time duration within a time slot.

[00166] In a fourteenth implementation of the method 1600, the reference signal is received from a start time duration with a time interval, and the reference signal reception in the time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration.

[00167] Figure 17 is a schematic flow chart diagram illustrating a further embodiment of a method 1700 according to the present application. In some embodiments, the method 1700 is performed by an apparatus, such as a base unit. In certain embodiments, the method 1700 may be performed by a processor executing program code, for example, a microcontroller, a microprocessor, a CPU, a GPU, an auxiliary processing unit, a FPGA, or the like.

[00168] The method 1700 may include 1702 transmitting a transmission switch indication; and 1704 transmitting or receiving, data, reference signal or control signal based on the transmission switch indication.

[00169] In a first implementation of the method 1700, the transmission switch indication is based on one of a configured subcarrier spacing, minimal subcarrier spacing of a set of bands, a subcarrier spacing used for determination slot format, a configured time unit, a configured reference numerology, and minimal numerology for a set of bands.

[00170] In a second implementation of the method 1700, the method further comprises transmitting at least one of synchronization signal, broadcast signal, and paging message in a time duration indicated as transmission OFF by the transmission switch indication. In particular, the time duration containing transmission of at least one of synchronization signal, broadcast signal, and paging message is assumed to be transmission ON even if being indicated as transmission OFF by the transmission switch indication.

[00171] In a third implementation of the method 1700, the control signal includes a time duration offset indicating a time duration between the control signal and the data, the time duration offset excluding the time duration indicated as transmission OFF by the transmission switch indication.

[00172] In a fourth implementation of the method 1700, if the time duration in which the data is to be transmitted is indicated as transmission OFF by the transmission switch

indication, the data is postponed to a next available time duration. For example, the data is postponed to a next available time duration within a time slot.

[00173] In a fifth implementation of the method 1700, the method comprises transmitting the data in the time duration that is indicated as transmission OFF by the transmission switch indication.

[00174] In a sixth implementation of the method 1700, the method comprises terminating transmitting the data if an unavailable time duration number or an unavailable time duration rate for the data transmission is larger than a first threshold. In particular, the unavailable time duration rate for the data is determined by the unavailable time duration number, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00175] In a seventh implementation of the method 1700, the TBS of the data is determined by the unavailable time duration number for the data, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00176] In an eighth implementation of the method 1700, the TBS of the data is determined by the maximal or minimal resource elements among resource elements corresponding to different TCI states.

[00177] In a ninth implementation of the method 1700, the reference signal in a time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration. For example, the reference signal is postponed to a next available time duration within a time slot.

[00178] In a tenth implementation of the method 1700, the method comprises terminating receiving the reference signal in a time duration indicated as transmission OFF by the transmission switch indication. In particular, the method comprises terminating transmitting a reference signal pair if the time duration for any of the reference signal pair transmission is indicated as transmission OFF by the transmission switch indication.

[00179] In an eleventh implementation of the method 1700, the method comprises terminating transmitting the reference signal if the unavailable time duration number or an unavailable time duration rate for the reference signal transmission is larger than a second threshold.

[00180] In a twelfth implementation of the method 1700, depending on the available time duration number for the reference signal transmission, the method comprises

terminating transmitting the reference signal in a time duration indicated as transmission OFF by the transmission switch indication, or the reference signal transmission is postponed to a next available time duration within a time slot.

[00181] In a thirteenth implementation of the method 1700, the reference signal is transmitted from a start time duration with a time interval, and the reference signal transmission in the time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration.

[00182] Figure 18 is a schematic block diagram illustrating apparatuses according to one embodiment.

[00183] Referring to Figure 18, the UE (i.e. the remote unit) includes a processor, a memory, and a transceiver. The processor implements a function, a process, and/or a method which are proposed in Figure 16.

[00184] The UE comprises a transceiver; and a processor, wherein the processor is configured to receive, via the transceiver, a transmission switch indication; and transmit or receive, via the transceiver, data, reference signal or control signal based on the transmission switch indication.

[00185] In a first implementation of the UE, the transmission switch indication is based on one of a configured subcarrier spacing, minimal subcarrier spacing of a set of bands, a subcarrier spacing used for determination slot format, a configured time unit, a configured reference numerology, and minimal numerology for a set of bands.

[00186] In a second implementation of the UE, the processor is further configured to assume that transmission is OFF in a time duration indicated as transmission OFF by the transmission switch indication except that the time duration contains transmission of at least one of synchronization signal, broadcast signal, and paging message. It means that the processor is further configured to receive, via the transceiver, at least one of synchronization signal, broadcast signal, and paging message in a time duration indicated as transmission OFF by the transmission switch indication. In particular, the time duration containing transmission of at least one of synchronization signal, broadcast signal, and paging message is assumed to be transmission ON even if being indicated as transmission OFF by the transmission switch indication.

[00187] In a third implementation of the UE, the control signal includes a time duration offset indicating a time duration between the control signal and the data, the time

duration offset excluding the time duration indicated as transmission OFF by the transmission switch indication.

[00188] In a fourth implementation of the UE, if the time duration in which the data is to be received is indicated as transmission OFF by the transmission switch indication, the data is postponed to a next available time duration. For example, the data is postponed to a next available time duration within a time slot.

[00189] In a fifth implementation of the UE, the processor is configured to terminate receiving the data in the time duration that is indicated as transmission OFF by the transmission switch indication.

[00190] In a sixth implementation of the UE, the processor is configured to terminate receiving the data if an unavailable time duration number or an unavailable time duration rate for the data transmission is larger than a first threshold. In particular, the unavailable time duration rate for the data is determined by the unavailable time duration number, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00191] In a seventh implementation of the UE, the TBS of the data is determined by the unavailable time duration number for the data, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00192] In an eighth implementation of the UE, the TBS of the data is determined by the maximal or minimal resource elements among resource elements corresponding to different TCI states.

[00193] In a ninth implementation of the UE, the processor is further configured to monitor a search space of the control signal even if a resource of the search space is overlapped in time domain with the time duration indicated as transmission OFF by the transmission switch indication.

[00194] In a tenth implementation of the UE, the reference signal in a time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration. For example, the reference signal is postponed to a next available time duration within a time slot.

[00195] In an eleventh implementation of the UE, the processor is configured to terminate receiving the reference signal in a time duration indicated as transmission OFF by the transmission switch indication. In particular, the processor is configured to terminate receiving a

reference signal pair if the time duration for any of the reference signal pair transmission is indicated as transmission OFF by the transmission switch indication.

[00196] In a twelfth implementation of the UE, the processor is configured to terminate receiving the reference signal if the unavailable time duration number or an
5 unavailable time duration rate for the reference signal transmission is larger than a second threshold.

[00197] In a thirteenth implementation of the UE, depending on the available time duration number for the reference signal transmission, the processor is configured to terminate receiving the reference signal in a time duration indicated as transmission OFF by the
10 transmission switch indication, or the reference signal transmission is postponed to a next available time duration within a time slot.

[00198] In a fourteenth implementation of the UE, the reference signal is received from a start time duration with a time interval, and the reference signal reception in the time duration indicated as transmission OFF by the transmission switch indication is postponed to a
15 next available time duration.

[00199] Referring to Figure 18, the gNB (i.e. base unit) includes a processor, a memory, and a transceiver. The processors implement a function, a process, and/or a method which are proposed in Figure 17.

[00200] The base unit comprises a transceiver; and a processor, wherein the
20 processor is configured to transmit, via the transceiver, a transmission switch indication; and transmit or receive, via the transceiver, data, reference signal or control signal based on the transmission switch indication.

[00201] In a first implementation of the base unit, the transmission switch indication is based on one of a configured subcarrier spacing, minimal subcarrier spacing of a set
25 of bands, a subcarrier spacing used for determination slot format, a configured time unit, a configured reference numerology, and minimal numerology for a set of bands.

[00202] In a second implementation of the base unit, the processor is further configured to transmit, via the transceiver, at least one of synchronization signal, broadcast signal, and paging message in a time duration indicated as transmission OFF by the transmission
30 switch indication. In particular, the time duration containing transmission of at least one of synchronization signal, broadcast signal, and paging message is assumed to be transmission ON even if being indicated as transmission OFF by the transmission switch indication.

[00203] In a third implementation of the base unit, the control signal includes a time duration offset indicating a time duration between the control signal and the data, the time duration offset excluding the time duration indicated as transmission OFF by the transmission switch indication.

5 [00204] In a fourth implementation of the base unit, if the time duration in which the data is to be transmitted is indicated as transmission OFF by the transmission switch indication, the data is postponed to a next available time duration. For example, the data is postponed to a next available time duration within a time slot.

[00205] In a fifth implementation of the base unit, the processor is configured to
10 terminate transmitting the data in the time duration that is indicated as transmission OFF by the transmission switch indication.

[00206] In a sixth implementation of the base unit, the processor is configured to terminate transmitting the data if an unavailable time duration number or an unavailable time duration rate for the data transmission is larger than a first threshold. In particular, the
15 unavailable time duration rate for the data is determined by the unavailable time duration number, where the unavailable time duration is time duration indicated as transmission OFF by the transmission switch indication.

[00207] In a seventh implementation of the base unit, the TBS of the data is determined by the unavailable time duration number for the data, where the unavailable time
20 duration is time duration indicated as transmission OFF by the transmission switch indication.

[00208] In an eighth implementation of the base unit, the TBS of the data is determined by the maximal or minimal resource elements among resource elements corresponding to different TCI states.

[00209] In a ninth implementation of the base unit, the reference signal in a time
25 duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration. For example, the reference signal is postponed to a next available time duration within a time slot.

[00210] In a tenth implementation of the base unit, the processor is configured to terminate transmitting the reference signal in a time duration indicated as transmission OFF by
30 the transmission switch indication. In particular, the processor is configured to terminate transmitting a reference signal pair if the time duration for any of the reference signal pair transmission is indicated as transmission OFF by the transmission switch indication.

[00211] In an eleventh implementation of the base unit, the processor is configured to terminate transmitting the reference signal if the unavailable time duration number or an unavailable time duration rate for the reference signal transmission is larger than a second threshold.

5 [00212] In a twelfth implementation of the base unit, depending on the available time duration number for the reference signal transmission, the processor is configured to terminate transmitting the reference signal in a time duration indicated as transmission OFF by the transmission switch indication, or the reference signal transmission is postponed to a next available time duration within a time slot.

10 [00213] In a thirteenth implementation of the base unit, the reference signal is transmitted from a start time duration with a time interval, and the reference signal transmission in the time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration.

[00214] Layers of a radio interface protocol may be implemented by the processors.
15 The memories are connected with the processors to store various pieces of information for driving the processors. The transceivers are connected with the processors to transmit and/or receive a radio signal. Needless to say, the transceiver may be implemented as a transmitter to transmit the radio signal and a receiver to receive the radio signal.

[00215] The memories may be positioned inside or outside the processors and
20 connected with the processors by various well-known means.

[00216] In the embodiments described above, the components and the features of the embodiments are combined in a predetermined form. Each component or feature should be considered as an option unless otherwise expressly stated. Each component or feature may be implemented not to be associated with other components or features. Further, the embodiment
25 may be configured by associating some components and/or features. The order of the operations described in the embodiments may be changed. Some components or features of any embodiment may be included in another embodiment or replaced with the component and the feature corresponding to another embodiment. It is apparent that the claims that are not expressly cited in the claims are combined to form an embodiment or be included in a new claim.

30 [00217] The embodiments may be implemented by hardware, firmware, software, or combinations thereof. In the case of implementation by hardware, according to hardware implementation, the exemplary embodiment described herein may be implemented by using one

or more application-specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, and the like.

[00218] Embodiments may be practiced in other specific forms. The described
5 embodiments are to be considered in all respects to be only illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS

1. An UE, comprising:
a transceiver; and
a processor, wherein the processor is configured to
5 receive, via the transceiver, a transmission switch indication; and
transmit or receive, via the transceiver, data, reference signal or control signal based on
the transmission switch indication.
2. The UE of claim 1, wherein, the transmission switch indication is based on one of
a configured subcarrier spacing,
10 minimal subcarrier spacing of a set of bands,
a subcarrier spacing used for determination slot format,
a configured time unit,
a configured reference numerology, and
minimal numerology for a set of bands.
- 15 3. The UE of claim 1, wherein, the processor is further configured to
assume that transmission is OFF in a time duration indicated as transmission OFF by the
transmission switch indication except that the time duration contains transmission
of at least one of synchronization signal, broadcast signal, and paging message.
4. The UE of claim 1, wherein, the control signal includes a time duration offset indicating a
20 time duration between the control signal and the data, the time duration offset excluding
the time duration indicated as transmission OFF by the transmission switch indication.
5. The UE of claim 1, wherein, if the time duration in which the data is to be received is
indicated as transmission OFF by the transmission switch indication, the data is
postponed to a next available time duration.

6. The UE of claim 1, wherein, the processor is configured to terminate receiving the data in the time duration that is indicated as transmission OFF by the transmission switch indication.
7. The UE of claim 1, wherein, the processor is configured to terminate receiving the data if
5 an unavailable time duration number or an unavailable time duration rate for the data transmission is larger than a first threshold.
8. The UE of claim 1, wherein, the TBS of the data is determined by the unavailable time duration number for the data or by the maximal or minimal resource elements among resource elements corresponding to different TCI states, where the unavailable time
10 duration is time duration indicated as transmission OFF by the transmission switch indication.
9. The UE of claim 1, wherein, the processor is further configured to monitor a search space of the control signal even if a resource of the search space is overlapped in time domain with the time duration indicated as transmission OFF by the transmission switch
15 indication.
10. The UE of claim 1, wherein, the reference signal in a time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration.
11. The UE of claim 1, wherein, the processor is configured to terminate receiving the
20 reference signal in a time duration indicated as transmission OFF by the transmission switch indication.
12. The UE of claim 1, wherein, depending on the available time duration number for the reference signal transmission,
the processor is configured to terminate receiving the reference signal in a time duration
25 indicated as transmission OFF by the transmission switch indication, or

the reference signal transmission is postponed to a next available time duration within a time slot.

13. The UE of claim 1, wherein, the reference signal is received from a start time duration with a time interval, and the reference signal reception in the time duration indicated as transmission OFF by the transmission switch indication is postponed to a next available time duration.

14. A method of an UE, comprising:
receiving a transmission switch indication; and
transmitting or receiving data, reference signal or control signal based on the transmission switch indication.

15. A base unit, comprising:
a transceiver; and
a processor, wherein the processor is configured to
transmit, via the transceiver, a transmission switch indication; and
transmit or receive, via the transceiver, data, reference signal or control signal based on the transmission switch indication.

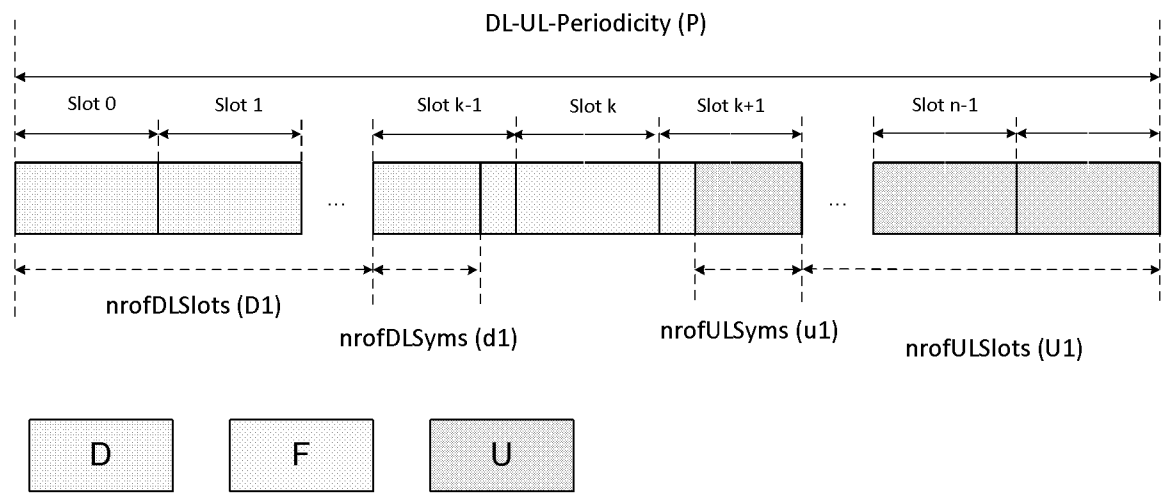


Figure 1

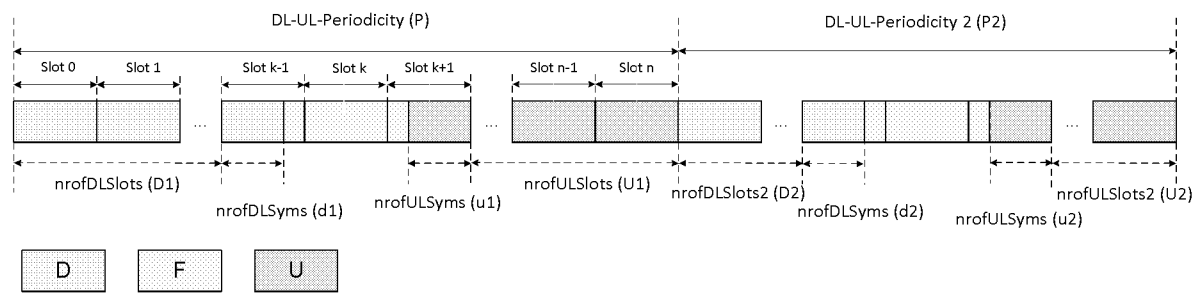


Figure 2

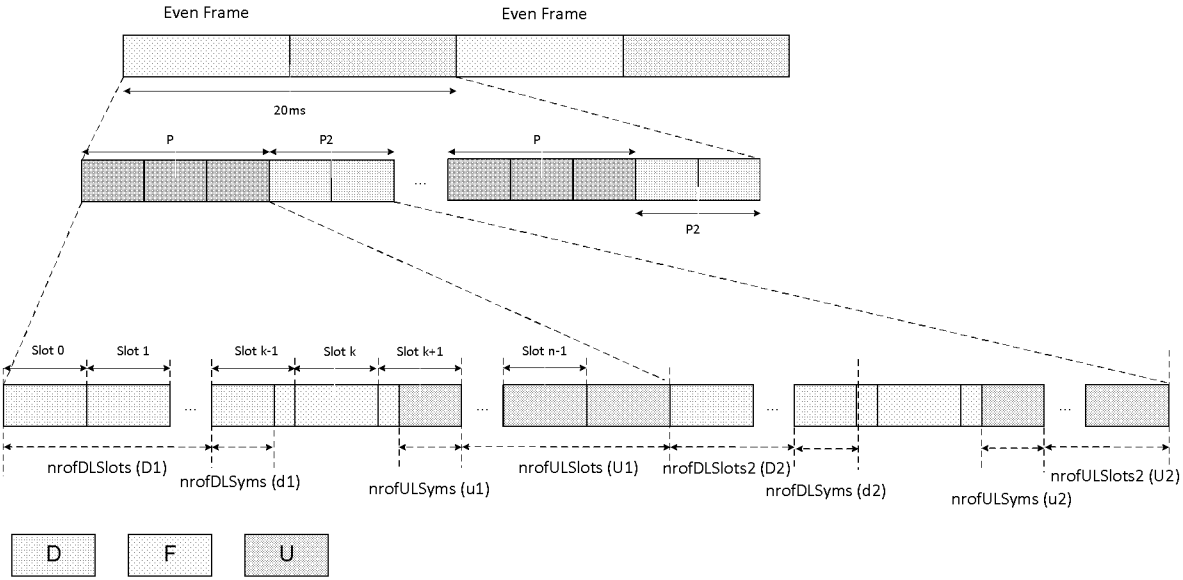


Figure 3

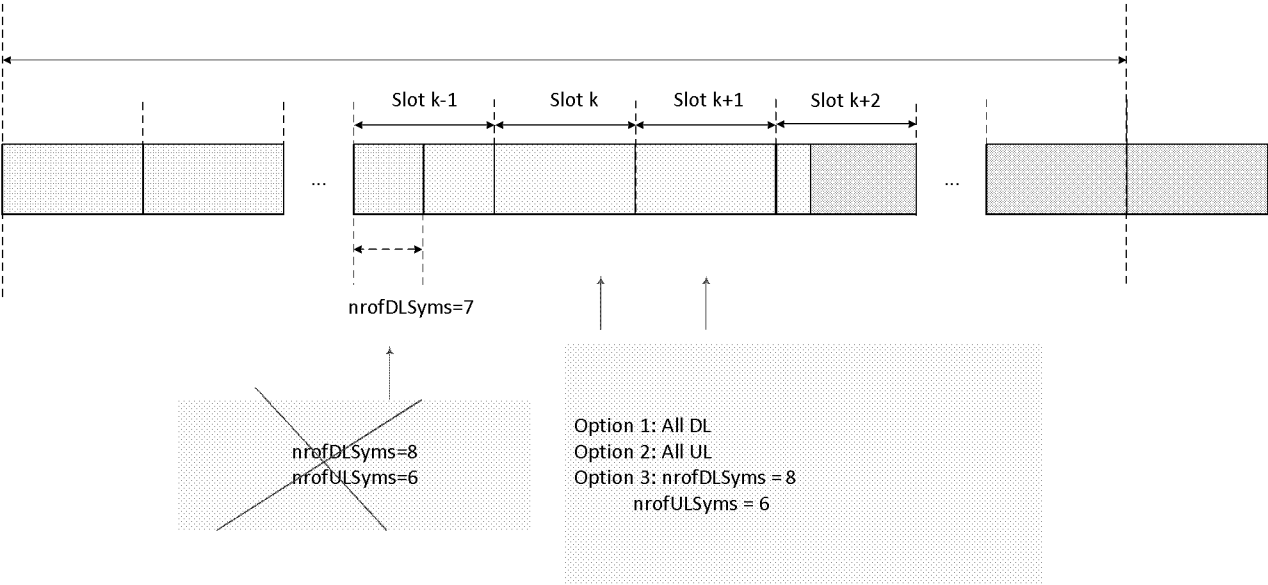


Figure 4

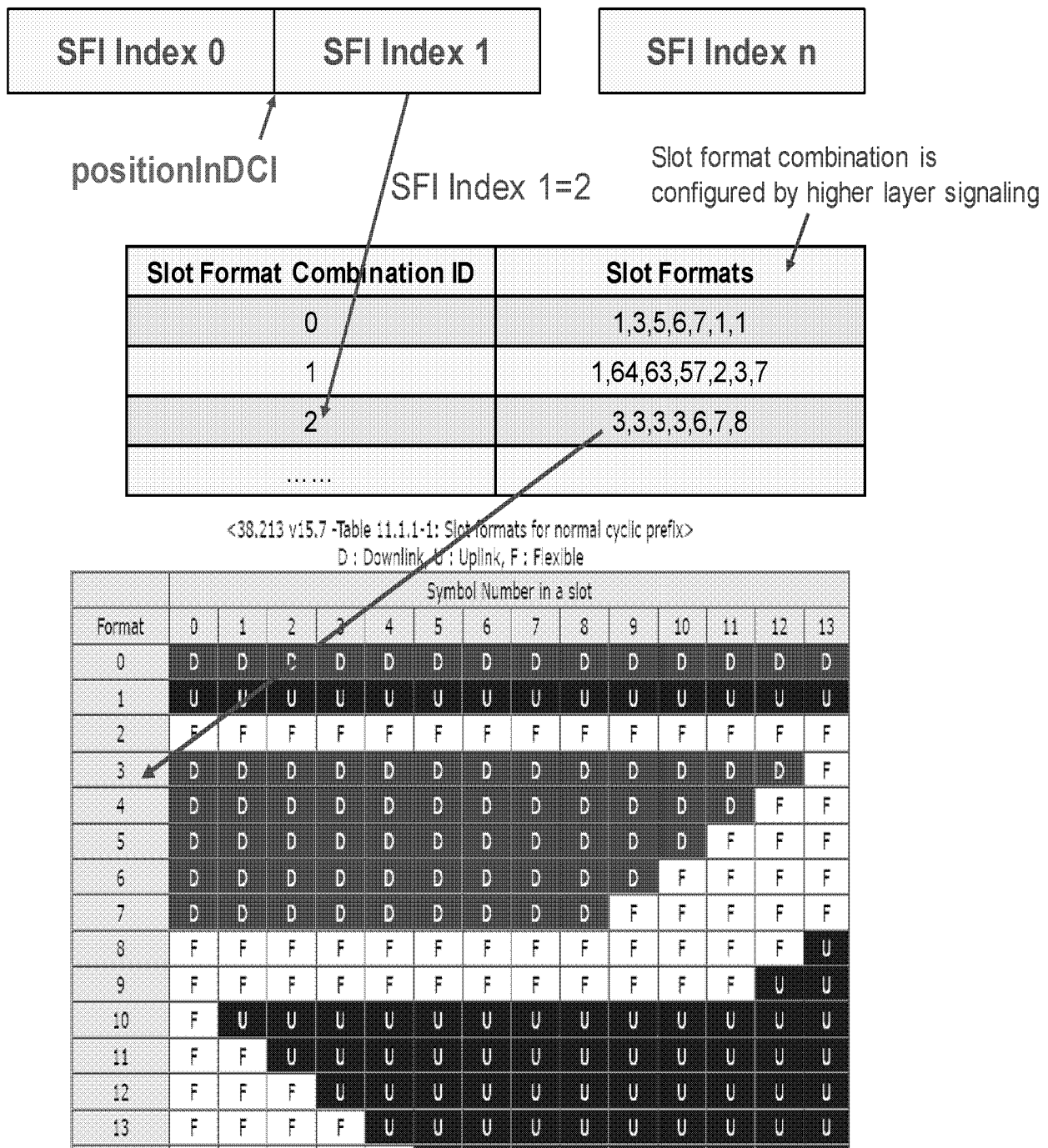


Figure 5

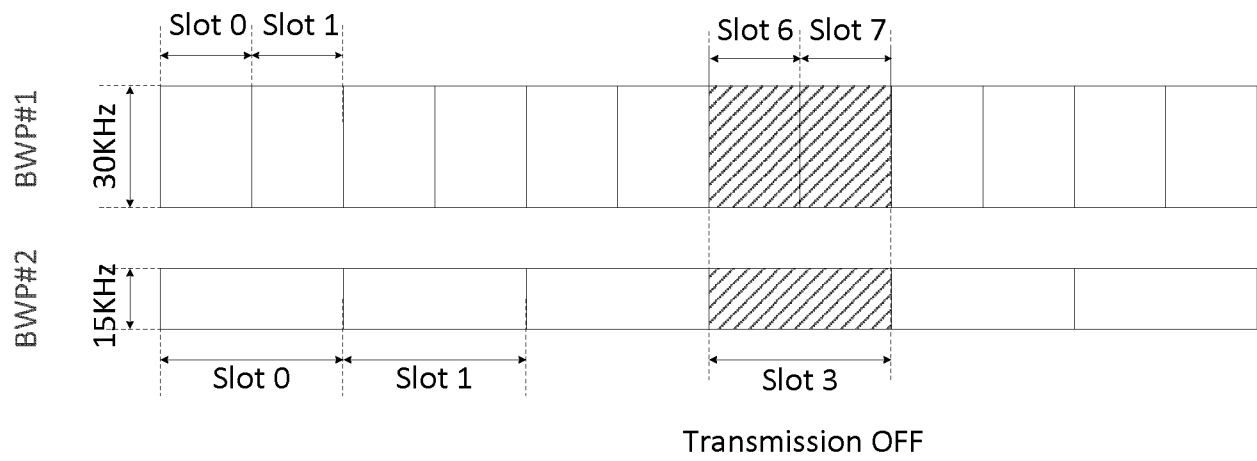


Figure 6

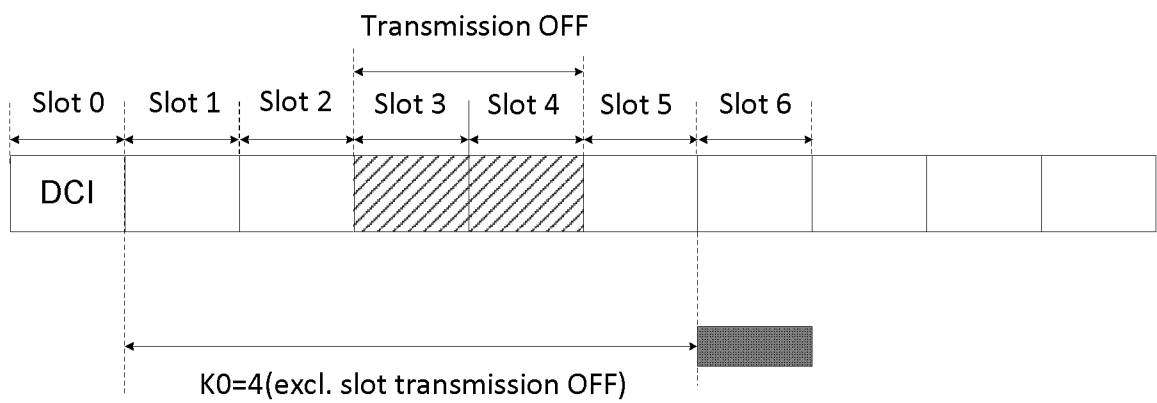


Figure 7(a)

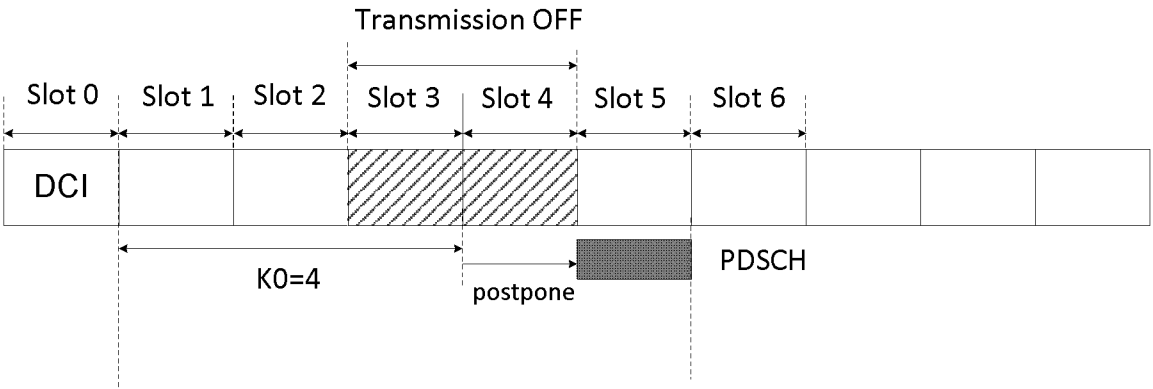


Figure 7(b)

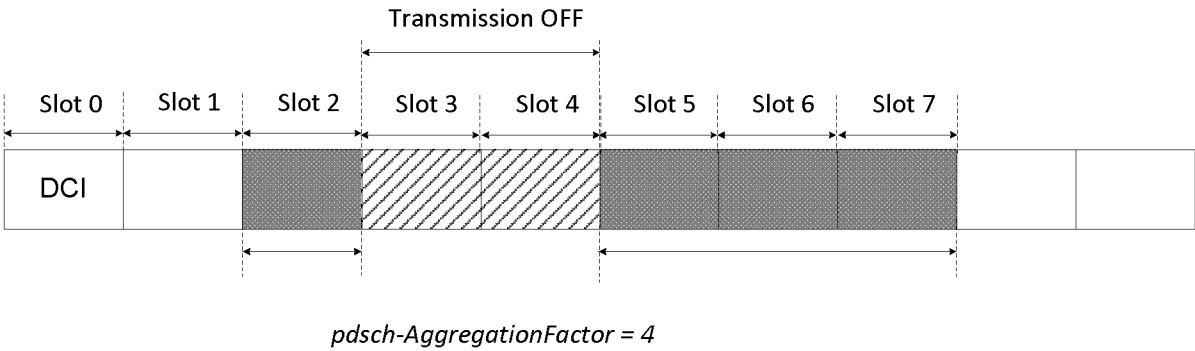


Figure 8

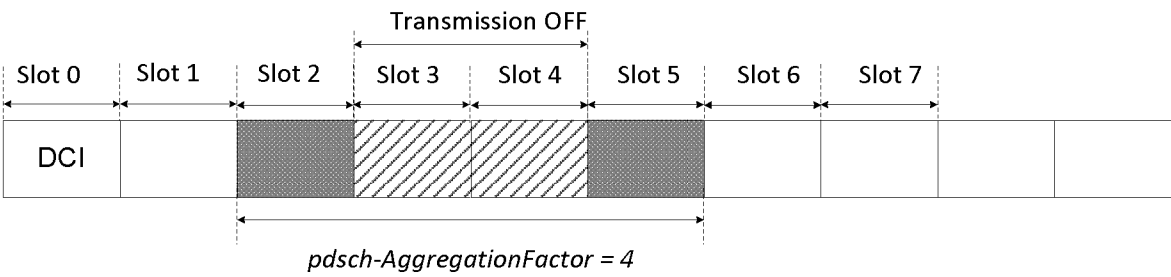


Figure 9(a)

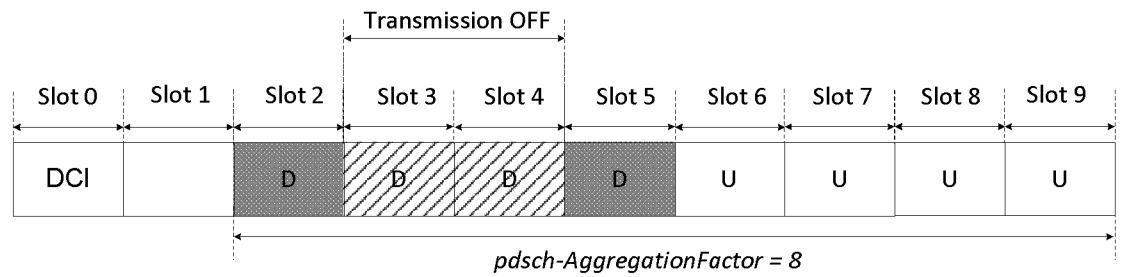


Figure 9(b)

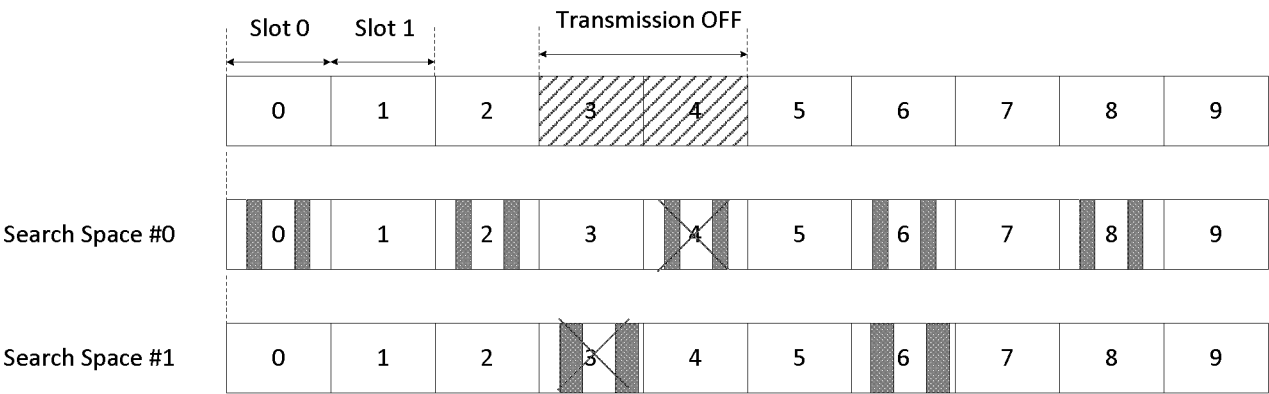


Figure 10

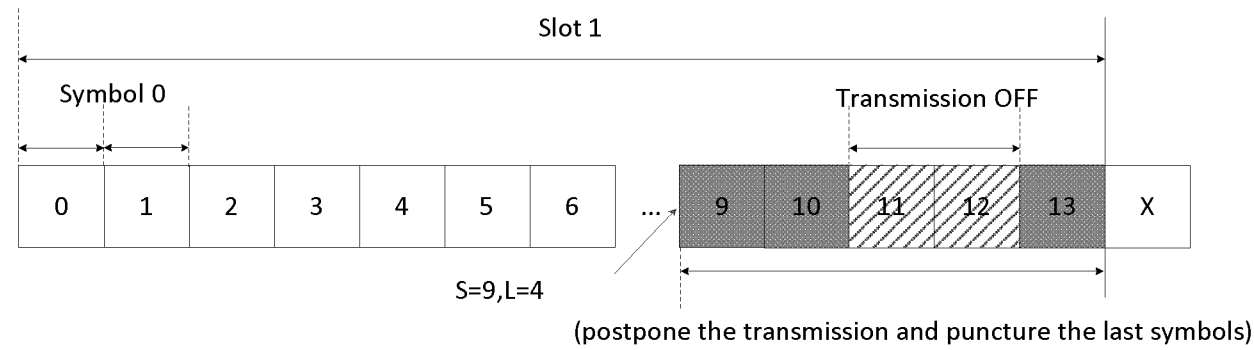


Figure 11

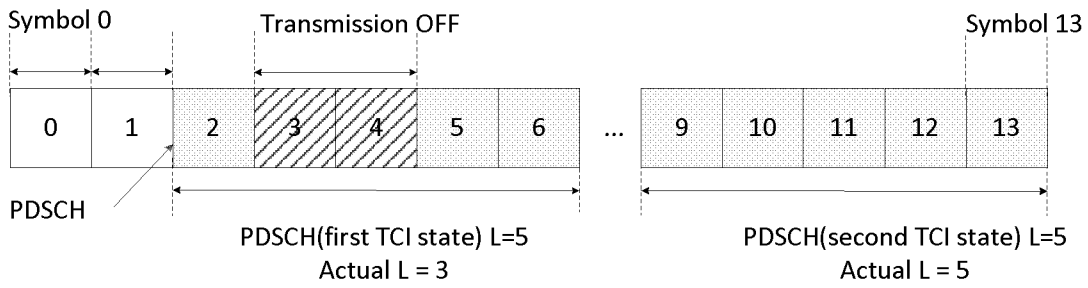


Figure 12

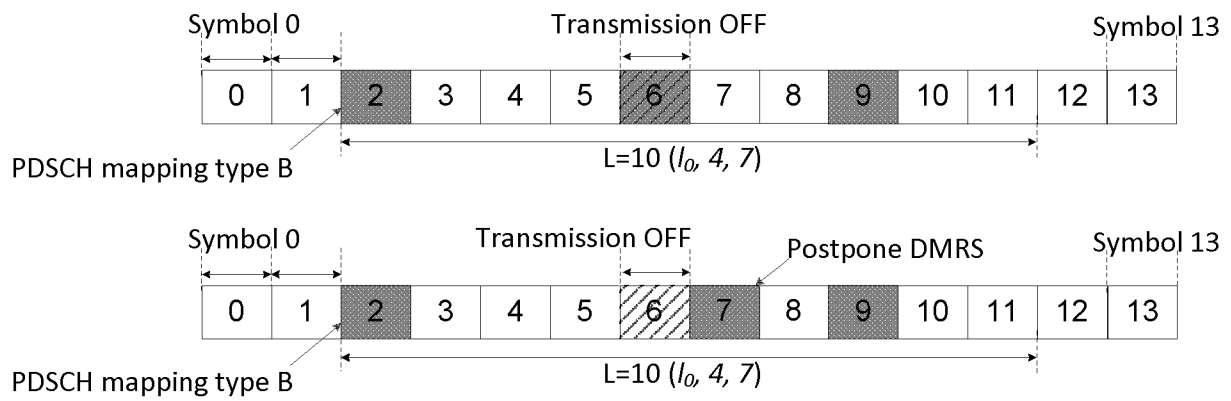


Figure 13(a)

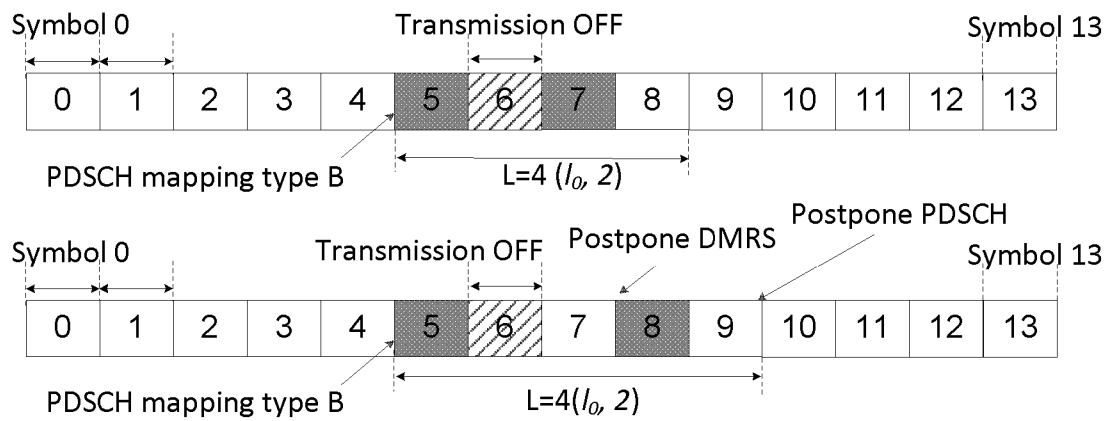


Figure 13(b)

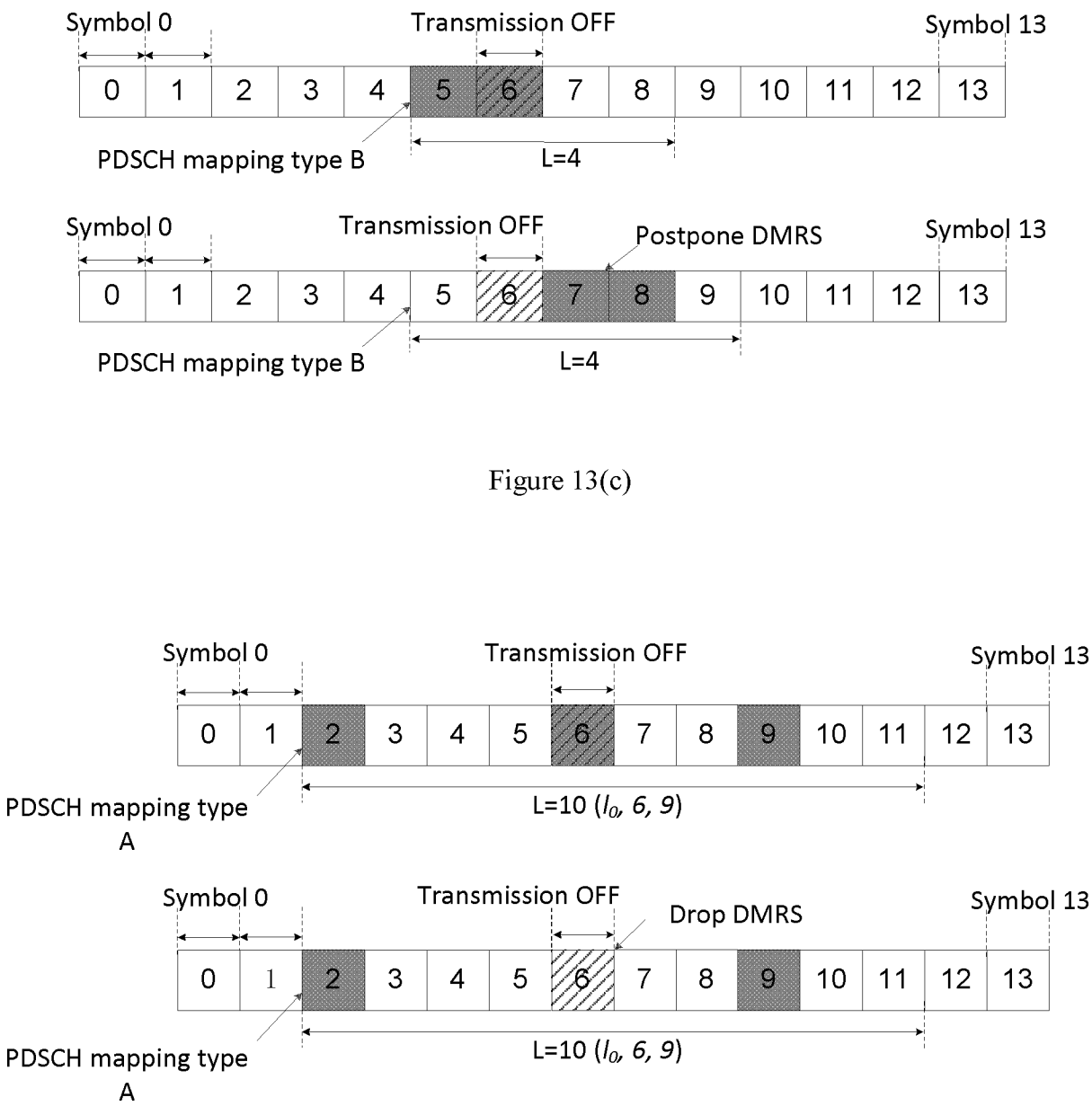


Figure 14

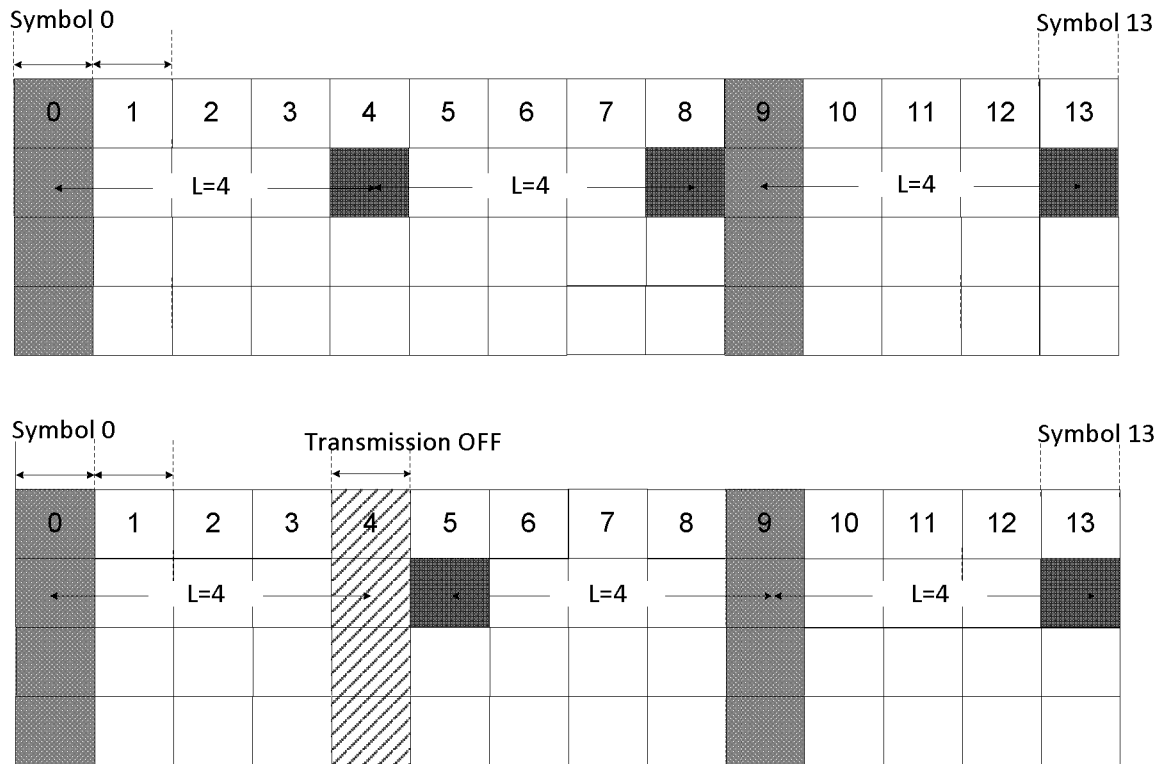


Figure 15

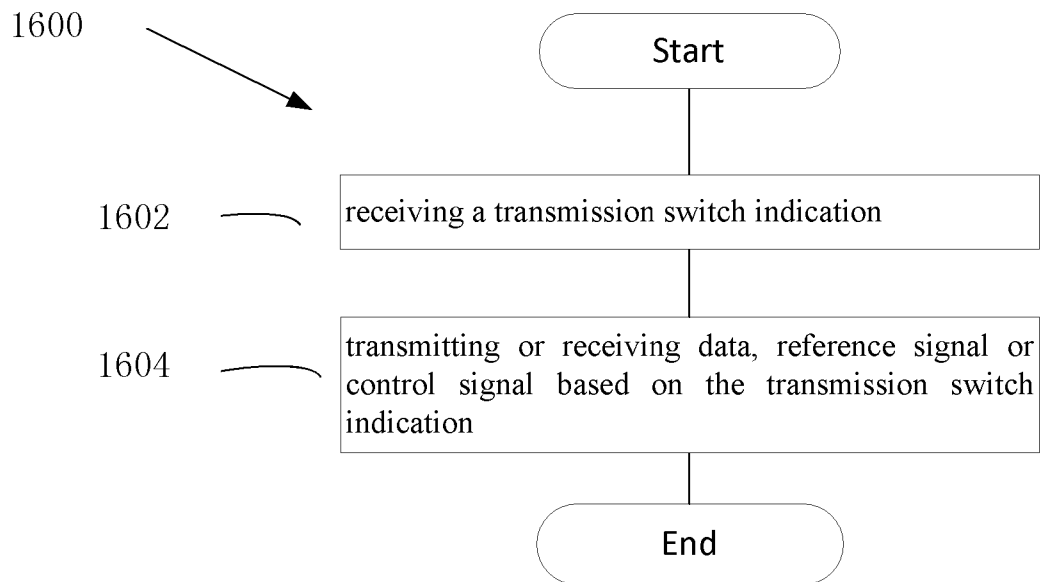


Figure 16

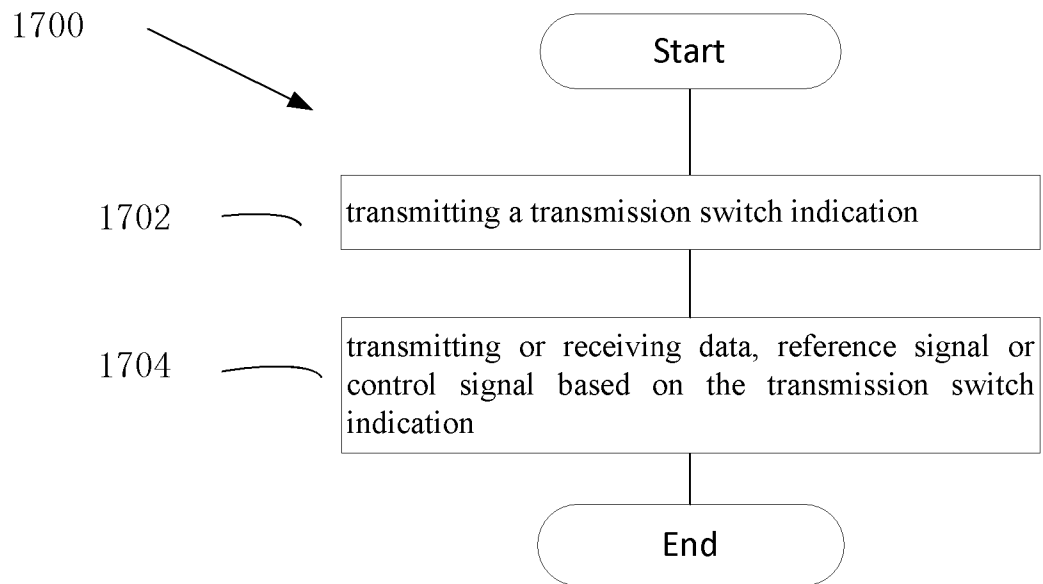


Figure 17

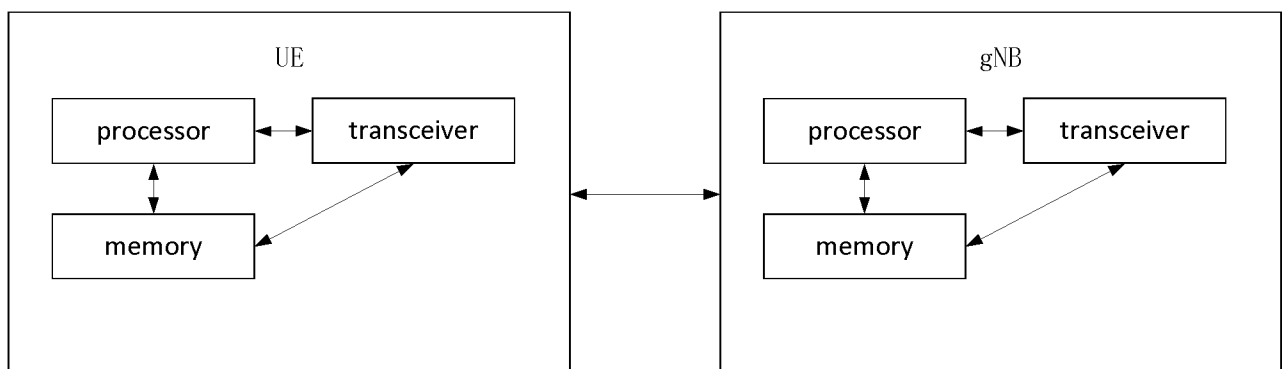


Figure 18

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/088465

A. CLASSIFICATION OF SUBJECT MATTER H04W 72/04(2009.01)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,EPODOC,WPI,3GPP:slot?, save, DL, format, slot-based, off, ON/OFF, symbol?, transmission, flexible, UL, indication, power, on, combination																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 2020314747 A1 (COMCAST CABLE COMMUNICATIONS, LLC) 01 October 2020 (2020-10-01) description, paragraphs 95-101, 303-304, and 311-312</td> <td>1-15</td> </tr> <tr> <td>A</td> <td>VIVO. "Proposal on the slot based dynamic TDD" 3GPP TSG RAN WG1 AH_NR Meeting R1-1700283, Vol. , No. , 20 January 2017 (2017-01-20), ISSN: , the whole document</td> <td>1-15</td> </tr> <tr> <td>A</td> <td>US 2021212101 A1 (ZTE CORPORATION) 08 July 2021 (2021-07-08) the whole document</td> <td>1-15</td> </tr> <tr> <td>A</td> <td>CN 113207110 A (OPPO GUANGDONG MOBILE TELECOMMUNICATIONS CO., LTD.) 03 August 2021 (2021-08-03) the whole document</td> <td>1-15</td> </tr> <tr> <td>A</td> <td>TW 202127940 A (WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.) 16 July 2021 (2021-07-16) the whole document</td> <td>1-15</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2020314747 A1 (COMCAST CABLE COMMUNICATIONS, LLC) 01 October 2020 (2020-10-01) description, paragraphs 95-101, 303-304, and 311-312	1-15	A	VIVO. "Proposal on the slot based dynamic TDD" 3GPP TSG RAN WG1 AH_NR Meeting R1-1700283, Vol. , No. , 20 January 2017 (2017-01-20), ISSN: , the whole document	1-15	A	US 2021212101 A1 (ZTE CORPORATION) 08 July 2021 (2021-07-08) the whole document	1-15	A	CN 113207110 A (OPPO GUANGDONG MOBILE TELECOMMUNICATIONS CO., LTD.) 03 August 2021 (2021-08-03) the whole document	1-15	A	TW 202127940 A (WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.) 16 July 2021 (2021-07-16) the whole document	1-15
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X	US 2020314747 A1 (COMCAST CABLE COMMUNICATIONS, LLC) 01 October 2020 (2020-10-01) description, paragraphs 95-101, 303-304, and 311-312	1-15																		
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A	CN 113207110 A (OPPO GUANGDONG MOBILE TELECOMMUNICATIONS CO., LTD.) 03 August 2021 (2021-08-03) the whole document	1-15																		
A	TW 202127940 A (WILUS INSTITUTE OF STANDARDS AND TECHNOLOGY INC.) 16 July 2021 (2021-07-16) the whole document	1-15																		
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																				
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Date of the actual completion of the international search 10 December 2022		Date of mailing of the international search report 19 December 2022																		
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 XING,Chaoxia Telephone No. 86-(10)-53961600																		

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2022/088465

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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				EP	3716697	A1	30 September 2020
				CA	3077014	A1	25 September 2020
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				KR	20210061373	A	27 May 2021
				WO	2020034305	A1	20 February 2020
				EP	3854046	A1	28 July 2021
				IN	202117017077	A	14 January 2022
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				KR	20210057749	A	21 May 2021
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				US	2022312469	A1	29 September 2022
				WO	2021071260	A1	15 April 2021
				IN	202227024342	A	02 September 2022