BEAM STATE UPDATING IN WIRELESS COMMUNICATION

TECHNICAL FIELD

This document is directed generally to wireless communications.

BACKGROUND

A key objective of new radio (NR) technology of fifth generation (5G) mobile communication systems is to support high frequency bands, which have abundantly more frequency domain resources compared to lower frequency bands. However, higher frequency signals attenuate more rapidly and provide a lower range of coverage. To improve these deficiencies, devices utilizing 5G NR are configured with antennas capable of performing beamforming in order to concentrate energy in a relatively small spatial range. In turn, the beams determined by two devices communicating with each other form a beam pair.

During communication, the time and/or position of at least one of the devices may change, which may or may not require the beam pair to change in order for the devices to maintain optimal communication settings. Also, during communication, the devices may communicate different control and data signals and channels, which may require the same or different beam pairs and/or other communication setting or parameters for optimal communication. As such, flexible ways for devices to determine communication settings and parameters during wireless communication in 5G NR or other wireless communication systems may be desirable.

SUMMARY

This document relates to methods, systems, and devices for communicating a second signal according to a beam state determined from a DCI command used to schedule a transmission of a first signal. In a first aspect of the present invention, a method for wireless communication, includes: receiving, by a first node, a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH); determining, by the first node, a transmission configuration indicator (TCI) 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 TCI state.

In a second aspect of the present invention, a wireless communications apparatus includes: a memory storing a plurality of instructions; and a processor configured to execute the plurality of instructions, and upon execution of the plurality of instructions, is configured to: receive a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH); determine a transmission configuration indicator (TCI) state for a transmission of a second signal based on the DCI command; and communicate the second signal with a second node according to the TCI state.

In a third aspect of the present invention, a method for wireless communication includes: transmitting, by a second node, a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH), wherein the DCI command indicates to a first node receiving the DCI command to determine a transmission configuration indicator (TCI) state for a transmission of a second signal based on the DCI command; and communicating, by the second node, the second signal with the first node according to the TCI state.

In a fourth aspect of the present invention, a wireless communications apparatus includes: a memory storing a plurality of instructions; and a processor configured to execute the plurality of instructions, and upon execution of the plurality of instructions, is configured to: transmit a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH), wherein the DCI command indicates to a first node receiving the DCI command to determine a transmission configuration indicator (TCI) state for a transmission of a second signal based on the DCI command; and communicate the second signal with the first node according to the TCI state.

In some of these implementations, the method further includes the first node determining the beam state for the transmission of the second signal according to a second transmission parameter.

In some of these implementations, the method further includes the first node determining the beam state for the transmission of the second signal after a predetermined time point, or after a predetermined time period after the predetermined time point.

In some of these implementations, the method further includes the first node determining

whether to communicate the first signal.

In some other implementations, a device, such as a network device, is disclosed. The device may include one or more processors and one or more memories, wherein the one or more processors are configured to read computer code from the one or more memories to implement any one of the methods above.

In yet some other implementations, a computer program product is disclosed. The computer program product may include a non-transitory computer-readable program medium with computer code stored thereupon, the computer code, when executed by one or more processors, causing the one or more processors to implement any one of the methods above.

The above and other aspects and their implementations are described in greater detail in the drawings, the descriptions, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an example of a wireless communication system.

FIG. 2 shows example layers of a communication node of the wireless communication system of FIG. 1.

FIG. 3 is a flow chart of an example of a wireless communication method.

FIG. 4 is a flow chart of another example of a wireless communication method.

C L A I M S

1. A method for wireless communication, comprising:

receiving, by a first node, a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH);

determining, by the first node, a transmission configuration indicator (TCI) 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 TCI state.

2. 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), a physical uplink shared channel (PUSCH), or a physical downlink shared channel (PDSCH).

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

determining, by the first node, the TCI state for the transmission of the second signal according to a second transmission parameter in a radio resource control (RRC) signaling.

4. The method of claim 3, wherein

the second transmission parameter is configured as enabled.

5. The method of claim 3, wherein the type of second signal comprises at least one of: a physical downlink control channel (PDCCH), a sounding reference signal (SRS), or a physical downlink shared channel (PDSCH).

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

determining, by the first node, the TCI state for the transmission of the second signal based on the DCI command after one or more symbols after a time that a response signal associated with the DCI command is communicated.

7. The method of claim 6, wherein the response signal comprises a hybrid automatic repeat request (HARQ) signal for the PDSCH scheduled by the DCI command.

8. A wireless communications apparatus comprising:

a memory storing a plurality of instructions; and

a processor configured to execute the plurality of instructions, and upon execution of the plurality of instructions, is configured to:

receive a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH);

determine a transmission configuration indicator (TCI) state for a transmission of a second signal based on the DCI command; and

communicate the second signal with a second node according to the TCI state.

9. The wireless communications apparatus of claim 8, 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), a physical uplink shared channel (PUSCH), or a physical downlink shared channel (PDSCH).

10. The wireless communications apparatus of claim 8, wherein the processor is configured to determine the TCI state for the transmission of the second signal according to a second transmission parameter in a radio resource control (RRC) signaling.

11. The wireless communications apparatus of claim 10, wherein the second communication parameter is configured as enabled.

12. The wireless communications apparatus of claim 10, wherein the second signal comprises at least one of: a physical downlink control channel (PDCCH), a sounding reference signal (SRS), or a physical downlink shared channel (PDSCH).

13. The wireless communications apparatus of claim 8 wherein the processor, upon execution of the plurality of instructions, is configured to determine the TCI state for the transmission of the second signal based on the DCI command after one or more symbols after a time that a response signal associated with the DCI command is communicated.

14. The wireless communications apparatus of claim 13, wherein the response signal comprises a hybrid automatic repeat request (HARQ) signal for the PDSCH.

15. A method for wireless communication, comprising:

transmitting, by a second node, a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH), wherein the DCI command indicates to a first node receiving the DCI command to determine a transmission configuration indicator (TCI) state for a transmission of a second signal based on the DCI command; and

communicating, by the second node, the second signal with the first node according to the TCI state.

16. The method of claim 15, 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), a physical uplink shared channel (PUSCH), or a physical downlink shared channel (PDSCH).

17. The method of claim 15, wherein the TCI state for the transmission of the second signal is determined according to a second transmission parameter in a radio resource control (RRC) signaling.

18. The method of claim 17, wherein the second transmission parameter is configured as enabled.

19. The method of claim 17, wherein the second signal comprises at least one of: a physical downlink control channel (PDCCH), a sounding reference signal (SRS), or a physical downlink shared channel (PDSCH).

20. The method of claim 15, wherein the TCI state for the transmission of the second signal based on the DCI command is determined after one or more symbols after a time that a response signal associated with the DCI command is communicated.

21. The method of claim 20, wherein the response signal comprises a hybrid automatic repeat request (HARQ) signal for the PDSCH scheduled by the DCI command.

22. A wireless communications apparatus comprising:

a memory storing a plurality of instructions; and

a processor configured to execute the plurality of instructions, and upon execution of the plurality of instructions, is configured to:

transmit a downlink control information (DCI) command scheduling a transmission of a physical downlink shared channel (PDSCH), wherein the DCI command indicates to a first node receiving the DCI command to determine a transmission configuration indicator (TCI) state for a transmission of a second signal based on the DCI command; and

communicate the second signal with the first node according to the TCI state.

23. The wireless communications apparatus of claim 22, 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), a physical uplink shared channel (PUSCH), or a physical downlink shared channel (PDSCH).

24. The wireless communications apparatus of claim 22, wherein the TCI state for the transmission of the second signal is determined according to a second transmission parameter in a radio resource control (RRC) signaling.

25. The wireless communications apparatus of claim 24, wherein the second transmission parameter is configured as enabled.

26. The wireless communications apparatus of claim 24, wherein the second signal comprises at least one of: a physical downlink control channel (PDCCH), a sounding reference signal (SRS), or a physical downlink shared channel (PDSCH).

27. The wireless communications apparatus of claim 22, wherein the TCI state for the transmission of the second signal based on the DCI command is determined after one or more symbols after a time that a response signal associated with the DCI command is communicated.

28. The wireless communications apparatus of claim 27, wherein the response signal comprises a hybrid automatic repeat request (HARQ) signal for the PDSCH scheduled by the DCI command.