

Claims

1. A method for wireless communication, comprising:
 - receiving, by a first node, a downlink control information (DCI) command, wherein the DCI command is used for scheduling a transmission of a first signal;
 - determining, by the first node, a beam state for a transmission of a second signal based on the DCI command; and
 - communicating, by the first node, the second signal with a second node according to the beam state.
2. The method of claim 1, wherein the beam state comprises at least one of: a quasi co-location (QCL) state, a transmission configuration indicator (TCI) state, spatial relation information, reference signal information, spatial filter information, or precoding information.
3. The method of claim 1, wherein the second signal comprises at least one of: a physical downlink control channel (PDCCH), a physical uplink control channel (PUCCH), a channel-state information reference signal (CSI-RS), a sounding reference signal (SRS), an physical uplink shared channel (PUSCH), or a physical downlink shared channel (PDSCH).
4. The method of claim 1, wherein the first signal comprises at least one of: a physical uplink shared channel (PUSCH), a physical downlink shared channel (PDSCH), a channel state information reference signal (CSI-RS), or a sounding reference signal (SRS).
5. The method of claim 1, wherein the DCI command includes: at least one transmission configuration indicator (TCI) field or at least one sounding reference signal resource indicator (SRI) field, wherein the at least one of the at least one TCI field or the at least one SRI field indicates the beam state.
6. The method of claim 1, wherein determining the beam state comprises determining, by the first node, one of a plurality of beam state combinations indicated in the DCI command .
7. The method of claim 6, wherein determining the beam state further comprises determining, by the first node, a beam state indication value in the DCI command that is associated with the one of the plurality of beam state combinations.
8. The method of claim 7, wherein determining the beam state further comprises accessing, by the first node, a lookup table that includes associations between a plurality of beam state indication values and the plurality of beam state combinations.

9. The method of claim 5, wherein the second signal comprises a downlink signal, wherein the at least one SRI field indicates the beam state, and wherein the beam state comprises a quasi-co location (QCL) type D reference signal.
10. The method of claim 5, wherein the second signal comprises an uplink signal, wherein the at least one TCI field indicates the beam state, and wherein the beam state comprises a quasi-co location (QCL) type D reference signal.
11. The method of claim 1, wherein the second signal comprises one of:
a PDCCH in all control resource sets (CORESET) in a bandwidth part or a cell;
a PDCCH in a control resource set (CORESET) on which the first node receives the DCI command;
a PDCCH in a CORESET pool on which the first node receives the DCI command;
a PDCCH in a CORESET or a CORESET pool that is associated with the beam state indicated in the DCI command; or
a PDCCH related to a same CORESET pool or a same CORESET as the DCI command.
12. The method of claim 1, wherein the second signal comprises one of:
a PUCCH in all PUCCH resources in a bandwidth part or a cell;
a PUCCH indicated by a PUCCH resource indicator (PRI) in the DCI command;
a PUCCH related to a same PUCCH resource group indicated by a PUCCH resource indicator in the DCI command; or
a PUCCH associated with a spatial relationship related to a control resource set (CORESET) in which the first node receives the DCI command.
13. The method of claim 1, wherein the second signal comprises one of:
a reference signal with all or part of reference signal (RS) resources;
a reference signal with all or part of RS resources in a bandwidth part or a cell; or
a reference signal with a RS resource determined by a RS resource set index or a RS resource index.
14. The method of any of claims 11 to 13, wherein the bandwidth part or the cell is determined according to the DCI command.
15. The method of claim 14, the bandwidth part or the cell further comprises:
a bandwidth part or a cell where the DCI command is communicated;
a first bandwidth part or a first cell related to a second bandwidth part or a second cell where the DCI command is communicated; or

a first bandwidth part or a first cell belonging to a same group as a second bandwidth part or a second cell where the DCI command is communicated.

16. The method of claim 13, wherein the RS resource set index or a RS resource index is activated by the DCI command.

17. The method of claim 13, wherein the RS resource is in a RS resource set comprising a highest resource set index or a lowest resource set index among a plurality of resource set indices for a plurality of RS resource sets activated by the DCI command.

18. The method of claim 13, wherein the reference signal (RS) comprises a sounding reference signal (SRS) or a channel state information reference signal (CSI-RS).

19. The method of claim 1, wherein the second signal comprises a physical uplink shared channel (PUSCH), the method further comprising:

determining, by the first node, a sounding reference signal resource indicator (SRI) of the PUSCH according to the beam state based on the DCI command.

20. The method of claim 19, wherein the PUSCH comprises one of:

- a PUSCH scheduled by a second DCI command; or
- a PUSCH configured according to ConfiguredGrantConfig.

21. The method of claim 19, wherein the beam state comprises one of a plurality of beam states, the method further comprising:

determining, by the first node, one or more SRS resources for the non-codebook based PUSCH transmission based on the plurality of beam states.

22. The method of claim 1, wherein the DCI command is a most recent DCI command comprising the beam state received prior to receiving a second DCI command which schedules the transmission of the second signal, or prior to receiving the second signal.

23. The method of claim 1, wherein the second signal comprises a physical downlink shared channel (PDSCH), wherein the transmission of the PDSCH is scheduled by the DCI command comprising a DCI format 1_0, a DCI format 1_1, or a DCI format 1_2.

24. The method of claim 1, further comprising:

determining, by the first node, whether to communicate the first signal.

25. The method of claim 24, wherein determining whether to communicate the first signal comprises determining, by the first node, whether to communicate the first signal according to a first transmission parameter.
26. The method of claim 25, wherein the first transmission parameter is in at least one of: radio resource control signaling, a medium access control layer signaling, or physical layer signaling.
27. The method of claim 25, wherein determining whether to communicate the first signal comprises determining, by the first node, not to communicate the first signal in response to the first transmission parameter indicating not to communicate the first signal or an absence of the first transmission parameter.
28. The method of claim 25, wherein determining whether to communicate the first signal comprises determining, by the first node, to communicate the first signal in response to the first transmission parameter indicating to communicate the first signal or a presence of the first transmission parameter.
29. The method of claim 25, wherein the first signal comprises an uplink signal, wherein the DCI command comprises an uplink shared channel (UL-SCH) indicator field that comprises the first transmission parameter.
30. The method of claim 29, wherein determining whether to communicate the uplink signal comprises determining, by the first node, not to communicate the uplink signal in response to the UL-SCH indicator field comprising a '0' value.
31. The method of claim 24, further comprising:
determining, by the first node, not to send a channel state information (CSI) report in response to a CSI request field of the DCI command comprising a '0' value.
32. The method of claim 25, wherein the first signal comprises a downlink signal, wherein the DCI command comprises a downlink shared channel (DL-SCH) indicator field that comprises the first transmission parameter.
33. The method of claim 32, wherein determining whether to communicate the downlink signal comprises determining, by the first node, not to communicate the downlink signal in response to the DL-SCH indicator field comprising a '0' value.
34. The method of claim 1, wherein determining, by the first node, the beam state for the transmission of the second signal based on the DCI command, further comprises:
determining, by the first node, the beam state for the transmission of the second signal based on the DCI command according to a second transmission parameter.

35. The method of claim 34, wherein the second transmission parameter is in a radio resource control signaling, a medium access control layer signaling, or a physical layer signaling.

36. The method of claim 34, wherein determining, by the first node, the beam state for the transmission of the second signal based on the DCI command according to the second transmission parameter comprises:

determining, by the first node, the beam state for the transmission of the second signal based on the DCI command according to the second transmission parameter in response to the second transmission parameter being enabled or provided.

37. The method of claim 34, wherein determining, by the first node, the beam state for the transmission of the second signal based on the DCI command according to the second transmission parameter comprises:

determining, by the first node, the beam state for the transmission of the second signal based on the DCI command according to the second transmission parameter in response to the second transmission parameter being enabled or provided for a type of second signal.

38. The method of claim 37, wherein the type of second signal comprises at least one of: a physical downlink control channel (PDCCH), a physical uplink control channel (PUCCH), a channel-state information reference signal (CSI-RS), a sounding reference signal (SRS), a physical downlink shared channel (PDSCH), or a physical uplink shared channel (PUSCH).

39. The method of claim 34, wherein the type of second signal is determined according to one of:

- a predetermined type of second signal;
- a configured type of second signal or a configured type of second signal related to the second transmission parameter;
- an indicated type of second signal or an indicated type of second signal related to the second transmission parameter; or
- a DCI format of the DCI command.

40. The method of claim 1, wherein determining, by the first node, the beam state for the transmission of the second signal based on the DCI command comprises: determining, by the first node, the beam state for the transmission of the second signal upon receiving the DCI command, wherein the DCI command comprises one of a plurality of beam states of a beam state group.

41. The method of claim 40, wherein the beam state group is related to a type of second signal.

42. The method of claim 40, wherein the beam state group is determined according to medium access control (MAC) layer signaling or radio resource control (RRC) signaling.

43. The method of claim 1, wherein determining, by the first node, the beam state for the transmission of the second signal based on the DCI command comprises:

determining, by the first node, the beam state for the transmission of the second signal based on the DCI command after a predetermined time point, or after a predetermined time period after the predetermined time point.

44. The method of claim 43, wherein the predetermined time period comprises one or more time units, each of the one or more time units comprises a slot, a symbol, a radio frame, a physical frame, a sub-frame of the radio frame or the physical frame, or a seconds-based unit.

45. The method of claim 43, wherein the predetermined time point is one of: (time point)
a time of receiving the DCI command;
a time of the transmission of the second signal;
a time of a second DCI command which schedules the second signal; or
a time that a response signal related to the DCI command is communicated.

46. The method of claim 45, wherein the time of receiving the DCI command corresponds to a time of receiving a last symbol of a physical downlink control channel (PDCCH) transmission that includes the DCI command, or an initial symbol immediately after the last symbol.

47. The method of claim 45, wherein the response signal comprises a physical uplink shared channel (PUSCH) scheduled by the DCI command, a first hybrid automatic repeat request (HARQ) signal for a physical downlink shared channel (PDSCH) transmission scheduled by the DCI command, or a second HARQ signal for the DCI command.

48. The method of claim 47, wherein, when the response signal comprises the first HARQ signal, the first HARQ signal comprises a positive acknowledgement (HARQ-ACK) or a negative acknowledgement (HARQ-NACK).

49. The method of claim 47, wherein the response signal comprises the PUSCH, and wherein determining, by the first node, the beam state for the transmission of the PUSCH after the predetermined time period after the predetermined time point, depends on:

the first node not detecting any other DCI commands before the predetermined time point, or before the predetermined time period after the predetermined time point; or

the first node detecting one or more other DCI commands before the predetermined time point, or before the predetermined time period after the predetermined time point, and the one or more other DCI commands is not used to determine the beam state of the second signal.

50. The method of claim 47, wherein the response signal comprises the PUSCH, the method further comprising:

detecting, by the first node, a second response signal from the second node before the

predetermined time point, or before the predetermined time period after the predetermined time point; and

determining, by the first node, the beam state for the transmission of the second signal after the predetermined time period after the predetermined time point, or after a second predetermined time period after the predetermined time point.

51. The method of claim 50, wherein the second response signal comprises: a DCI format, the method further comprising:

scheduling, by the second node, a second PUSCH transmission with a same hybrid automatic repeat request (HARQ) process number as for a first PUSCH transmission of the response signal with a toggled new-data indicator (NDI) field value.

52. A wireless communications apparatus comprising a processor and a memory, wherein the processor is configured to read code from the memory and implement a method recited in any of claims 1 to 51.

53. A computer program product comprising a computer-readable program medium code stored thereupon, the code, when executed by a processor, causing the processor to implement a method recited in any of claims 1 to 51.