**3GPP TSG RAN WG1 #110bis-eR1-221xxxx**

**e-Meeting, October 10th – 19th, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.214** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.3.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** | Draft CR for TCI state parameter name alignment in TS 38.214 | | | | | | | | | |
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| ***Source to WG:*** | Moderator(ZTE), ASUSTeK, Lenovo, Ericsson, Huawei, Hisilicon | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_FeMIMO-Core | | | | |  | ***Date:*** | | | 2022-09-30 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | RRC parameter name *TCIState* in TS 38.214 is not aligned to TS 38.331.  RRC parameter name *UL-TCIState* in TS 38.214 is not aligned to TS 38.331.  RRC parameter name *DLorJointTCIState* in TS 38.214 is not aligned to TS 38.331. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Change “*TCIState*” to “*TCI-State*”.  Change “*UL-TCIState*” to “*TCI-UL-State*”.  Change “*DLorJointTCIState*” to “*TCI-State*”.  Change “if UE is configured with *TCI-State* configurations with *DLorJointTCIState*” to “if UE is configured with *TCI-State* in *dl-OrJoint-TCIStateList*”. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incorrectly RRC parameters cause confusion on Rel-17 TCI state. | | | | | | | | |
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| ***Clauses affected:*** | | 5.1.5, 6.1, 6.2.1 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

5.1.5 Antenna ports quasi co-location

The UE can be configured with a list of up to *M* *TCI-State* configurations within the higher layer parameter *PDSCH-Config* to decode PDSCH according to a detected PDCCH with DCI intended for the UE and the given serving cell, where M depends on the UE capability *maxNumberConfiguredTCIstatesPerCC*. Each *TCI-State* contains parameters for configuring a quasi co-location relationship between one or two downlink reference signals and the DM-RS ports of the PDSCH, the DM-RS port of PDCCH or the CSI-RS port(s) of a CSI-RS resource. The quasi co-location relationship is configured by the higher layer parameter *qcl-Type1* for the first DL RS, and *qcl-Type2* for the second DL RS(if configured). For the case of two DL RSs, the QCL types shall not be the same, regardless of whether the references are to the same DL RS or different DL RSs. The quasi co-location types corresponding to each DL RS are given by the higher layer parameter *qcl-Type* in *QCL-Info* and may take one of the following values:

- 'typeA': {Doppler shift, Doppler spread, average delay, delay spread}

- 'typeB': {Doppler shift, Doppler spread}

- 'typeC': {Doppler shift, average delay}

- 'typeD': {Spatial Rx parameter}

The UE can be configured with a list of up to *128* *TCI-State* configurations, within the higher layer parameter *dl-OrJoint-TCIStateList* in *PDSCH-Config* for providing a reference signal for the quasi co-location for DM-RS of PDSCH and DM-RS of PDCCH in a CC, for CSI-RS, and to provide a reference, if applicable, for determining UL TX spatial filter for dynamic-grant and configured-grant based PUSCH and PUCCH resource in a CC, and SRS.

If the *TCI-State* or *TCI-UL-State* configurations are absent in a BWP of the CC, the UE can apply the *TCI-State* or *TCI-UL-State* configurations from a reference BWP of a reference CC. The UE is not expected to be configured with *TCI-State*, *SpatialRelationInfo* or *PUCCH-SpatialRelationInfo*, except *SpatialRelationInfoPos* in a CC in a band, if the UE is configured with *dl-OrJoint-TCIStateList* or *TCI-UL-State* in any CC in the same band. The UE can assume that when the UE is configured with *TCI-State* in any CC in the CC list configured by *simultaneousTCI-UpdateList1-r16, simultaneousTCI-UpdateList2-r16,* *simultaneousSpatial-UpdatedList1-r16, or simultaneousSpatial-UpdatedList2-r16,* the UE is not configured with *dl-OrJoint-TCIStateList* or *TCI-UL-State* in any CC within the same band in the CC list.

The UE receives an activation command, as described in clause 6.1.3.14 of [10, TS 38.321] or 6.1.3.47 of [10, TS 38.321], used to map up to 8 TCI states and/or pairs of TCI states, with one TCI state for DL channels/signals and/or one TCI state for UL channels/signals to the codepoints of the DCI field *'Transmission Configuration Indication'* for one or for a set of CCs/DL BWPs, and if applicable, for one or for a set of CCs/UL BWPs. When a set of TCI state IDs are activated for a set of CCs/DL BWPs and if applicable, for a set of CCs/UL BWPs, where the applicable list of CCs is determined by the indicated CC in the activation command, the same set of TCI state IDs are applied for all DL and/or UL BWPs in the indicated CCs. If the activation command maps *TCI-State* and/or *TCI-UL-State* to only one TCI codepoint, the UE shall apply the indicated *TCI-State* and/or *TCI-UL-State* to one or to a set of CCs /DL BWPs, and if applicable, to one or to a set of CCs /UL BWPs once the indicated mapping for the one single TCI codepoint is applied as described in [11, TS 38.133].

When the *bwp-id* or *cell* for QCL-TypeA/D source RS in a QCL-Info of the TCI state is not configured, the UE assumes that QCL-TypeA/D source RS is configured in the CC/DL BWP where TCI state applies.

When *tci-PresentInDCI* is set as 'enabled' or *tci-PresentDCI-1-2* is configured for the CORESET, a UE configured with *dl-OrJoint-TCIStateList* with activated *TCI-State* or *TCI-UL-State* receives DCI format 1\_1/1\_2 providing indicated *TCI-State* or *TCI-UL-State* for a CC or all CCs in the same CC list configured by *simultaneousTCI-UpdateList1-r17, simultaneousTCI-UpdateList2-r17, simultaneousTCI-UpdateList3-r17, simultaneousTCI-UpdateList4-r17*. The DCI format 1\_1/1\_2 can be with or without, if applicable, DL assignment. If the DCI format 1\_1/1\_2/ is without DL assignment, the UE can assume the following:

- CS-RNTI is used to scramble the CRC for the DCI

- The values of the following DCI fields are set as follows:

- RV = all '1's

- MCS = all '1's

- NDI = 0

- Set to all '0's for FDRA Type 0, or all '1's for FDRA Type 1, or all '0's for dynamicSwitch (same as in Table 10.2-4 of [6, TS 38.213]).

After a UE receives an initial higher layer configuration of *dl-OrJoint-TCIStateList* with more than one *TCI-State* and before application of an indicated TCI state from the configured TCI states:

- The UE assumes that DM-RS of PDSCH and DM-RS of PDCCH and the CSI-RS applying the indicated TCI state are quasi co-located with the SS/PBCH block the UE identified during the initial access procedure

After a UE receives an initial higher layer configuration of *dl-OrJoint-TCIStateList* with more than one *TCI-State* or more than one *TCI-UL-State* and before application of an indicated TCI state from the configured TCI states:

- The UE assumes that the UL TX spatial filter, if applicable, for dynamic-grant and configured-grant based PUSCH and PUCCH, and for SRS applying the indicated TCI state, is the same as that for a PUSCH transmission scheduled by a RAR UL grant during the initial access procedure

After a UE receives a higher layer configuration of *dl-OrJoint-TCIStateList* with more than one *TCI-State* as part of a Reconfiguration with sync procedure as described in [12, TS 38.331]and before applying an indicated TCI state from the configured TCI states:

- The UE assumes that DM-RS of PDSCH and DM-RS of PDCCH, and the CSI-RS applying the indicated TCI state are quasi co-located with the SS/PBCH block or the CSI-RS resource the UE identified during the random access procedure initiated by the Reconfiguration with sync procedure as described in [12, TS 38.331].

After a UE receives a higher layer configuration of *dl-OrJoint-TCIStateList* with more than one *TCI-State* or more than one *TCI-UL-State* as part of a Reconfiguration with sync procedure as described in [12, TS 38.331] and before applying an indicated TCI state from the configured TCI states:

- The UE assumes that the UL TX spatial filter, if applicable, for dynamic-grant and configured-grant based PUSCH and PUCCH, and for SRS applying the indicated TCI state, is the same as that for a PUSCH transmission scheduled by a RAR UL grant during random access procedure initiated by the Reconfiguration with sync procedure as described in [12, TS 38.331].

If a UE receives a higher layer configuration of *dl-OrJoint-TCIStateList* with a single *TCI-State*, that can be used as an indicated TCI state*,* the UE obtains the QCL assumptions from the configured TCI state for DM-RS of PDSCH and DM-RS of PDCCH, and the CSI -RS applying the indicated TCI state.

If a UE receives a higher layer configuration of *dl-OrJoint-TCIStateList* with a single *TCI-State* or a single *TCI-UL-State*, that can be used as an indicated TCI state,the UE determines an UL TX spatial filter, if applicable, from the configured TCI state for dynamic-grant and configured-grant based PUSCH and PUCCH, and SRS applying the indicated TCI state.

When a UE configured with *dl-OrJoint-TCIStateList* would transmit a PUCCH with HARQ-ACK information or a PUSCH with HARQ-ACK information corresponding to the DCI carrying the TCI State indication and without DL assignment, or corresponding to the PDSCH scheduled by the DCI carrying the TCI State indication, and if the indicated TCI State is different from the previously indicated one, the indicated *TCI-State* or *TCI-UL-State* should be applied starting from the first slot that is at least symbols after the last symbol of the PUCCH or the PUSCH. The first slot and the symbols are both determined on the active BWP with the smallest SCS among the active BWP(s) of the carrier(s) applying the beam indication.

<omitted>

A UE that has indicated a capability *beamCorrespondenceWithoutUL-BeamSweeping* set to '1', as described in [13, TS 38.306], can determine a spatial domain filter to be used while performing the applicable channel access procedures described in [16, TS 37.213] prior to a UL transmission on the channel as follows:

- if UE is indicated with an SRI corresponding to the UL transmission, the UE may use a spatial domain filter that is same as the spatial domain transmission filter associated with the indicated SRI,

- if UE is configured with *TCI-State* in *dl-OrJoint-TCIStateList* or *TCI-UL-State*, the UE may use a spatial domain transmit filter that is same as the spatial domain receive filter the UE may use to receive the DL reference signal associated with the indicated TCI state.

<omitted>

For periodic/semi-persistent CSI-RS, if the UE is configured with *dl-OrJoint-TCIStateList,* the UE can assume that the indicated *TCI-State* is not applied.

<omitted>

For the DM-RS of PDCCH, if the UE is not configured with *dl-OrJoint-TCIStateList*, the UE shall expect that a *TCI-State* indicates one of the following quasi co-location type(s):

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with the same CSI-RS resource, or

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, or

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured without higher layer parameter trs-Info and without higher layer parameter *repetition* and,when applicable, 'typeD' with the same CSI-RS resource.

When a UE is configured with *sfnSchemePdcch* set to 'sfnSchemeA', and CORESET is activated with two TCI states, the UE shall assume that the DM-RS port(s)of the PDCCH in the CORESET is quasi co-located with the DL-RSs of the two TCI states. When a UE is configured with *sfnSchemePdcch* set to 'sfnSchemeB', and a CORESET is activated with two TCI states, the UE shall assume that the DM-RS port(s)of the PDCCH is quasi co-located with the DL-RSs of the two TCI states except for quasi co-location parameters {Doppler shift, Doppler spread} of the second indicated TCI state.

For the DM-RS of PDSCH, if the UE is not configured with *dl-OrJoint-TCIStateList*, the UE shall expect that a *TCI-State* indicates one of the following quasi co-location type(s):

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with the same CSI-RS resource*,* or

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*,or

- typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured without higher layer parameter *trs-Info* and without higher layer parameter *repetition* and, when applicable, 'typeD' with the same CSI-RS resource.

For the DM-RS of PDCCH, if the UE is configured with *dl-OrJoint-TCIStateList*, the UE shall expect that an indicated *TCI-State* indicates one of the following quasi co-location type(s):

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with the same CSI-RS resource, or

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition.*

For the DM-RS of PDSCH, if the UE is configured with *dl-OrJoint-TCIStateList*, the UE shall expect that an indicated *TCI-State* indicates one of the following quasi co-location type(s) :

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with the same CSI-RS resource*,* or

- 'typeA' with a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info* and, when applicable, 'typeD' with a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition.*

6.1 UE procedure for transmitting the physical uplink shared channel

PUSCH transmission(s) can be dynamically scheduled by an UL grant in a DCI, or the transmission can correspond to a configured grant Type 1 or Type 2. The configured grant Type 1 PUSCH transmission is semi-statically configured to operate upon the reception of higher layer parameter of *configuredGrantConfig* including *rrc-ConfiguredUplinkGrant* without the detection of an UL grant in a DCI. The configured grant Type 2 PUSCH transmission is semi-persistently scheduled by an UL grant in a valid activation DCI according to clause 10.2 of [6, TS 38.213] after the reception of higher layer parameter *configuredGrantConfig* not including *rrc-ConfiguredUplinkGrant*. If *configuredGrantConfigToAddModList* is configured, more than one configured grant configuration of configured grant Type 1 and/or configured grant Type 2 may be active at the same time on an active BWP of a serving cell.

The UE can be configured with a list of up to 64 *TCI-UL-State* configurations within the higher layer parameter *BWP-UplinkDedicated.* Each *TCI-UL-State* configuration contains a parameter for configuring one reference signal, if applicable, for determining UL TX spatial filter for dynamic-grant and configured-grant based PUSCH and PUCCH resource in a CC, and SRS.

For the PUSCH transmission corresponding to a Type 1 configured grant or a Type 2 configured grant activated by DCI format 0\_0 or 0\_1, the parameters applied for the transmission are provided by *configuredGrantConfig* except for *dataScramblingIdentityPUSCH*, *txConfig*, *codebookSubset*, *maxRank*, *scaling* of *UCI-OnPUSCH,* which are provided by *pusch-Config*. For the PUSCH transmission corresponding to a Type 2 configured grant activated by DCI format 0\_2, the parameters applied for the transmission are provided by *configuredGrantConfig* except for *dataScramblingIdentityPUSCH*, *txConfig*, *codebookSubsetDCI-0-2*, *maxRankDCI-0-2*, *scaling* of *UCI-OnPUSCH*, *resourceAllocationType1GranularityDCI-0-2* provided by *pusch-Config*.If the UE is provided with *transformPrecoder* in *configuredGrantConfig*, the UE applies the higher layer parameter *tp-pi2BPSK*, if provided in *pusch-Config*, according to the procedure described in clause 6.1.4 for the PUSCH transmission corresponding to a configured grant. When the UE is configured *dl-OrJoint-TCIStateList* or *TCI-UL-State*, the UE shall perform PUSCH transmission corresponding to a Type 1 configured grant or a Type 2 configured grant or a dynamic grant according to the spatial relation, if applicable, with a reference to the RS for determining UL Tx spatial filter. The RS is determined based on an RS configured with *qcl-Type* set to 'typeD' of the indicated *TCI-State* or an RS in the indicated *TCI-UL-State*. The reference RS in the indicated *TCI-State* can be a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, or a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info.* The reference RS in the indicated *TCI-UL-State* can be a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info*, an SRS resource in an SRS resource set with the higher layer parameter *usage* set to 'beamManagement', or SS/PBCH block associated with the same or different PCI from the PCI of the serving cell.

6.2.1 UE sounding procedure

The UE may be configured with one or more Sounding Reference Signal (SRS) resource sets as configured by the higher layer parameter *SRS-ResourceSet* or *SRS-PosResourceSet*. For each SRS resource set configured by *SRS-ResourceSet*, a UE may be configured with SRS resources (higher layer parameter *SRS-Resource*), where the maximum value of K is indicated by UE capability[13, 38.306]. When SRS resource set is configured with the higher layer parameter *SRS-PosResourceSet,* a UE may be configured with *K* ≥1 SRS resources (higher layer parameter *SRS-PosResource*), where the maximum value of K is 16. The SRS resource set applicability is configured by the higher layer parameter *usage* in *SRS-ResourceSet.* When the higher layer parameter *usage* is set to 'beamManagement'*,* only one SRS resource in each of multiple SRS resource sets may be transmitted at a given time instant, but the SRS resources in different SRS resource sets with the same time domain behaviour in the same BWP may be transmitted simultaneously.

For the SRS resource set(s) configured *in srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* set to '*antennaSwitching*' or '*beamManagement*', the UE expects the same SRS resource set(s) with the same *usage* being configured in *srs-ResourceSetToAddModList.*

When the UE is configured *dl-OrJoint-TCIStateList* or *TCI-UL-State,* the UE can assume that SRS resource(s) in any SRS resource set, except SRS resource set for positioning and an SRS resource set configured with *followUnifiedTCIstateSRS*, can be configured with *TCI-State* or *TCI-UL-State* or updated as described in clause 6.1.3.47 of [10, TS 38.321]. The reference RS in the *TCI-State* can be a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, or a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info*. The reference RS in the *TCI-UL-State*(s) can be a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info*, an SRS resource with the higher layer parameter *usage* set to 'beamManagement', or SS/PBCH block associated with the same or different PCI from the PCI of the serving cell.

If an SRS resource set, except an SRS resource set for positioning, is configured with *followUnifiedTCIstateSRS*, the UE shall transmit the target SRS resource(s) within the SRS resource set according to the spatial relation, if applicable, with a reference to the RS used for determining UL TX spatial filter. The RS is determined based on an RS configured with *qcl-Type* set to 'typeD' in *QCL-Info* of the indicated *TCI-State* or an RS in the indicated *TCI-UL-State*. The reference RS in the indicated *TCI-State* can be a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, or a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info.* The reference RS in the indicated *TCI-UL-State* can be a CSI-RS resource in a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *repetition*, a CSI-RS resource in an *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info,* an SRS resource with the higher layer parameter *usage* set to 'beamManagement', or SS/PBCH block associated with the same or different PCI from the PCI of the serving cell.

For aperiodic SRS at least one state of the DCI field is used to select at least one out of the configured SRS resource set(s).

The following SRS parameters are semi-statically configurable by higher layer parameter *SRS-Resource* or *SRS-PosResource*.

<omitted>

- The configuration of the spatial relation between a reference RS and the target SRS, where the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos*, if configured, contains the ID of the reference RS. The reference RS may be an SS/PBCH block, CSI-RS configured on serving cell indicated by higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise, or an SRS configured on uplink BWP indicated by the higher layer parameter *uplinkBWP*, and serving cell indicated by the higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise. When the target SRS is configured by the higher layer parameter *SRS-PosResourceSet*, the reference RS may also be a DL PRS configured on a serving cell or a non-serving cell indicated by the higher layer parameter *dl-PRS*, or an SS/PBCH block of a non-serving cell indicated by the higher layer parameter *ssb-Ncell*. If the UE is configured with *dl-OrJoint-TCIStateList* or *TCI-UL-State*, the reference RS may additionally be an SS/PBCH block associated with a PCI different from the PCI of the serving cell.