

SYSTEMS AND METHODS FOR RESOURCE CONFIGURATION ENHANCEMENT

TECHNICAL FIELD

The disclosure relates generally to wireless communications, including but not limited to systems and methods for channel measurement and beam management.

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, and some being hardware based, so that they could be adapted according to need.

SUMMARY

The example 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 accompanying drawings. In accordance with various embodiments, example systems, methods, devices and computer program products are disclosed herein. It is understood, however, that these embodiments 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 can be made while remaining within the scope of this disclosure.

At least one ~~aspect~~example is directed to a system, method, apparatus, or a computer-readable medium. A wireless communication device may receive a configuration of at least one radio resource control (RRC) parameter for X channel measurement reference signal (CMR) resource sets or X CMR resource subsets of CMRs from a corresponding set of CMR resources. The

CMR resource periodicity can be the same for all CMR resources of the X CMR resource sets or X CMR resource subsets.

At least one ~~aspect-example~~ is directed to a system, method, apparatus, or a computer-readable medium. A wireless communication node may configure configuration of at least one radio resource control (RRC) parameter for X channel measurement reference signal (CMR) resources sets or X CMR resources subsets from a CMR resource set. The parameter X can be an integer greater than 1. The wireless communication node may send, to a wireless communication device, the configuration of the at least one RRC parameter for configuring the wireless communication device for measurement of at least one CMR resource corresponding to the X CMR resource sets or the X CMR resources subset.

At least one aspect is directed to a system, method, apparatus, or a computer-readable medium. In a first aspect, the present disclosure provides a method comprising: applying, by a wireless communication device, a new beam to a signal after 28 symbols from a last received symbol of a physical downlink control channel (PDCCH), according to a smallest subcarrier spacing of a response receiving cell and at least a first cell. In a second aspect, ~~At the present disclosure provides a~~ wireless communication device ~~may comprising at least one processor configured to:~~ apply a new beam to a signal after 28 symbols from a last received symbol of a physical downlink control channel (PDCCH), according to a smallest subcarrier spacing of a response receiving cell and at least a first cell. In a third aspect, the present disclosure provides a non-transitory computer readable medium storing instructions, which when executed by at least one processor, cause the at least one processor to: apply a new beam to a signal after 28 symbols from a last received symbol of a physical downlink control channel (PDCCH), according to a smallest subcarrier spacing of a response receiving cell and at least a first cell.

In some implementations, the at least a first cell can include at least one of each failed cell or all failed cells. A cell of the at least a first cell can be determined to be a failed cell upon the wireless communication device detecting one or more beam failures each of which is detected based on a beam failure detecting reference signal resource set (BFD-RS set) configured on the cell for a link. The all failed cells can be associated with a same link. The link can include at least

one of CORESETPoolIndex, transmission reception points (TRP), beam failure detecting reference signal resource set (BFD-RS set) or TRP-ID.

In some implementations, the new beam can include a reference signal (RS) from a new candidate beam indication reference signal resource set (NBI-RS set) with corresponding link quality that is larger than or equal to a threshold. The signal can include at least one of PDCCH monitoring using a same antenna port quasi co-location parameters as the RS, or PUCCH transmitting, using a same spatial domain filter as the RS.

BRIEF DESCRIPTION OF THE DRAWINGS

CLAIMS

1. ~~— A method comprising:~~

~~receiving, by a wireless communication device, configuration of at least one radio resource control (RRC) parameter for X channel measurement reference signal (CMR) resource sets or X CMR resource subsets of CMRs from a corresponding set of CMR resources, where X is an integer greater than 1;~~

~~measuring, by the wireless communication device, channel quality for at least one CMR resource of the X CMR resource sets or the X CMR resource subsets according to the configuration; and~~

~~sending, by the wireless communication device to the wireless communication node, a report including at least one of a CMR index or channel quality.~~

2. ~~— The method of claim 1, wherein the configuration comprises a plurality of parameters each for one or more CMR resource sets of the X CMR resource sets or one or more CMR resource subsets of the X CMR resource subsets, each of the plurality of parameters set to a same value across the one or more CMR resource sets or the one or more CMR resource subsets.~~

3. ~~— The method of claim 1, wherein, the configuration comprises a plurality of parameters each for one or more CMR resource sets of the X CMR resource sets or one or more CMR resource subsets of the X CMR resource subsets, each parameter of the plurality of parameters set to different values across the one or more CMR resource sets or the one or more resource subsets.~~

4. ~~— The method of any of claims 1-3, wherein the at least one RRC parameter includes at least one of:~~

~~a repetition parameter;~~

~~an aperiodic triggering offset (aperiodicTriggeringOffset) parameter; or~~

~~a tracking reference signal information (Trs-Info) parameter.~~

5. ~~— The method of claim 1, wherein receiving the configuration of the at least one RRC parameter for the X CMR resource sets or the X CMR resource subsets comprises:~~

~~receiving, by the wireless communication device, a separate set of configuration for each CMR resource set of the X CMR resource sets or each CMR resource subset of the X CMR resource subsets.~~

~~6. The method of claim 1, wherein receiving the configuration for the at least one RRC parameter for the X CMR resource sets or the X CMR resource subsets comprises at least one of:~~

~~receiving, by the wireless communication device, a first set of one or more RRC parameters associated with a first CMR resource set of the X CMR resource sets or with a first CMR resource subset of the X CMR resource subsets, to be applied to at least one of the X CMR resource sets or the X CMR resource subsets;~~

~~receiving, by the wireless communication device, a second set of one or more RRC parameters associated with a second CMR resource of the X CMR resource sets or with a second CMR resource subset of the X CMR resource subsets, to be applied to the second CMR resource set or the second CMR resource subset.~~

~~7. The method of claim 6, comprising:~~

~~receiving, by the wireless communication device, a reference parameter in the second set of one or more RRC parameters to indicate one or more first values of the first set of one or more RRC parameters, to be applied to the second CMR resource set or the second CMR resource subset.~~

~~8. The method of claim 1, wherein receiving the configuration of the at least one RRC parameter includes:~~

~~receiving, by the wireless communication device, at least a first RRC parameter for use to indicate a division of the corresponding set of CMR resources into the X CMR resource subsets.~~

~~9. The method of claim 8, wherein the at least a first RRC parameter includes at least one of:~~

~~a resource division parameter to indicate at least one of: whether to divide the corresponding set of CMR resources into the X CMR resource subsets using a default method; or~~

~~a resource division mode parameter to indicate one of a plurality of methods for dividing the corresponding set of CMR resources into the X CMR resource subsets.~~

~~10. The method of claim 1, wherein receiving the configuration of the at least one RRC parameter includes:~~

~~receiving, by the wireless communication device, X CMR resource lists, wherein each of the X CMR resource lists corresponds to a CMR resource subset.~~

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

~~selecting, by the wireless communication device, the X CMR resource sets from Y CMR resource sets based on a RRC signaling; or~~

~~selecting, by the wireless communication device, the X CMR resource subsets from Y CMR resource subsets, based on the RRC signaling,~~

~~wherein Y is an integer greater than X.~~

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

~~selecting, by the wireless communication device, the X CMR resource sets from Y CMR resource sets, based on a bitmap configured in a downlink control information (DCI); or~~

~~selecting, by the wireless communication device, the X CMR resource subsets based on the bitmap configured in the DCI.~~

~~13. The method of claim 1, comprising:~~

~~selecting, by the wireless communication device, Z CMR resource sets from Y CMR resource sets based on a RRC signaling, and selecting the X CMR resource sets from the Z CMR resource sets based on a bitmap configured in a downlink control information (DCI); or~~

~~selecting, by the wireless communication device, Z CMR resource subsets from Y CMR resource subsets based on the RRC signaling, and selecting the X CMR resource subsets from Z the CMR resource subsets based on the bitmap configured in DCI,~~

~~where Y is an integer greater than Z.~~

~~14. The method of claim 1, wherein the configuration includes a periodicity and offset (periodicityAndOffset) parameter defining a CMR resource periodicity and a slot offset, the CMR resource periodicity being the same for all CMR resources of the X CMR resource sets or X CMR resource subsets.~~

~~15.~~ A method comprising:

~~configuring, by a wireless communication node, configuration of at least one radio resource control (RRC) parameter for X channel measurement reference signal (CMR) resources sets of or X CMR resources subsets from a CMR resource set, where X is an integer greater than 1; and~~

~~sending, by the wireless communication node to a wireless communication device, the configuration of the at least one RRC parameter for configuring the wireless communication device for measurement of at least one CMR resource corresponding to the X CMR resource sets or the X CMR resources subset.~~

~~161.~~ A method ~~of claim~~ comprising:

applying, by a wireless communication device, a new beam to a signal after 28 symbols from a last received symbol of a physical downlink control channel (PDCCH), according to a smallest subcarrier spacing of a response receiving cell and at least a first cell.

~~172.~~ The method of claim ~~16~~, wherein the at least a first cell comprises at least one of:
each failed cell, or
all failed cells.

~~183.~~ The method of claim ~~172~~, wherein a cell of the at least a first cell is determined to be a failed cell upon the wireless communication device detecting one or more beam failures each of which is detected based on a beam failure detecting reference signal resource set (BFD-RS set) configured on the cell for a link.

~~194.~~ The method of claim ~~172~~, wherein the all failed cells are associated with a same link.

~~205.~~ The method of ~~any of~~ claims ~~318 and 19~~, wherein the link comprises at least one of:
CORESETPoolIndex;
one or more transmission reception points (TRPs);
beam failure detecting reference signal resource set (BFD-RS set); or
one or more identifiers TRP-(IDs) of the one or more TRPs.

246. The method of claim 16, wherein the new beam comprises a reference signal (RS) from a new candidate beam indication reference signal resource set (NBI-RS set) with corresponding link quality that is larger than or equal to a threshold.

227. The method of claim 16, wherein the signal comprises at least one of:
PDCCH monitoring, using a same antenna port quasi co-location parameters as the RS, or
physical uplink control channel (PUCCH) transmitting, using a same spatial domain filter as the RS.

8. A wireless communication device comprising:
at least one processor configured to:
apply a new beam to a signal after 28 symbols from a last received symbol of a physical downlink control channel (PDCCH), according to a smallest subcarrier spacing of a response receiving cell and at least a first cell.

9. The wireless communication device of claim 8, wherein the at least a first cell comprises at least one of:
each failed cell, or
all failed cells.

10. The wireless communication device of claim 9, wherein a cell of the at least a first cell is determined to be a failed cell upon the wireless communication device detecting one or more beam failures each of which is detected based on a beam failure detecting reference signal resource set (BFD-RS set) configured on the cell for a link.

11. The wireless communication device of claim 9, wherein the all failed cells are associated with a same link.

12. The wireless communication device of claim 10, wherein the link comprises at least one of:

CORESETPoolIndex;

one or more transmission reception points (TRPs);

beam failure detecting reference signal resource set (BFD-RS set); or

one or more identifiers (IDs) of the one or more TRPs.

13. The wireless communication device of claim 8, wherein the new beam comprises a reference signal (RS) from a new candidate beam indication reference signal resource set (NBI-RS set) with corresponding link quality that is larger than or equal to a threshold.

14. The wireless communication device of claim 8, wherein the signal comprises at least one of:

PDCCH monitoring, using a same antenna port quasi co-location parameters as the RS, or
physical uplink control channel (PUCCH) transmitting, using a same spatial domain filter
as the RS.

~~23~~15. 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 1-22;~~

apply a new beam to a signal after 28 symbols from a last received symbol of a physical downlink control channel (PDCCH), according to a smallest subcarrier spacing of a response receiving cell and at least a first cell.

16. The non-transitory computer readable medium of claim 15, wherein the at least a first cell comprises at least one of:

each failed cell, or

all failed cells.

17. The non-transitory computer readable medium of claim 16, wherein a cell of the at least a first cell is determined to be a failed cell upon the wireless communication device detecting one or more beam failures each of which is detected based on a beam failure detecting reference signal resource set (BFD-RS set) configured on the cell for a link.

18. The non-transitory computer readable medium of claim 16, wherein the all failed cells are associated with a same link.

19. The non-transitory computer readable medium of claim 17, wherein the link comprises at least one of:

CORESETpoolIndex;

one or more transmission reception points (TRPs);

beam failure detecting reference signal resource set (BFD-RS set); or

one or more identifiers (IDs) of the one or more TRPs.

20. The non-transitory computer readable medium of claim 16, wherein the new beam comprises a reference signal (RS) from a new candidate beam indication reference signal resource set (NBI-RS set) with corresponding link quality that is larger than or equal to a threshold.

~~24. An apparatus comprising:~~

~~at least one processor configured to implement the method of any one of claims 1-22.~~