A METHOD FOR UNIFIED UPLINK AND DOWNLINK BEAM INDICATION

TECHNICAL FIELD

This document is directed generally to unified beam indications and/or transmission frameworks for wireless communications.

BACKGROUND

As the expense of wide or ultra-wide spectrum resources, the considerable propagation loss induced by the extremely high frequency becomes a noticeable challenge. To solve this, antenna array and beam-forming training technologies using massive multiple-input and multiple output (MIMO), e.g., up to 1024 antenna elements for one node, have been adopted to achieve beam alignment and obtain sufficiently high antenna gain. To keep low implementation cost while still benefit from antenna array, analog phase shifters become very attractive for implementing mmWave beam-forming, which means that the number of controllable phases is finite and the constant modulus constraints are placed on these antenna elements. Given the pre-specified beam patterns, the variable-phase-shift-based beam-forming training targets are implemented to identify the best pattern for subsequent data transmission generally, in the one-total radiated power (TRP) and one-panel case.

SUMMARY

This document relates to methods, systems, and devices for unified beam indication and/or unified transmission frameworks for wireless communication.

In a first aspect of the present invention, a method for wireless communication is disclosed. The method may include determining a plurality of communication parameter sets in response to a first command; determining a subset of the plurality of communication parameter sets in response to a second command from among the plurality of communication parameter sets; selecting a communication parameter set from the subset for transmitting an uplink signal in response to a third command; associating, by a first communication node, a power control parameter with the

communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi co-location (QCL) type parameter; and transmitting, by the first communication node, the uplink signal according to the communication parameter set and the association.

In a second aspect of the present invention, another method for wireless communication is

disclosed. The method may include: transmitting, by a second communication node, a first command for determination of a plurality of communication parameter sets; transmitting, by the second communication node, a second command for determination of a subset of the plurality of communication parameter sets from among the plurality of communication parameter sets; transmitting, by the second communication node, a third command for selection of a communication parameter set from the subset for transmission of an uplink signal; transmitting, by the second communication node to a first communication node, a fourth command to associate at least one of a power control parameter with the communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi-co-location (QCL) type parameter; and receiving, by the second communication node from the first communication node, the uplink signal according to the communication parameter set and the association.

In a third aspect of the present invention, a wireless communications apparatus is disclosed. The apparatus may include: 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: determine a plurality of communication parameter sets in response to a first command; determine a subset of the plurality of communication parameter sets in response to a second command from among the plurality of communication parameter sets; select a communication parameter set from the subset for transmission of an uplink signal in response to a third command; associate a power control parameter with a communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi co-location (QCL) type parameter; and transmit the uplink signal according to the communication parameter set and the association.

In a fourth aspect of the present invention, a wireless communications apparatus is disclosed. The apparatus may include: 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 first command for determination of a plurality of communication parameter sets; transmit a second command for determination of a subset of the plurality of communication parameter sets from among the plurality of communication parameter sets; transmit a third command for selection of a communication parameter set from the subset for transmission of an uplink signal; transmit, to a first communication node, a fourth command to associate a power control parameter

with the communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi-co-location (QCL) type parameter; and receive, from the first communication node, the uplink signal according to the communication parameter set and the association.

In some other implementations, a network device is disclosed. The network 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. 2A shows an example of a general transmission framework for a mobile station of FIG. 1.

FIG. 2B shows an example of a unified transmission framework for the mobile station 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.

FIG. 5 is a diagram illustrating aspects of the method of FIG. 4

FIG. 6 is a flow chart of another example of a wireless communication method.

FIG. 7 is a diagram illustrating aspects of the method of FIG. 6.

FIG. 8 is a flow chart of another example of a wireless communication method.

FIG. 9 is a diagram illustrating aspects of the method of FIG. 8.

FIG. 10 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:

determining a plurality of communication parameter sets in response to a first command;

determining a subset of the plurality of communication parameter sets in response to a second command from among the plurality of communication parameter sets;

selecting a communication parameter set from the subset for transmitting an uplink signal in response to a third command;

associating, by a first communication node, a power control parameter with the communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi co-location (QCL) type parameter; and

transmitting, by the first communication node, the uplink signal according to the communication parameter set and the association.

2. The method of claim 1, further comprising:

receiving, with the first communication node, an association command from a second communication node,

wherein the associating comprises associating the the power control parameter with the communication parameter set in response to receiving the association command.

3. The method of claim 1, wherein the uplink signal comprises a sounding reference signal (SRS), a physical uplink control channel (PUCCH), or a physical uplink shared channel (PUSCH).

4. The method of claim 1, wherein the power control parameter comprises a target power, a path loss RS, a scaling factor for path loss, or a closed loop process.

5. The method of claim, 1, further comprising: receiving a downlink signal according to the communication parameter set.

6. The method of claim 5, wherein the downlink signal comprises a physical downlink control channel (PDCCH), a physical downlink shared channel (PDSCH), or a channel- state information reference signal (CSI-RS).

7. The method of claim 1, further comprising: determining at least one of a spatial relation or the power control parameter of the uplink signal according to the communication parameter set, wherein the uplink signal comprises a physical uplink control channel (PUCCH) or a sounding reference signal (SRS).

8. The method of claim 7, wherein the PUCCH comprises a PUCCH resource.

9. The method of claim 7, further comprising: determining the spatial relation of the uplink signal according to the at least one RS resource.

10. The method of claim 1, wherein at least one of: the first command comprises a radio resource control (RRC) command; the second command comprises a medium access control control element (MAC-CE) command; or the third command comprises a downlink control information (DCI) command.

11. The method of claim 1, further comprising:

reporting to a second communication node at least one of:

an indicator of supporting a medium access control control element (MAC-CE) cross carrier component indicator;

an indicator of supporting the communication parameter set for both downlink transmissions and uplink transmissions;

or

an indicator of supporting a downlink control information (DCI) command comprising a plurality of communication parameter set identifiers (IDs).

12. A method for wireless communication, the method comprising:

transmitting, by a second communication node, a first command for determination of a plurality of communication parameter sets;

transmitting, by the second communication node, a second command for determination of a subset of the plurality of communication parameter sets from among the plurality of communication

parameter sets;

transmitting, by the second communication node, a third command for selection of a communication parameter set from the subset for transmission of an uplink signal;

transmitting, by the second communication node to a first communication node, a fourth command to associate at least one of a power control parameter with the communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least aone quasi-co-location (QCL) type parameter; and

receiving, by the second communication node from the first communication node, the uplink signal according to the communication parameter set and the association.

13. 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:

determine a plurality of communication parameter sets in response to a first command;

determine a subset of the plurality of communication parameter sets in response to a second command from among the plurality of communication parameter sets;

select a communication parameter set from the subset for transmission of an uplink signal in response to a third command;

associate a power control parameter with a communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi co-location (QCL) type parameter; and

transmit the uplink signal according to the communication parameter set and the association.

14. The method of claim 12, wherein the uplink signal comprises a sounding reference signal (SRS), a physical uplink control channel (PUCCH), or a physical uplink shared channel (PUSCH).

15. The method of claim 12, wherein the power control parameter comprises a target power, a path loss RS, a scaling factor for path loss, or a closed loop process.

16. The method of claim 12, further comprising: transmitting a downlink signal according to the communication parameter set.

17. The method of claim 12, further comprising: determining at least one of a spatial relation or the power control parameter of the uplink signal according to the communication parameter set, wherein the uplink signal comprises a physical uplink control channel (PUCCH) or a sounding reference signal (SRS).

18. The method of claim 12, wherein at least one of: the first command comprises a radio resource control (RRC) command; the second command comprises a MAC-CE command; or the third command comprises a downlink control information (DCI) command.

19. The method of claim 12, further comprising:

receiving, with the second node, at least one of:

an indicator of supporting a medium access control control element (MAC-CE) cross carrier component indicator;

an indicator of supporting the communication parameter set for both downlink transmissions and uplink transmissions; or

an indicator of supporting a downlink control information (DCI) command comprising a plurality of communication parameter set identifiers (IDs).

20. 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 first command for determination of a plurality of communication parameter sets;

transmit a second command for determination of a subset of the plurality of communication parameter sets from among the plurality of communication parameter sets;

transmit a third command for selection of a communication parameter set from the subset for transmission of an uplink signal;

transmit, to a first communication node, a fourth command to associate a power control parameter with the communication parameter set, the communication parameter set comprising at least one reference signal (RS) resource and at least one quasi-co-location (QCL) type parameter; and

receive, from the first communication node, the uplink signal according to the communication parameter set and the association.