equipments, a PSBCH carrying information, and the information carried in the PSBCH is used to determine a periodicity and a number of slots.

[0010] In a third aspect of the present disclosure, a method for receiving a physical sidelink broadcast channel (PSBCH) of a second user equipment comprises receiving, from one or more first user equipments, a PSBCH carrying information, wherein the information carried in the PSBCH is used to determine a periodicity and a number of slots.

[0011] In a fourth aspect of the present disclosure, a second user equipment for receiving a physical sidelink broadcast channel (PSBCH) comprises a memory, a transceiver, and a processor coupled to the memory and the transceiver. The processor is configured to control the transceiver to receive, from one or more first user equipments, a PSBCH carrying information, wherein the information carried in the PSBCH is used to determine a periodicity and a number of slots.

[0012] In a fifth aspect of the present disclosure, a non-transitory machine-readable storage medium has stored thereon instructions that, when executed by a computer, cause the computer to perform the above method.

[0013] In a sixth aspect of the present disclosure, a chip includes a processor, configured to call and run a computer program stored in a memory, to cause a device in which the chip is installed to execute the above method.

[0014] In a seventh aspect of the present disclosure, a computer readable storage medium, in which a computer program is stored, causes a computer to execute the above method.

[0015] In an eighth aspect of the present disclosure, a computer program product includes a computer program, and the computer program causes a computer to execute the above method.

[0016] In a ninth aspect of the present disclosure, a computer program causes a computer to execute the above method.

BRIEF DESCRIPTION OF DRAWINGS

[0017] In order to more clearly illustrate the embodiments of the present disclosure or related art, the following figures will be described in the embodiments are briefly introduced. It is obvious that the drawings are merely some embodiments of the present disclosure, a person having ordinary skill in this field can obtain other figures according to these figures without paying the premise.

[0018] FIG. 1 is a block diagram of a first user equipments (UE), a second UE, and a network node (such as, base station, BS) (e.g., gNB) of communication in a communication network system according to an embodiment of the present disclosure.

[0019] FIG. 2 is a flowchart illustrating a method for transmitting a physical sidelink broadcast channel (PSBCH) of a first user equipment according to an embodiment of the present disclosure.

[0020] FIG. 3 is a flowchart illustrating a method for receiving a physical sidelink broadcast channel (PSBCH) of a second user equipment according to an embodiment of the present disclosure.

[0021] FIG. 4 is a block diagram of a system for wireless communication according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0022] Embodiments of the present disclosure are described in detail with the technical matters, structural features, achieved objects, and effects with reference to the accompanying drawings as follows. Specifically, the

according to an embodiment of the present disclosure. The communication network system 40 includes one or more first UEs 10 of a cell, one or more second UEs 20 out of the cell, and the network node 30. The first UE 10 may include a memory 12, a transceiver 13, and a processor 11 coupled to the memory 12 and the transceiver 13. The second UE 20 may include a memory 22, a transceiver 23, and a processor 21 coupled to the memory 22 and the transceiver 23. The network node 30 may include a memory 32, a transceiver 33, and a processor 31 coupled to the memory 32, the transceiver 33. The processor 11 or 21 or 31 may be configured to implement proposed functions, procedures and/or methods described in this description. Layers of radio interface protocol may be implemented in the processor 11 or 21 or 31. The memory 12 or 22 or 32 is operatively coupled with the processor 11 or 21 or 31 and stores a variety of information to operate the processor 11 or 21 or 31. The transceiver 13 or 23 or 33 is operatively coupled with the processor 11 or 21 or 33, and the transceiver 13 or 23 or 33 transmits and/or receives a radio signal.

[0039] The processor 11 or 21 or 31 may include application-specific integrated circuit (ASIC), other chipset, logic circuit and/or data processing device. The memory 12 or 22 or 32 may include read-only memory (ROM), random access memory (RAM), flash memory, memory card, storage medium and/or other storage device. The transceiver 13 or 23 or 33 may include baseband circuitry to process radio frequency signals. When the embodiments are implemented in software, the techniques described herein can be implemented with modules (e.g., procedures, functions, and so on) that perform the functions described herein. The modules can be stored in the memory 12 or 22 or 32 and executed by the processor 11 or 21 or 31. The memory 12 or 22 or 32 can be implemented within the processor 11 or 21 or 31 or external to the processor 11 or 21 or 31 in which case those can be communicatively coupled to the processor 11 or 21 or 31 via various means as is known in the art.

[0040] The communication between UEs relates to vehicle-to-everything (V2X) communication including vehicle-to-vehicle (V2V), vehicle-to-pedestrian (V2P), and vehicle-to-infrastructure/network (V2I/N) according to a sidelink technology developed under 3rd generation partnership project (3GPP) long term evolution (LTE) and new radio (NR) Release 16 and beyond. UEs are communicated with each other directly via a sidelink interface such as a PC5 interface. Some embodiments of the present disclosure relate to sidelink communication technology in 3GPP NR release 16 and beyond.

[0041] In some embodiments, the processor 11 of the first UE 10 is configured to control the transceiver 13 to transmit, to one or more second UEs, a PSBCH carrying information, and the information carried in the PSBCH is used to determine a periodicity and a number of slots. The information comprises a slot format indication (SFI). The information also comprises a time division duplex (TDD) configuration. This can reduce a payload size of the information (such as a TDD configuration) carried in the PSBCH.

[0042] In some embodiments, the processor 21 of the second UE 20 is configured to control the transceiver 23 to receive, from one or more first user UE 10, a PSBCH carrying information, wherein the information carried in the PSBCH is used to determine a periodicity and a number of slots. The information also comprises a time division duplex (TDD) configuration. This can reduce a payload size of the information (such as a TDD configuration) carried in the PSBCH.

[0043] FIG. 2 illustrates a method 200 for transmitting a physical sidelink broadcast channel (PSBCH) of a first user equipment according to an embodiment of the present disclosure. The method 200 includes: a block 202, transmitting, to one or more second user equipments, a PSBCH carrying information, wherein the information carried in the PSBCH is used to determine a periodicity and a number of slots. In some embodiments, the

PSBCH. In some embodiments, the information carried in the PSBCH is further used to determine the second reference SCS.

[0050] In some embodiments, the number of slots which is determined by the information carried in the PSBCH is determined by the number of UL slots configured in the pattern 1 and the scaling factor between the first reference SCS and the second reference SCS. In some embodiments, the number of slots which is determined by the information carried in the PSBCH is determined by the number of UL slots configured in at least one of the pattern 1 and the pattern 2, and the scaling factor between the first reference SCS and the second reference SCS.

[0051] In some embodiments, when the first reference SCS is N times of the second reference SCS, the number of slots which is determined by the information carried in the PSBCH is N times of the number of slots configured in at least one of the pattern 1 and the pattern 2. In some embodiments, when the second reference SCS is N times of the first reference SCS, the number of slots configured in at least one of the pattern 1 and the pattern 2 is N times of the number of slots which is determined by the information carried in the PSBCH.

[0052] In some embodiments, the information carried in the PSBCH further determines a number of symbols. In some embodiments, the symbols comprise UL symbols. In some embodiments, the symbols comprise SL symbols.

[0053] In some embodiments, the first user equipment is in coverage of a cell, and the second user equipment is out coverage of the cell.

[0054] In some embodiments, if a network node (such as a base station) configures both pattern 1 and pattern 2, the following information is determined by the information carried in PSBCH:

[0055] 1. Periodicity.

[0056] 2. Number of UL slots or number of SL slots.

[0057] 3. Reference SCS.

[0058] The periodicity is a determined by periodicities configured in pattern 1 and pattern 2, the number of UL slots is determined by the number of UL shots that is configured in pattern 2, reference SCS is the reference subcarrier spacing which is used to determine the time domain boundaries. If SL is deployed on Uu carrier, only UL resource can be used for SL transmission. For example, for TDD system, only UL slots or UL symbols can be used for SL transmission; for frequency division duplex (FDD) system, SL transmission can only be deployed on UL band. Alternatively, the number of SL slots and/or number of SL symbols can be indicated in the PSBCH. In another embodiment, the number of SL slots and/or number of SL symbols can be determined by the information carried in the PSBCH. The number of SL slots is determined by number of UL slots configured in at least one of pattern 1 and pattern 2. The number of SL symbols is determined by number of UL symbols configured in at least one of pattern 1 and pattern 2

[0059] One embodiment is that the periodicity which is determined by the information carried in PSBCH is summary of the periodicities configured in pattern 1 and pattern 2.

[0060] For example, the network node configures both pattern 1 and pattern 2 in TDD-UL-DL-ConfigCommon. And the parameter referenceSubcarrierSpacing is set to 15 kHz. In pattern 1, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 3 ms), the number of UL slots is set to 1. In pattern 2, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 7 ms), the number of UL slots is set to 3.

[0061] For the PSBCH, the parameter reference SCS is set to 15 kHz, which is set to the same value of parameter referenceSubcarrierSpacing configured by the network node. The parameter of periodicity in the PSBCH is

summary of the parameter dl-UL-TransmissionPeriodicity in both pattern 1 and pattern 2. Therefore, the periodicity is 10 ms. The information of number of UL (or SL) slots in the PSBCH is determined by the number of UL slots in pattern 2. Then number of UL (or SL) slots in the PSBCH is 3.

[0062] For example, the network node configures both pattern 1 and pattern 2 in TDD-UL-DL-ConfigCommon. And the parameter referenceSubcarrierSpacing is set to 15 kHz. In pattern 1, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 3 ms), the number of UL slots is set to 1. In pattern 2, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 7 ms), the number of UL slots is set to 3.

[0063] For the PSBCH, the parameter reference SCS can be set to 30 kHz, which is double of parameter referenceSubcarrierSpacing configured by the network node. The parameter of periodicity in PSBCH is summary of the parameter dl-UL-TransmissionPeriodicity in both pattern 1 and pattern 2. Therefore, the periodicity is 10 ms. The information of number of UL (or SL) slots in PSBCH is determined by the number of UL slots in pattern 2 and the scale between the reference SCS in PSBCH and the referenceSubcarrierSpacing. Then number of UL (or SL) slots in PSBCH is 6, which corresponds to 3 UL slots in pattern 2 considering the different reference SCS. The above embodiments can reduce a payload size of the information (such as a TDD configuration) carried in the PSBCH. Further, in the above embodiments, the slot structure is flexible to provide for better spectrum utilization.

[0064] In some embodiments, if a network node (such as a base station) configures both pattern 1 and pattern 2, the following information is determined by the information carried in PSBCH:

[0065] 1. Periodicity.

[0066] 2. Number of UL slots or number of SL slots.

[0067] The periodicity is determined by periodicities configured in pattern 1 and pattern 2, the number of UL slots is determined by the number of UL shots that is configured in pattern 2. If SL is deployed on Uu carrier, only UL resource can be used for SL transmission. For example, for TDD system, only UL slots or UL symbols can be used for SL transmission; for FDD system, SL transmission can only be deployed on UL band. Alternatively, the number of SL slots and/or number of SL symbols can be indicated in PSBCH. In another embodiment, the number of SL slots and/or number of SL symbols can be determined by the information carried in the PSBCH. The number of SL slots is determined by number of UL slots configured in at least one of pattern 1 and pattern 2. The number of SL symbols is determined by number of UL symbols configured in at least one of pattern 1 and pattern 2.

[0068] One embodiment is that the periodicity which is determined by the information carried in PSBCH is summary of the periodicities configured in pattern 1 and pattern 2.

[0069] For example, the network node configures both pattern 1 and pattern 2 in TDD-UL-DL-ConfigCommon. And the parameter referenceSubcarrierSpacing (marked as the first reference SCS) is set to 15 kHz. In pattern 1, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 3 ms), the number of UL slots is set to 1. In pattern 2, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 7 ms), the number of UL slots is set to 3.

[0070] In one embodiment, a pre-defined reference SCS (marked as the second reference SCS) is 15 kHz. The parameter of periodicity in PSBCH is summary of the parameter dl-UL-TransmissionPeriodicity in both pattern 1 and pattern 2. Therefore, the periodicity is 10 ms. The information of number of UL (or SL) slots in PSBCH is determined by the number of UL slots in pattern 2. Since the parameter referenceSubcarrierSpacing is same as the second reference SCS, the number of UL (or SL) slots in PSBCH is 3.

and/or number of SL symbols can be determined by the information carried in the PSBCH. The number of SL slots is determined by number of UL slots configured in pattern 1. The number of SL symbols is determined by number of UL symbols configured in pattern 1.

[0100]]For example, the network node configures pattern 1 in TDD-UL-DL-ConfigCommon. And the parameter referenceSubcarrierSpacing is set to 15 kHz. In pattern 1, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 3 ms), the number of UL slots is set to 1.

[0101] For the PSBCH, the parameter reference SCS is set to 15 kHz, which is set to the same value of parameter referenceSubcarrierSpacing configured by the network node. The parameter of periodicity in PSBCH is 5 ms (another example can be 3 ms). The information of number of UL (or SL) slots in PSBCH is determined by the number of UL slots in pattern 1. Then number of UL slots in PSBCH is 1.

[0102] For example, the network node configures pattern 1 in TDD-UL-DL-ConfigCommon. And the parameter referenceSubcarrierSpacing is set to 15 kHz. In pattern 1, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 3 ms), the number of UL slots is set to 1.

[0103] For PSBCH, the parameter reference SCS can be set to 30 kHz, which is double of parameter referenceSubcarrierSpacing configured by the network node. The parameter of periodicity in PSBCH is 5 ms (another example can be 3 ms). The information of number of UL (or SL) slots in the PSBCH is determined by the number of UL slots in pattern 1 and the scale between the reference SCS in PSBCH and the referenceSubcarrierSpacing. Then it is 2, which corresponding to 1 UL slot in pattern1 considering the different reference SCS. The above embodiments can reduce a payload size of the information (such as a TDD configuration) carried in the PSBCH. Further, in the above embodiments, the slot structure is flexible to provide for better spectrum utilization.

[0104] In some embodiments, if a network node (such as a base station) configures only pattern 1, the following information is determined by the information carried in PSBCH:

[0105] 1. Periodicity.

[0106] 2. Number of UL slots or Number of SL slots.

[0107] The periodicity is determined by the periodicity configured in pattern 1, the number of UL slots is determined by the number of UL slots that is configured in pattern 1. If SL is deployed on Uu carrier, only UL resource can be used for SL transmission. For example, for TDD system, only UL slots or UL symbols can be used for SL transmission; for FDD system, SL transmission can only be deployed on UL band. Alternatively, the number of SL slots and/or number of SL symbols can be indicated in PSBCH. In another embodiment, the number of SL slots and/or number of SL symbols can be determined by the information carried in the PSBCH. The number of SL slots is determined by number of UL slots configured in pattern 1. The number of SL symbols is determined by number of UL symbols configured in pattern 1.

[0108] For example, the network configures only pattern 1 in TDD-UL-DL-ConfigCommon. And the parameter referenceSubcarrierSpacing is set to 15 kHz. In pattern 1, the parameter dl-UL-TransmissionPeriodicity is set to 5 ms (another example can be 3 ms), the number of UL slots is set to 1.

[0109] In one embodiment, the pre-defined reference SCS (marked as the second reference SCS) is 15 kHz. The parameter of periodicity in the PSBCH is set to the same value as the parameter dl-UL-TransmissionPeriodicity in pattern 1. Therefore, the periodicity is 5 ms (another example can be 3). The information of number of UL (or SL)

What is claimed is:

1. A method for transmitting a physical sidelink broadcast channel (PSBCH) of a first user equipment, comprising:

transmitting, to one or more second user equipments, a PSBCH carrying information, wherein the information carried in the PSBCH is used to determine a periodicity and a number of slots, wherein the slots comprise sidelink (SL) slots.

2. The method of claim 1, wherein only a pattern 1 is configured by a network, the information carried in PSBCH is determined by parameters configured in pattern 1.

3. The method of claim 2, wherein the periodicity which is determined by the information carried in the PSBCH is determined by a periodicity configured in the pattern 1.

4. The method of claim 2 or 3, wherein the number of slots which is determined by the information carried in the PSBCH is determined by a number of slots configured in the pattern 1.

5. The method of claim 4, wherein the slots configured in the pattern 1 comprise UL slots.

6. The method of claim 1, wherein both a pattern 1 and a pattern 2 are configured by the network, the information carried in PSBCH is determined by parameters configured in pattern 1 and/or pattern 2.

7. The method of claim 6, wherein the periodicity which is determined by the information carried in the PSBCH is determined by a first periodicity configured in the pattern 1 and a second periodicity configured in the pattern 2.

8. The method of claim 6 or 7, wherein the number of slots which is determined by the information carried in the PSBCH is determined by a number of slots configured in at least one of the pattern 1 and the pattern 2.

9. The method of claim 8, wherein the slots configured in at least one of the pattern 1 and the pattern 2 comprise UL slots.

10. The method of any one of claims 1 to 9, further comprising obtaining a first reference subcarrier spacing (SCS), wherein the first reference SCS is configured by the network.

11. The method of claim 10, wherein the number of slots which is determined by the information carried in the PSBCH is further determined by the first reference SCS and a second reference SCS, wherein the second reference SCS is pre-configured, or pre-defined, or determined by the information carried in the PSBCH.

12. The method of any one of claims 1 to 11, wherein the information carried in the PSBCH further determines a number of symbols, wherein the symbols comprise SL symbols.

13. The method of any one of claims 1 to 12, wherein the first user equipment is in coverage of a cell.

14. A first user equipment for transmitting a physical sidelink broadcast channel (PSBCH), configured to implement the method of any one of claims 1 to 13.

15. A chip, comprising:

a processor, configured to call and run a computer program stored in a memory, to cause a device in which the chip is installed to execute the method of any one of claims 1 to 13.