

CLAIMS

1. A method for uplink channel multiplexing, applied to a terminal and comprising:

when a terminal would transmit multiple overlapping Physical Uplink Control Channels (PUCCHs) and/or Physical Uplink Shared Channels (PUSCHs) in a same slot or sub-slot, if one of the PUCCH transmissions or PUSCH transmissions is in response to a Downlink Control Information (DCI) format detected by the terminal, expecting, by the terminal, that a start symbol S0 of an earliest PUCCH or PUSCH among the overlapping PUCCHs and/or PUSCHs satisfies a first condition.

2. The method for uplink channel multiplexing of claim 1, wherein the first condition satisfied by the start symbol S0 of the earliest PUCCH or PUSCH among the overlapping PUCCHs and/or PUSCHs comprises at least one of the following:

S0 is not before a first symbol, a Cyclic Prefix (CP) of the first symbol starts at a first time after a last symbol of any corresponding PDSCH, and Hybrid Automatic Repeat reQuest-ACK (HARQ-ACK) corresponding to the any corresponding PDSCH has a same first priority index; and/or S0 is not before a second symbol, a CP of the second symbol starts at a second time after the last symbol of any corresponding PDSCH, and the HARQ-ACK corresponding to the any corresponding PDSCH has a same second priority index;

S0 is not before a third symbol, a CP of the third symbol starts at a third time after a last symbol of any Semi-Persistent Scheduling (SPS) PDSCH release, and an HARQ-ACK corresponding to the any SPS PDSCH release has the same first priority index; and/or S0 is not before a fourth symbol, a CP of the fourth symbol starts at a fourth time after the last symbol of any SPS PDSCH release, and the HARQ-ACK corresponding to the any SPS PDSCH release has the same second priority index;

when there is no aperiodic Channel State Information (CSI) report multiplexed in a PUSCH in the overlapping PUCCHs and/or PUSCHs, S0 is not before a fifth symbol, a CP of

the fifth symbol starts at a fifth time after a last symbol of any PDCCH with a DCI format that carries and scheduling an overlapping PUSCH and any PDCCH that schedules the PDSCH or SPS PDSCH release, the HARQ-ACK of the PDSCH or the SPS PDSCH release is in an overlapping PUCCH and has the same first priority index, and the any PUSCH has the same first priority index; and/or S0 is not before a sixth symbol, a CP of the sixth symbol starts at a sixth time after the last symbol of any PDCCH with a DCI format scheduling an overlapping PUSCH and any PDCCH that schedules the PDSCH or SPS PDSCH release, where the HARQ-ACK of the PDSCH or the SPS PDSCH release is in an overlapping PUCCH and has the same second priority index, and the any PUSCH has the same second priority index;

when there is an aperiodic CSI report multiplexed in a PUSCH in the overlapping PUCCHs and/or PUSCHs, S0 is not before a seventh symbol, a CP of the seventh symbol starts at a seventh time after the last symbol of any PDCCH with a DCI format scheduling an overlapping PUSCH and any PDCCH that schedules the PDSCH or SPS PDSCH release, where the HARQ-ACK of the PDSCH or the SPS PDSCH release is in an overlapping PUCCH and has the same first priority index, and the any PUSCH has the same first priority index; and/or S0 is not before an eighth symbol, a CP of the eighth symbol starts at an eighth time after the last symbol of any PDCCH with a DCI format scheduling an overlapping PUSCH and any the PDCCH that schedules the PDSCH or SPS PDSCH release, where the HARQ-ACK of the PDSCH or the SPS PDSCH release is in an overlapping PUCCH and has the same second priority index, and any PUSCH has the same second priority index.

3. The method for uplink channel multiplexing of claim 1, further comprising:

determining a resource set, wherein the resource set comprises a Physical Uplink Control Channel (PUCCH) resource for transmitting the PUCCH in a single slot or sub-slot; and

removing the PUCCH resource from the resource set in at least one of the following cases: the PUCCH resource cannot satisfy the first condition, the PUCCH resource cannot satisfy a first latency requirement, or the PUCCH resource cannot satisfy a first reliability requirement.

4. The method for uplink channel multiplexing of claim 3, wherein removing the PUCCH resource from the resource set in the case that the PUCCH resource cannot satisfy a first latency requirement comprises:

in a case that an end symbol of the PUCCH resource is later than X symbols after an end symbol of a first PUCCH resource, removing the PUCCH resource from the resource set, wherein X is an integer, and the first PUCCH resource is a PUCCH resource that is determined according to at least one of a high layer signaling or a physical layer control signaling sent by a network device and carries Uplink Control Information (UCI) of a first priority index.

~~5. The method for uplink channel multiplexing of claim 4, wherein X is predetermined, or configured by the network device by means of the high layer signaling, or a value, indicated by means of physical layer downlink control signaling, in a set determined in a predetermined manner or by high layer signaling configuration.~~

65. The method for uplink channel multiplexing of claim 3, wherein removing the PUCCH resource from the resource set in the case that the PUCCH resource cannot satisfy a first reliability requirement comprises:

in a case that a maximum bitrate of the PUCCH resource determined according to the high layer signaling is higher than a maximum bitrate of the first PUCCH resource by a first preset value, or the maximum bitrate of the PUCCH resource is higher than a second preset value, removing the PUCCH resource from the resource set, wherein the first PUCCH resource is a PUCCH resource that is determined according to at least one of a high layer signaling or a physical layer control signaling sent by a network device and carries UCI of a first priority index.

~~7. The method for uplink channel multiplexing of claim 6, wherein at least one of the first preset value or the second preset value is predetermined, or configured by a base station by means of the high layer signaling; or a value, indicated by means of physical layer downlink control signaling, in a set determined in a predetermined manner or by high layer signaling configuration.~~

86. The method for uplink channel multiplexing of claim 1 or 3, further comprising at least one of the following:

determining bitrates of Uplink Control Information (UCI) of different priority indexes transmitted on a Physical Uplink Control Channel (PUCCH); or

determining content transmitted on the PUCCH in a resource set.

~~9. The method for uplink channel multiplexing of claim 8, wherein the determining bitrates of the UCI of different priority indexes transmitted on the PUCCH comprises:~~

~~determining a bitrate of UCI of a first priority index to be: a lowest maximum bitrate in the maximum bitrates of the PUCCH indicated according to corresponding high layer configuration and/or physical layer downlink control information, or a bitrate of the PUCCH in the resource set; and~~

~~determining a bitrate of UCI of a second priority index to be: the lowest maximum bitrate in the maximum bitrates of the PUCCH indicated according to the corresponding high layer configuration and/or the physical layer downlink control information, or the bitrate of the PUCCH in the resource set.~~

~~107. The method for uplink channel multiplexing of claim 8 or 96, wherein the determining content transmitted on the PUCCH in the resource set comprises:~~

the PUCCH being required to transmit a first UCI set, in a case that a number of bits

that can be carried by the PUCCH resource, that is determined according to a number of Physical Resource Blocks (PRBs) configured in the PUCCH and a modulation order and bitrate of the first UCI set, is greater than or equal to a number of bits of the first UCI set, determining a minimum number of PRBs to be a first number of PRBs according to the number of bits of the first UCI set, the number of PRBs configured in the PUCCH, and the modulation order and bitrate of the first UCI set, and transmitting the first UCI set by using the first number of PRBs;

in a case that the number of bits that can be carried by the PUCCH resource, that is determined according to the number of PRBs configured in the PUCCH and the modulation order and bitrate of the UCI, is less than the number of bits of the first UCI set, transmitting a second UCI set, wherein the second UCI set satisfies the following conditions:

the second UCI set being a sub-set of the first UCI set, and

the number of bits that can be carried by the PUCCH resource, that is determined according to the number of PRBs configured in the PUCCH and the modulation order and bitrate of the second UCI set, being greater than or equal to the number of bits of the second UCI set; and

the first UCI set comprising at least one of the following UCI:

a Hybrid Automatic Repeat Request-ACKnowledgement (HARQ-ACK), a Scheduling Request (SR), a wide band Channel State Information (CSI) report, and a sub-band CSI report of the first priority index, wherein a number of bits occupied by the HARQ-ACK of the first priority index is O_{H-ACK} , a number of bits occupied by the SR of the first priority index is O_{H-SR} , and a numbers of bits occupied by each of the wideband CSI report and the sub-band CSI report of the first priority index is O_{H-CSI} ; and

a HARQ-ACK, an SR, a wideband CSI report, a sub-band CSI report, or a Cyclic Redundancy Check (CRC) of the second priority index, wherein a number of bits occupied by the HARQ-ACK of the second priority index is O_{L-ACK} , a number of bits occupied by the SR of the second priority index is O_{L-SR} , a numbers of bits occupied by each of the wideband CSI

report and the sub-band CSI report of the second priority index is O_{L-CSI} , and a number of bits occupied by the CRC of the second priority index is O_{CRC} .

~~118~~. The method for uplink channel multiplexing of claim ~~107~~, wherein the determining the second UCI set comprises:

selecting UCI from the first UCI set according to a first sequence, so as to determine the second UCI set;

wherein the first sequence comprises at least one of the following:

the UCI of the first priority index being selected in preference to the UCI of the second priority index;

the HARQ-ACK and the SR being selected in preference to the CSI when the priority index is the same;

a first part of the CSI being selected in preference to a second part of the CSI when the priority index is the same; or

one with a higher priority among the first part of the CSI and the second part of the CSI being selected in preference when the priority index is the same.

~~129~~. A method for uplink channel multiplexing, applied to a terminal and comprising:

determining a resource set, wherein the resource set comprises a Physical Uplink Control Channel (PUCCH) resource for transmitting the PUCCH in a single slot or sub-slot; and

removing the PUCCH resource from the resource set in at least one of the following cases: the PUCCH resource cannot satisfy the first condition, the PUCCH resource cannot satisfy a first latency requirement, or the PUCCH resource cannot satisfy a first reliability

requirement.

~~13~~10. The method for uplink channel multiplexing of claim ~~12~~9, wherein removing the PUCCH resource from the resource set in the case that the PUCCH resource cannot satisfy a first latency requirement comprises:

in a case that an end symbol of the PUCCH resource is later than X symbols after an end symbol of a first PUCCH resource, removing the PUCCH resource from the resource set, wherein X is an integer, and the first PUCCH resource is a PUCCH resource that is determined according to at least one of a high layer signaling or a physical layer control signaling sent by a network device and carries Uplink Control Information (UCI) of a first priority index.

~~14~~11. The method for uplink channel multiplexing of claim ~~13~~10, wherein X is predetermined, or configured by the network device by means of the high layer signaling, or a value, indicated by means of physical layer downlink control signaling, in a set determined in a predetermined manner or by high layer signaling configuration.

~~15~~12. The method for uplink channel multiplexing of claim ~~12~~9, wherein removing the PUCCH resource from the resource set in the case that the PUCCH resource cannot satisfy a first reliability requirement comprises:

in a case that a maximum bitrate of the PUCCH resource determined according to the high layer signaling is higher than a maximum bitrate of the first PUCCH resource by a first preset value, or the maximum bitrate of the PUCCH resource is higher than a second preset value, removing the PUCCH resource from the resource set, wherein the first PUCCH resource is a PUCCH resource that is determined according to at least one of a high layer signaling or a physical layer control signaling sent by a network device and carries UCI of a first priority index.

~~16~~13. The method for uplink channel multiplexing of claim ~~15~~12, wherein at least one of the first preset value or the second preset value is predetermined, or configured by a base station by means of the high layer signaling; or a value, indicated by means of physical layer downlink control signaling, in a set determined in a predetermined manner or by high layer signaling configuration.

~~17~~14. A method for uplink channel multiplexing, applied to a terminal and comprising at least one of the following:

determining bitrates of Uplink Control Information (UCI) of different priority indexes transmitted on a Physical Uplink Control Channel (PUCCH); or

determining content transmitted on the PUCCH in a resource set.

~~18~~15. The method for uplink channel multiplexing of claim ~~17~~14, wherein the determining bitrates of the UCI of different priority indexes transmitted on the PUCCH comprises:

determining a bitrate of UCI of a first priority index to be: a lowest maximum bitrate in the maximum bitrates of the PUCCH indicated according to corresponding high layer configuration and/or physical layer downlink control information, or a bitrate of the PUCCH in the resource set; and

determining a bitrate of UCI of a second priority index to be: the lowest maximum bitrate in the maximum bitrates of the PUCCH indicated according to the corresponding high layer configuration and/or the physical layer downlink control information, or the bitrate of the PUCCH in the resource set.

~~19~~16. The method for uplink channel multiplexing of claim ~~17~~14 or ~~18~~15, wherein the determining content transmitted on the PUCCH in the resource set comprises:

the PUCCH being required to transmit a first UCI set, in a case that a number of bits that can be carried by the PUCCH resource, that is determined according to a number of Physical Resource Blocks (PRBs) configured in the PUCCH and a modulation order and bitrate of the first UCI set, is greater than or equal to a number of bits of the first UCI set, determining a minimum number of PRBs to be a first number of PRBs according to the number of bits of the first UCI set, the number of PRBs configured in the PUCCH, and the modulation order and bitrate of the first UCI set, and transmitting the first UCI set by using the first number of PRBs;

in a case that the number of bits that can be carried by the PUCCH resource, that is determined according to the number of PRBs configured in the PUCCH and the modulation order and bitrate of the UCI, is less than the number of bits of the first UCI set, transmitting a second UCI set, wherein the second UCI set satisfies the following conditions:

the second UCI set being a sub-set of the first UCI set, and

the number of bits that can be carried by the PUCCH resource, that is determined according to the number of PRBs configured in the PUCCH and the modulation order and bitrate of the second UCI set, being greater than or equal to the number of bits of the second UCI set; and

the first UCI set comprising at least one of the following UCI:

a HARQ-ACK, a Scheduling Request (SR), a wideband Channel State Information (CSI) report, a sub-band CSI report, or a Cyclic Redundancy Check (CRC) of the first priority index, wherein a number of bits occupied by the HARQ-ACK of the first priority index is O_{L-ACK} , a number of bits occupied by the SR of the first priority index is O_{L-SR} , a number of bits occupied by each of the wideband CSI report and the sub-band CSI report of the first priority index is O_{L-CSI} , and a number of bits occupied by the CRC of the first priority index is O_{CRC} .

2017. The method for uplink channel multiplexing of claim 1916, wherein the determining

the second UCI set comprises:

selecting UCI from the first UCI set according to a first sequence, so as to determine the second UCI set;

wherein the first sequence comprises at least one of the following:

the UCI of the first priority index being selected in preference to the UCI of the second priority index;

the HARQ-ACK and the SR being selected in preference to the CSI when the priority index is the same;

a first part of the CSI being selected in preference to a second part of the CSI when the priority index is the same; or

one with a higher priority among the first part of the CSI and the second part of the CSI being selected in preference when the priority index is the same.

~~21. A device for uplink channel multiplexing, applied to a terminal and comprising:~~

~~a transceiving module, configured such that when a terminal would transmit multiple overlapping Physical Uplink Control Channels (PUCCHs) and/or Physical Uplink Shared Channels (PUSCHs) in a same slot or sub-slot, if one of the PUCCH transmissions or PUSCH transmissions is in response to a Downlink Control Information (DCI) format detected by the terminal, the terminal expects that a start symbol S0 of an earliest PUCCH or PUSCH among the overlapping PUCCHs and/or PUSCHs satisfies a first condition.~~

~~22~~18. A terminal, comprising:

a memory storing instructions; and

a processor, configured to, when executing the instructions, perform the method of any

of claims 1 to 8.

~~a transceiver, configured such that when a terminal would transmit multiple overlapping Physical Uplink Control Channels (PUCCHs) and/or Physical Uplink Shared Channels (PUSCHs) in a same slot or sub-slot, if one of the PUCCH transmissions or PUSCH transmissions is in response to a Downlink Control Information (DCI) format detected by the terminal, the terminal expects that a start symbol S0 of an earliest PUCCH or PUSCH among the overlapping PUCCHs and/or PUSCHs satisfies a first condition.~~

~~23. A device for uplink channel multiplexing, applied to a terminal and comprising:~~

~~a determination module, configured to determine a resource set, wherein the resource set comprises resources for transmitting a Physical Uplink Control Channel (PUCCH) in a single slot or sub-slot; and remove a PUCCH resource that does not satisfy a first condition or a first latency requirement or a first reliability requirement from the resource set.~~

~~24~~19. A terminal, comprising:

a memory storing instructions; and

a processor, configured to, when executing the instructions, perform the method of any of claims 9 to 13.

~~a processor, configured to determine a resource set, wherein the resource set comprises resources for transmitting a Physical Uplink Control Channel (PUCCH) in a single slot or sub-slot; and remove a PUCCH resource that does not satisfy a first condition or a first latency requirement or a first reliability requirement from the resource set.~~

~~25. A device for uplink channel multiplexing, applied to a terminal and comprising:~~

~~a processor, configured to determine at least one of the following:~~

~~bitrates of Uplink Control Information (UCI) of different priority indexes transmitted in a Physical Uplink Control Channel (PUCCH); or~~

~~content transmitted on the PUCCH in a resource set.~~

2620. A terminal, comprising:

a memory storing instructions; and

a processor, configured to, when executing the instructions, perform the method of any of claims 14 to 17.

~~a processor, configured to determine at least one of the following:~~

~~bitrates of Uplink Control Information (UCI) of different priority indexes transmitted in a Physical Uplink Control Channel (PUCCH); and/or~~

~~content transmitted on the PUCCH in a resource set.~~

~~27. A communication device, comprising a processor and a memory storing a computer program, wherein the computer program, when operated by the processor, performs the method of any of claims 1 to 11 or the method of any of claims 12 to 16 or the method of any of claims 17 to 20.~~

~~28. A computer-readable storage medium, comprising instructions, wherein the instructions, when running in a computer, cause the computer to perform the method of any of claims 1 to 11, or the method of any of claims 12 to 16, or the method of any of claims 17 to 20.~~