

COMMUNICATION IN MULTIPLE TRANSMISSION/RECEPTION POINT ENVIRONMENTS

TECHNICAL FIELD

The disclosure relates generally to wireless communications, including but not limited to systems and methods for communicating in multiple transmission/reception point (MTRP) environments.

BACKGROUND

The standardization organization Third Generation Partnership Project (3GPP) is currently in the process of specifying a new Radio Interface called 5G New Radio (5G NR) as well as a Next Generation Packet Core Network (NG-CN or NGC). The 5G NR will have three main components: a 5G Access Network (5G-AN), a 5G Core Network (5GC), and a User Equipment (UE). In order to facilitate the enablement of different data services and requirements, the elements of the 5GC, also called Network Functions, have been simplified with some of them being software based so that they could be adapted according to need.

SUMMARY

The examples ~~embodiments~~ disclosed herein are directed to solving the issues relating to one or more of the problems presented in the prior art, as well as providing additional features that will become readily apparent by reference to the following detailed description when taken in conjunction with the accompany drawings. In accordance with various ~~embodiments~~examples, example systems, methods, devices and computer program products are disclosed herein. It is understood, however, that these ~~embodiments~~examples are presented by way of example and are not limiting, and it will be apparent to those of ordinary skill in the art who read the present disclosure that various modifications to the disclosed ~~embodiments~~examples can be made while remaining within the scope of this disclosure.

In a first aspect, the present disclosure provides a method comprising: receiving, by a wireless communication device from a wireless communication node, a configuration of at least one sounding reference signal (SRS) resource; receiving, by the wireless communication device

from the wireless communication node, an indication of at least one beam state; determining, by the wireless communication device, at least one first SRS resource according to the at least one beam state and the at least one SRS resource; and determining, by the wireless communication device, a transmission parameter for an uplink transmission, according to the at least one first SRS resource, wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

In a second aspect, the present disclosure provides a method comprising: transmitting, by a wireless communication node to a wireless communication device, a configuration of at least one sounding reference signal (SRS) resource; transmitting, by the wireless communication node to the wireless communication device, an indication of at least one beam state, wherein the wireless communication device determines at least one first SRS resource according to the at least one beam state and the at least one SRS resource, and determines a transmission parameter for an uplink transmission, according to the at least one first SRS resource, wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

In a third aspect, the present disclosure provides a wireless communication device comprising: at least one processor configured to: receive, via a receiver from a wireless communication node, a configuration of at least one sounding reference signal (SRS) resource; receive, via the receiver from the wireless communication node, an indication of at least one beam state; determine at least one first SRS resource according to the at least one beam state and the at least one SRS resource; and determine a transmission parameter for an uplink transmission, according to the at least one first SRS resource, wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

In a fourth aspect, the present disclosure provides a wireless communication node, comprising: at least one processor configured to: transmit, via a transmitter to a wireless communication device, a configuration of at least one sounding reference signal (SRS) resource; transmit, via the transmitter to the wireless communication device, an indication of at least one beam state; wherein the wireless communication device determines at least one first SRS resource according to the at least one beam state and the at least one SRS resource, and determines a transmission parameter for an uplink transmission, according to the at least one first

SRS resource, wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

At least one ~~aspect-example~~ is directed to a system, a method, an apparatus, or a computer-readable medium. A wireless communication device may receive, from a wireless communication node, a configuration (e.g., RRC signaling or configuration) of at least one

sounding reference signal (SRS) resource. The wireless communication device may receive, from the wireless communication node, an indication of at least one beam state. The wireless communication device may determine at least one first SRS resource according to the at least one beam state and the at least one SRS resource. The wireless communication device may determine a transmission parameter for an uplink transmission (e.g., physical uplink shared channel (PUSCH) or physical uplink control channel (PUCCH)), according to the at least one first SRS resource.

In some [embodimentsexamples](#), the indication may include at least one of indication via a downlink control information (DCI) or activation via a medium access control control element (MAC CE) signaling. In some [embodimentsexamples](#), each of the at least one beam state may include at least one of: a quasi co-location (QCL) information, a transmission configuration indicator (TCI) state, spatial relation information, reference signal information, spatial filter information, or precoding information. The transmission parameter may include at least one of transmit antenna port, the precoder, a number of layers, spatial relation information, the spatial filters, and QCL information, among others

In some [embodimentsexamples](#), the wireless communication device may determine a transmission parameter for the at least one SRS resource, according to the at least one beam state. In some [embodimentsexamples](#), the wireless communication device may determine a transmission parameter for the at least one first SRS resource, according to the at least one beam state.

In some [embodimentsexamples](#), the at least one beam state may be associated with the at least one SRS resource. In some [embodimentsexamples](#), one of the at least one beam state may be associated with one of the at least one SRS resource. In some [embodimentsexamples](#), one of the at least one beam state may be associated with a group of SRS resources from at least one group of SRS resources. The at least one group of SRS resources may be obtained from the at least one SRS resource. In some [embodimentsexamples](#), one of the at least one beam state may be associated with an SRS resource set from at least one SRS resource set. The SRS resource set may include one or more of the at least one SRS resource.

In some ~~embodiment~~examples, each of the at least one beam state may be respectively associated with N SRS resources or N groups of SRS resources in an SRS resource set.

In some

embodimentexamples, each of the at least one beam state may be respectively associated with N SRS resources or N groups of SRS resources. Each of the N SRS resources or the N SRS resource groups may be in a respective SRS resource set. In some embodimentexamples, each of the at least one beam state may be respectively associated with first or last N SRS resources or first N or last groups of SRS resources in an SRS resource set. In some embodimentexamples, each of the at least one beam state may be respectively associated with first N SRS resources or first N SRS resource groups. Each of the N SRS resources or the N SRS resource groups may be in a respective SRS resource set. In some embodimentexamples, N may be an integer that is equal to a number of beam states of the at least one beam state.

In some embodimentexamples, the wireless communication device may determine a transmission parameter for at least a second SRS resource, according to the at least one beam state. The second SRS resource may be associated with the at least one beam state. In some embodimentexamples, the wireless communication device may transmit at least one SRS according to the transmission parameter for the at least one SRS resource, the at least one first SRS resource or the at least one second SRS resource.

In some embodimentexamples, the wireless communication device may determine an association between one of the at least one beam state and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource sets, according to the at least one beam state and the at least one SRS resource or the one of the at least one group of SRS resources or the one of the at least one SRS resource set being associated with a transmission reception point (TRP).

In some embodimentexamples, the TRP may include or correspond to a control resource set (CORESET) pool identifier (ID), a physical cell ID (PCI), a transmission configuration indicator (TCI) state, a TCI state group, a beam state or a beam state group.

In some embodimentexamples, the wireless communication device may determine an association between one of the at least one beam state, and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource set. The determination may be according to at least one of: an identifier of the at least one SRS

resource in the one of the at least one SRS resource set; an identifier of the one of the at least one SRS

resource set; an identifier of the one of the at least one SRS resource set; an identifier of the one of the at least one group of SRS resources; a position of the at least one beam state in a transmission configuration indicator (TCI) state codepoint; and a control resource set (CORESET) pool identifier (ID) associated with the one of the at least one beam state.

In some [embodimentsexamples](#), the wireless communication device may determine an association between the at least one beam state and the at least one SRS resource, in response to the at least one SRS resource having a spatial relation which is same as or Quasi Co-Located (QCLed) with an RS of the at least one beam state. In some [embodimentsexamples](#), the wireless communication device may determine the at least one first SRS resource according to an association between the at least one beam state and the at least one SRS resource.

In some [embodimentsexamples](#), the wireless communication device may receive, from the wireless communication node, an SRS resource indicator (SRI) for the uplink transmission. In some [embodimentsexamples](#), the wireless communication device may determine the at least one first SRS resource according to the at least one beam state and the SRI.

In some [embodimentsexamples](#), one of the at least one beam state may be associated with an SRS resource set or a group of SRS resources from the at least one SRS resource, and the SRI indicates the at least one first SRS resource in the SRS resource set or in the group of SRS resources. In some [embodimentsexamples](#), in response to the indication of the at least one beam state indicating more than one SRS resource, the SRI may indicate the at least one first SRS resource in the more than one SRS resource.

In some [embodimentsexamples](#), the wireless communication device may receive from the wireless communication node, a port information for the uplink transmission. In some [embodimentsexamples](#), the wireless communication device may determine a precoder for the uplink transmission, according to the first SRS resource and the port information.

In some [embodimentsexamples](#), the first SRS resource may support one or more ports. In some [embodimentsexamples](#), a usage of the first SRS resource, or of a SRS resource set may include the first SRS resource, may be non-codebook or codebook. In some [embodimentsexamples](#), the port

information of the uplink transmission may include: transmitted precoding matrix indicator (TPMI) or port selection information for the uplink transmission.

In some [embodimentsexamples](#), a precoding matrix corresponding to the TPMI may include primary diagonal elements that are each equal to 0 or 1, and non-primary diagonal elements that are each equal to 0. In some [embodimentsexamples](#), the port selection information may include an index of a predefined port combination.

In some [embodimentsexamples](#), the wireless communication device may receive, from the wireless communication node via a downlink control information (DCI) transmission. The indication may indicate N1 beam states. In some [embodimentsexamples](#), the wireless communication device may apply the N1 beam states to the uplink transmission in N1 time units respectively. N1 may be an integer and equal a number of beam states of the at least one beam state.

In some [embodimentsexamples](#), the wireless communication device may receive, from the wireless communication node via M downlink control information (DCI) transmissions, an indication to transmit M uplink transmissions at least partially overlapped in time, using more than one beam states. M may be an integer. In some [embodimentsexamples](#), the wireless communication device may transmit a first uplink transmission among the M uplink transmissions. In some [embodimentsexamples](#), the wireless communication device may cancel or delay uplink transmissions other than the first uplink transmission among the M uplink transmissions.

In some [embodimentsexamples](#), the wireless communication device may determine the first uplink transmission according to a priority of a transmission reception point (TRP) or a panel related to the M uplink transmissions. In some [embodimentsexamples](#), the wireless communication device may determine the first uplink transmission as an uplink transmission related to a TRP or a panel that has a highest priority among a plurality of TRPs or panels, according to a configuration that is predefined or a configuration of the wireless communication node.

In some embodimentsexamples, the wireless communication device may determine a transmission reception point (TRP) corresponding to the uplink transmission, according to a control resource set (CORESET) pool identifier (ID) that is associated with a downlink control information (DCI) that indicates a beam state of the uplink transmission. In some embodimentsexamples,

the wireless communication device may determine at least one power control parameter associated with one or more beam states.

In some ~~embodiment~~examples, the at least one power control parameter may include at least one of: P0 and alpha for the uplink transmission comprising a physical uplink shared channel (PUSCH), configured by an index from a P0 and alpha parameter pool configured for the PUSCH or for an uplink channel; P0 for the uplink transmission comprising a physical uplink control channel (PUCCH) determined by an P0_offset and a P0 for an associated PUSCH; or a closed-loop power control index that is: configured for the one or more beam states via radio resource control (RRC) signaling, or associated with the one or more beam states when activated by a medium access control control element (MAC CE), or associated with the one or more beam states according to a transmission reception point (TRP) associated with the one or more beam states, or shared by a plurality of transmission reception points (TRPs), and corresponds to an independent respective closed-loop power control for each TRP of the plurality of TRPs.

At least one ~~aspect~~example is directed to a system, a method, an apparatus, or a computer-readable medium. A wireless communication node may transmit, to a wireless communication device, a configuration of at least one sounding reference signal (SRS) resource. The wireless communication node may transmit, to the wireless communication device, an indication of at least one beam state. The wireless communication node may cause the wireless communication device to determine at least one first SRS resource according to the at least one beam state and the at least one SRS resource. The wireless communication node may cause the wireless communication device to determine a transmission parameter for an uplink transmission, according to the at least one first SRS resource.

In some ~~embodiment~~examples, the indication may include at least one of indication via a downlink control information (DCI) or activation via a medium access control control element (MAC CE) signaling. In some ~~embodiment~~examples, each of the at least one beam state may include 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. The transmission parameter may include at least one of transmit antenna port, the

precoder, a number of layers, spatial relation information, the spatial filters, and QCL information, among others.

In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine a transmission parameter for the at least one SRS resource, according to the at least one beam state. In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine a transmission parameter for the at least one first SRS resource, according to the at least one beam state.

In some [embodimentsexamples](#), the at least one beam state may be associated with the at least one SRS resource. In some [embodimentsexamples](#), one of the at least one beam state may be associated with one of the at least one SRS resource. In some [embodimentsexamples](#), one of the at least one beam state may be associated with a group of SRS resources from at least one group of SRS resources. The at least one group of SRS resources may be obtained from the at least one SRS resource. In some [embodimentsexamples](#), one of the at least one beam state may be associated with an SRS resource set from at least one SRS resource set. The SRS resource set may include one or more of the at least one SRS resource.

In some [embodimentsexamples](#), each of the at least one beam state may be respectively associated with N SRS resources or N groups of SRS resources in an SRS resource set. In some [embodimentsexamples](#), each of the at least one beam state may be respectively associated with N SRS resources or N groups of SRS resources. Each of the N SRS resources or the N SRS resource groups may be in a respective SRS resource set. In some [embodimentsexamples](#), each of the at least one beam state may be respectively associated with first N or last SRS resources or first or last N groups of SRS resources in an SRS resource set. In some [embodimentsexamples](#), each of the at least one beam state may be respectively associated with first N or last SRS resources or first N or last SRS resource groups. Each of the N SRS resources or the N SRS resource groups may be in a respective SRS resource set. In some [embodimentsexamples](#), N may be an integer that is equal to a number of beam states of the at least one beam state.

In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine a transmission parameter for at least a second SRS

resource, according to the at least one beam state. The second SRS resource may be associated with the at

least one beam state. In some embodimentexamples, the wireless communication node may receive at least one SRS according to the transmission parameter for the at least one SRS resource, the at least one first SRS resource or the at least one second SRS resource.

In some embodimentexamples, the wireless communication node may cause the wireless communication device to determine an association between one of the at least one beam state and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource sets, according to the at least one beam state and the at least one SRS resource or the one of the at least one group of SRS resources or the one of the at least one SRS resource set being associated with a transmission reception point (TRP).

In some embodimentexamples, the TRP may include or correspond to a control resource set (CORESET) pool identifier (ID), a physical cell ID (PCI), a transmission configuration indicator (TCI) state, a TCI state group, a beam state or a beam state group.

In some embodimentexamples, the wireless communication node may cause the wireless communication device to determine an association between one of the at least one beam state, and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource set. The determination may be according to at least one of: an identifier of the at least one SRS resource in the one of the at least one SRS resource set; an identifier of the one of the at least one SRS resource set; an identifier of the one of the at least one SRS resource set; an identifier of the one of the at least one group of SRS resources; a position of the at least one beam state in a transmission configuration indicator (TCI) state codepoint; and a control resource set (CORESET) pool identifier (ID) associated with the one of the at least one beam state.

In some embodimentexamples, the wireless communication node may cause the wireless communication device to determine an association between the at least one beam state and the at least one SRS resource, in response to the at least one SRS resource having a spatial relation which is same as or Quasi Co-Located (QCLed) with an RS of the at least one beam state. In some embodimentexamples, the wireless communication node may cause the wireless communication device to determine the at least one first SRS resource according to an association between the at least one beam state and the at least one SRS resource.

In some [embodimentexamples](#), the wireless communication node may transmit, to the wireless communication device, an SRS resource indicator (SRI) for the uplink transmission. In some [embodimentexamples](#), the wireless communication node may cause the wireless communication device to determine the at least one first SRS resource according to the at least one beam state and the SRI.

In some [embodimentexamples](#), one of the at least one beam state may be associated with an SRS resource set or a group of SRS resources from the at least one SRS resource, and the SRI indicates the at least one first SRS resource in the SRS resource set or in the group of SRS resources. In some [embodimentexamples](#), in response to the indication of the at least one beam state indicating more than one SRS resource, the SRI may indicate the at least one first SRS resource in the more than one SRS resource.

In some [embodimentexamples](#), the wireless communication node may transmit to the wireless communication device, a port information for the uplink transmission. In some [embodimentexamples](#), the wireless communication node may cause the wireless communication device to determine a precoder for the uplink transmission, according to the first SRS resource and the port information.

In some [embodimentexamples](#), the first SRS resource may support one or more ports. In some [embodimentexamples](#), a usage of the first SRS resource, or of a SRS resource set may include the first SRS resource, may be non-codebook or codebook. In some [embodimentexamples](#), the port information of the uplink transmission may include: transmitted precoding matrix indicator (TPMI) or port selection information for the uplink transmission.

In some [embodimentexamples](#), a precoding matrix corresponding to the TPMI may include primary diagonal elements that are each equal to 0 or 1, and non-primary diagonal elements that are each equal to 0. In some [embodimentexamples](#), the port selection information may include an index of a predefined port combination.

In some [embodimentexamples](#), the wireless communication node may transmit, to the wireless communication device via a downlink control information (DCI) transmission. The indication may indicate N1 beam states. In some [embodimentexamples](#), the wireless

communication node may cause the wireless communication device to apply the N1 beam states to the uplink

transmission in $N1$ time units respectively. $N1$ may be an integer and equal a number of beam states of the at least one beam state.

In some [embodimentsexamples](#), the wireless communication node may transmit, to the wireless communication device via M downlink control information (DCI) transmissions, an indication to transmit M uplink transmissions at least partially overlapped in time, using more than one beam states. M may be an integer. In some [embodimentsexamples](#), the wireless communication node may receive a first uplink transmission among the M uplink transmissions. In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to cancel or delay uplink transmissions other than the first uplink transmission among the M uplink transmissions.

In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine the first uplink transmission according to a priority of a transmission reception point (TRP) or a panel related to the M uplink transmissions. In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine the first uplink transmission as an uplink transmission related to a TRP or a panel that has a highest priority among a plurality of TRPs or panels, according to a configuration that is predefined or a configuration of the wireless communication node.

In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine a transmission reception point (TRP) corresponding to the uplink transmission, according to a control resource set (CORESET) pool identifier (ID) that is associated with a downlink control information (DCI) that indicates a beam state of the uplink transmission. In some [embodimentsexamples](#), the wireless communication node may cause the wireless communication device to determine at least one power control parameter associated with one or more beam states.

In some [embodimentsexamples](#), the at least one power control parameter may include at least one of: $P0$ and α for the uplink transmission comprising a physical uplink shared channel (PUSCH), configured by an index from a $P0$ and α parameter pool configured for

the PUSCH or for an uplink channel; P_0 for the uplink transmission comprising a physical uplink control channel (PUCCH) determined by an P_0 _offset and a P_0 for an associated PUSCH; or a

CLAIMS

1. A method comprising:

receiving, by a wireless communication device from a wireless communication node, a configuration of at least one sounding reference signal (SRS) resource;

receiving, by the wireless communication device from the wireless communication node, an indication of at least one beam state;

determining, by the wireless communication device, at least one first SRS resource according to the at least one beam state and the at least one SRS resource; and

determining, by the wireless communication device, a transmission parameter for an uplink transmission, according to the at least one first SRS resource.

wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

2. The method of claim 1, wherein the indication comprises at least one of indication via a downlink control information (DCI) or activation via a medium access control control element (MAC CE) signaling.

~~3. The method of claim 1, wherein each of the at least one beam state comprises at least one of: a quasi-co location (QCL) information, a transmission configuration indicator (TCI) state, spatial relation information, reference signal information, spatial filter information, or precoding information.~~

~~43.~~ The method of claim 1, comprising:

determining, by the wireless communication device, a transmission parameter for the at least one SRS resource, according to the at least one beam state;

~~5. The method of claim 1, comprising:~~

determining, by the wireless communication device, a transmission parameter for the at least one first SRS resource, according to the at least one beam state; or

determining, by the wireless communication device, a transmission parameter for at least

a second SRS resource, according to the at least one beam state, wherein the second SRS resource is associated with the at least one beam state.

64. The method of claim 1, wherein
the at least one beam state is associated with the at least one SRS resource.
one of the at least one beam state is associated with one of the at least one SRS resource;
one of the at least one beam state is associated with a group of SRS resources from at least one group of SRS resources, the at least one group of SRS resources obtained from the at least one SRS resource; or
one of the at least one beam state is associated with an SRS resource set from at least one SRS resource set, wherein the SRS resource set comprises one or more of the at least one SRS resource.

75. The method of claim 64, wherein:
each of the at least one beam state is respectively associated with N SRS resources or N groups of SRS resources in an SRS resource set;
each of the at least one beam state is respectively associated with N SRS resources or N groups of SRS resources, each of the N SRS resources or the N SRS resource groups in a respective SRS resource set;
each of the at least one beam state is respectively associated with first or last N SRS resources or first N groups of SRS resources in an SRS resource set; or
each of the at least one beam state is respectively associated with first or last N SRS resources or first N SRS resource groups, each of the N SRS resources or the N SRS resource groups in a respective SRS resource set,
wherein N is an integer that is equal to a number of beam states of the at least one beam state.

~~8. The method of claim 6, comprising:~~

~~determining, by the wireless communication device, a transmission parameter for at least a second SRS resource, according to the at least one beam state, wherein the second SRS resource is associated with the at least one beam state.~~

96. The method of claim ~~43, 5, or 8~~ comprising:

transmitting, by the wireless communication device, at least one SRS according to the transmission parameter for the at least one SRS resource, the at least one first SRS resource or the at least one second SRS resource.

107. The method of claim ~~64~~, comprising:

determining, by the wireless communication device, an association between one of the at least one beam state and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource sets, according to the at least one beam state and the at least one SRS resource or the one of the at least one group of SRS resources or the one of the at least one SRS resource set being associated with a transmission reception point (TRP).

118. The method of claim ~~107~~, wherein the TRP comprises or corresponds to a control resource set (CORESET) pool identifier (ID), a physical cell ID (PCI), a transmission configuration indicator (TCI) state, a TCI state group, a beam state or a beam state group.

129. The method of claim ~~64~~, comprising:

determining, by the wireless communication device, an association between one of the at least one beam state, and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource set, according to at least one of:

an identifier of the at least one SRS resource in the one of the at least one SRS resource set;

an identifier of the one of the at least one SRS resource set;

an identifier of the one of the at least one group of SRS resources;

a position of the at least one beam state in a transmission configuration indicator (TCI) state codepoint; or

a control resource set (CORESET) pool identifier (ID) associated with the one of the at least one beam state.

~~13~~10. The method of claim ~~64~~, comprising:

determining, by the wireless communication device, an association between the at least one beam state and the at least one SRS resource, in response to the at least one SRS resource having a spatial relation which is same as or Quasi Co-Located (QCLed) with an RS of the at least one beam state; or

~~14. The method of claim 6, comprising:~~

determining, by the wireless communication device, the at least one first SRS resource according to an association between the at least one beam state and the at least one SRS resource.

~~15~~11. The method of claim 1, comprising:

receiving, by the wireless communication device from the wireless communication node, an SRS resource indicator (SRI) for the uplink transmission; and

determining, by the wireless communication device, the at least one first SRS resource according to the at least one beam state and the SRI₁;

~~16. The method of claim 15, wherein one of the at least one beam state is associated with an SRS resource set or a group of SRS resources from the at least one SRS resource, and the SRI indicates the at least one first SRS resource in the SRS resource set or in the group of SRS resources.~~

~~17. The method of claim 15, wherein in response to the indication of the at least one beam state indicating more than one SRS resource, the SRI indicates the at least one first SRS resource in the more than one SRS resource.~~

~~18. The method of claim 1 comprising:~~

~~receiving, by the wireless communication device from the wireless communication node, a port information for the uplink transmission;~~

~~determining, by the wireless communication device, a precoder for the uplink transmission, according to the first SRS resource and the port information.~~

~~19. The method of claim 1, wherein at least one of:
the first SRS resource supports one or more ports;
a usage of the first SRS resource, or of a SRS resource set including the first SRS resource, is
non-codebook or codebook.~~

~~20. The method of claim 18 or 19, wherein the port information of the uplink transmission
comprises: transmitted precoding matrix indicator (TPMI) or port selection information for the
uplink transmission.~~

~~21. The method of claim 20, wherein a precoding matrix corresponding to the TPMI
comprises primary diagonal elements that are each equal to 0 or 1, and non-primary diagonal
elements that are each equal to 0.~~

~~22. The method of claim 20, wherein the port selection information includes an index of a
predefined port combination.~~

~~23. The method of claim 1, comprising:
receiving, by the wireless communication device from the wireless communication node via a
downlink control information (DCI) transmission, the indication indicating N1 beam states; and
applying, by the wireless communication device, the N1 beam states to the uplink transmission
in N1 time units respectively, wherein N1 is an integer and equals a number of beam states of the
at least one beam state.~~

~~24. The method of claim 1, comprising:
receiving, by the wireless communication device from the wireless communication node via M
downlink control information (DCI) transmissions, an indication to transmit M uplink
transmissions at least partially overlapped in time, using more than one beam states; wherein M
is an integer;
transmitting, by the wireless communication device, a first uplink transmission among the M
uplink transmissions; or
canceling or delaying, by the wireless communication device, uplink transmissions other than the~~

~~first uplink transmission among the M uplink transmissions.~~

~~25. The method of claim 24, comprising:~~

~~—determining, by the wireless communication device, the first uplink transmission according to a priority of a transmission reception point (TRP) or a panel related to the M uplink transmissions.~~

~~26. The method of claim 25, comprising:~~

~~determining, by the wireless communication device, the first uplink transmission as an uplink transmission related to a TRP or a panel that has a highest priority among a plurality of TRPs or panels, according to a configuration that is predefined or a configuration of the wireless communication node.~~

~~27~~12. The method of claim 1, comprising:

determining, by the wireless communication device, a transmission reception point (TRP) corresponding to the uplink transmission, according to a control resource set (CORESET) pool identifier (ID) that is associated with a downlink control information (DCI) that indicates a beam state of the uplink transmission.

~~28. The method of claim 1, comprising:~~

~~—determining, by the wireless communication device, at least one power control parameter associated with one or more beam states.~~

~~29. The method of claim 28, wherein the at least one power control parameter includes at least one of:~~

~~P0 and alpha for the uplink transmission comprising a physical uplink shared channel (PUSCH), configured by an index from a P0 and alpha parameter pool configured for the PUSCH or for an uplink channel;~~

~~P0 for the uplink transmission comprising a physical uplink control channel (PUCCH) determined by an P0_offset and a P0 for an associated PUSCH, or~~

~~a closed-loop power control index that is:~~

~~configured for the one or more beam states via radio resource control (RRC) signaling, or~~
~~associated with the one or more beam states when activated by a medium access control control element (MAC CE), or~~
~~associated with the one or more beam states according to a transmission reception point (TRP) associated with the one or more beam states, or~~
~~shared by a plurality of transmission reception points (TRPs), and corresponds to an independent respective closed-loop power control for each TRP of the plurality of TRPs.~~

3013. A method, comprising:

transmitting, by a wireless communication node to a wireless communication device, a configuration of at least one sounding reference signal (SRS) resource;

transmitting, by the wireless communication node to the wireless communication device, an indication of at least one beam state;_{1,5}

~~causing, by the wireless communication node, wherein~~ the wireless communication device ~~to determine~~_s at least one first SRS resource according to the at least one beam state and the at least one SRS resource;_{1,5} and

~~causing, by the wireless communication node, the wireless communication device to determine~~_s a transmission parameter for an uplink transmission, according to the at least one first SRS resource;₂

wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

14. A wireless communication device comprising:

at least one processor configured to:

receive, via a receiver from a wireless communication node, a configuration of at least one sounding reference signal (SRS) resource;

receive, via the receiver from the wireless communication node, an indication of at least one beam state;

determine at least one first SRS resource according to the at least one beam state and the

at least one SRS resource; and

determine a transmission parameter for an uplink transmission, according to the at least one first SRS resource,

wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

15. A wireless communication node, comprising:

at least one processor configured to:

transmit, via a transmitter to a wireless communication device, a configuration of at least one sounding reference signal (SRS) resource;

transmit, via the transmitter to the wireless communication device, an indication of at least one beam state,

wherein the wireless communication device determines at least one first SRS resource according to the at least one beam state and the at least one SRS resource, and determines a transmission parameter for an uplink transmission, according to the at least one first SRS resource,

wherein each of the at least one beam state comprises a transmission configuration indicator (TCI) state.

~~31. The method of claim 30, wherein the indication comprises at least one of indication via a downlink control information (DCI) or activation via a medium access control control element (MAC CE) signaling.~~

~~32. The method of claim 30, wherein each of the at least one beam state comprises at least one of: a quasi co location (QCL) information, a transmission configuration indicator (TCI) state, spatial relation information, reference signal information, spatial filter information, or precoding information.~~

~~33. The method of claim 30, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to~~

~~determine a transmission parameter for the at least one SRS resource, according to the at least one beam state.~~

~~34. The method of claim 30, comprising:~~

~~—causing, by the wireless communication node, the wireless communication device to determine a transmission parameter for the at least one first SRS resource, according to the at least one beam state.~~

~~35. The method of claim 30, wherein:~~

~~the at least one beam state is associated with the at least one SRS resource.~~

~~each of the at least one beam state is associated with one of the at least one SRS resource;~~

~~each of the at least one beam state is associated with a group of SRS resources from at least one group of SRS resources, the at least one group of SRS resources obtained from the at least one SRS resource; or~~

~~each of the at least one beam state is associated with an SRS resource set from at least one SRS resource set, wherein the SRS resource set comprises one or more of the at least one SRS resource.~~

~~36. The method of claim 35, wherein:~~

~~each of the at least one beam state is respectively associated with N SRS resources or N groups of SRS resources in an SRS resource set;~~

~~each of the at least one beam state is respectively associated with N SRS resources or N groups of SRS resources, each of the N SRS resources or the N SRS resource groups in a respective SRS resource set;~~

~~each of the at least one beam state is respectively associated with first N SRS resources or first N groups of SRS resources in an SRS resource set; or~~

~~each of the at least one beam state is respectively associated with first N SRS resources or first N SRS resource groups, each of the N SRS resources or the N SRS resource groups in a respective SRS resource set,~~

~~wherein N is an integer that is equal to a number of beam states of the at least one beam state.~~

37. ~~The method of claim 35, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine a transmission parameter for at least a second SRS resource, according to the at least one beam state, wherein the second SRS resource is associated with the at least one beam state.~~

38. ~~The method of claim 33, 34, or 37, comprising:~~

~~receiving, by the wireless communication node, at least one SRS according to the transmission parameter for the at least one SRS resource, the at least one first SRS resource or the at least one second SRS resource.~~

39. ~~The method of claim 35, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine an association between one of the at least one beam state and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource sets, according to the at least one beam state and the at least one SRS resource or the one of the at least one group of SRS resources or the one of the at least one SRS resource set being associated with a transmission reception point (TRP).~~

40. ~~The method of claim 39, wherein the TRP comprises or corresponds to a control resource set (CORESET) pool identifier (ID), a physical cell ID (PCI), a transmission configuration indicator (TCI) state, a TCI state group, a beam state or a beam state group.~~

41. ~~The method of claim 35, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine an association between one of the at least one beam state, and one of the at least one SRS resource or one of the at least one group of SRS resources or one of the at least one SRS resource set, according to at least one of:~~

~~an identifier of the at least one SRS resource in the one of the at least one SRS resource set;~~

~~an identifier of the one of the at least one SRS resource set;~~

~~an identifier of the one of the at least one group of SRS resources;~~
~~a position of the at least one beam state in a transmission configuration indicator (TCI) state codepoint; or~~
~~a control resource set (CORESET) pool identifier (ID) associated with the one of the at least one beam state.~~

~~42. The method of claim 35, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine an association between the at least one beam state and the at least one SRS resource, in response to the at least one SRS resource having a spatial relation which is same as or Quasi Co-Located (QCLed) with an RS of the at least one beam state.~~

~~43. The method of claim 35, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine the at least one first SRS resource according to an association between the at least one beam state and the at least one SRS resource.~~

~~44. The method of claim 30, comprising:~~

~~transmitting, by the wireless communication node to the wireless communication device, an SRS resource indicator (SRI) for the uplink transmission; and~~

~~causing, by the wireless communication node, the wireless communication device to determine the at least one first SRS resource according to the at least one beam state and the SRI.~~

~~45. The method of claim 44, wherein one of the at least one beam state is associated with an SRS resource set or a group of SRS resources from the at least one SRS resource, and the SRI indicates the at least one first SRS resource in the SRS resource set or in the group of SRS resources.~~

~~46. The method of claim 44, wherein in response to the indication of the at least one beam state indicating more than one SRS resource, the SRI indicates the at least one first SRS resource in the more than one SRS resource.~~

~~47. The method of claim 30, comprising:~~

~~transmitting, by the wireless communication node to the wireless communication device,
a port information for the uplink transmission;~~

~~causing, by the wireless communication node, the wireless communication device to
determine a precoder for the uplink transmission, according to the first SRS resource and the port
information.~~

~~48. The method of claim 30, wherein at least one of:~~

~~the first SRS resource supports one or more ports;~~

~~a usage of the first SRS resource, or of a SRS resource set including the first SRS
resource, is non-codebook or codebook.~~

~~49. The method of claim 47 or 48, wherein the port information of the uplink transmission
comprises: transmitted precoding matrix indicator (TPMI) or port selection information for the
uplink transmission.~~

~~50. The method of claim 49, wherein a precoding matrix corresponding to the TPMI
comprises primary diagonal elements that are each equal to 0 or 1, and non-primary diagonal
elements that are each equal to 0.~~

~~51. The method of claim 50, wherein the port selection information includes an index of a
predefined port combination.~~

~~52. The method of claim 30, comprising:~~

~~—transmitting, by the wireless communication node to the wireless communication device
via a downlink control information (DCI) transmission, the indication indicating N1 beam states;
and~~

~~causing, by the wireless communication node, the wireless communication device to
apply the N1 beam states to the uplink transmission in N1 time unit s respectively, wherein N1 is
an integer and equals a number of beam states of the at least one beam state.~~

53. ~~The method of claim 30, comprising:~~

~~transmitting, by the wireless communication node to the wireless communication device via M downlink control information (DCI) transmissions, an indication to transmit M uplink transmissions at least partially overlapped in time, using more than one beam states, wherein M is an integer;~~

~~receiving, by the wireless communication node, a first uplink transmission among the M uplink transmissions; or~~

~~causing, by the wireless communication node, the wireless communication device to cancel or delay uplink transmissions other than the first uplink transmission among the M uplink transmissions.~~

54. ~~The method of claim 53, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine the first uplink transmission according to a priority of a transmission reception point (TRP) or a panel related to the M uplink transmissions.~~

55. ~~The method of claim 54, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine the first uplink transmission as an uplink transmission related to a TRP or a panel that has a highest priority among a plurality of TRPs or panels, according to a configuration that is predefined or a configuration of the wireless communication node.~~

56. ~~The method of claim 30, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to determine a transmission reception point (TRP) corresponding to the uplink transmission, according to a control resource set (CORESET) pool identifier (ID) that is associated with a downlink control information (DCI) that indicates a beam state of the uplink transmission.~~

57. ~~The method of claim 30, comprising:~~

~~causing, by the wireless communication node, the wireless communication device to~~

determine at least one power control parameter associated with one or more beam states.

58. The method of claim 57, wherein the at least one power control parameter includes at least one of:

~~P0 and alpha for the uplink transmission comprising a physical uplink shared channel (PUSCH), configured by an index from a P0 and alpha parameter pool configured for the PUSCH or for an uplink channel,~~

~~P0 for the uplink transmission comprising a physical uplink control channel (PUCCH) determined by an P0_offset and a P0 for an associated PUSCH, or~~

~~a closed-loop power control index that is:~~

~~configured for the one or more beam states via radio resource control (RRC) signaling, or~~

~~associated with the one or more beam states when activated by a medium access control control element (MAC CE), or~~

~~associated with the one or more beam states according to a transmission reception point (TRP) associated with the one or more beam states, or~~

~~shared by a plurality of transmission reception points (TRPs), and corresponds to an independent respective closed-loop power control for each TRP of the plurality of TRPs.~~

59. A non-transitory computer-readable medium storing instructions, which when executed by at least one processor, cause the at least one processor to perform the method of any one of claims 1-58.

60. An apparatus comprising:

~~at least one processor configured to implement the method of any one of claims 1-58.~~