**3GPP TSG RAN WG1 #109-e** **R1-22xxxxx**

**e-Meeting, May 9th – 20th, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **17.1.0** |  |
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| *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:*** | Corrections on further enhancements on MIMO for NR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | | 2022-05-24 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | 1. Unclear association of CSI-RS that shares a same indicated TCI state as for the PDCCH and PDSCH in clause 6. 2. Missing description that a UE can determine the set from a *DLorJointTCIState*, in addition to a TCI-State, in clause 6. 3. For operation with unified TCI state, the number of symbols after successful BFR that a UE transmits PUCCH, PUSCH, and SRS using the specified spatial domain filter and the corresponding power control procedure are not defined in clause 6. 4. Missing description that a UE can provide and at least one of and in a same MAC CE in clause 6. 5. Missing RRC parameters providing periodic CSI-RS resource configuration indexes in clause 6. 6. Reference to “a first” SRS resource from the SRS resource set can be misinterpreted to mean “the first” SRS resource instead of any SRS resource in clause 7. 7. Correct the PL-RS association to be with *DLorJoint-TCIState* or *UL-TCIState* of an SRS resource with lowest *SRS-ResourceId* in the SRS resource set instead of the indicated *DLorJoint-TCIState* or *UL-TCIState* in clause 7. 8. Undefined ‘*p0-PUSCH-Alpha*’ and ‘*powerControlLoopToUse*’ association to SRS resource sets for m-TRP Type 1 CG PUSCH repetitions in clause 7.1.1. 9. Unclear BWP/carrier/serving cell for PUCCH resource with lowest index in m-TRP operation when a PUCCH resource is activated with two spatial relations in clause 7.1.1. 10. Unclear whether, for m-TRP PUCCH, two RS resources for DL pathloss estimates are determined when *pathlossReferenceLinking* is provided in clause 7.1.1. 11. Determination of power control parameters when sTRP mode is indicated for mTRP PUSCH repetition is not described in clause 7.1.1. 12. Missing determination of closed-loop index based on one or two power control parameter sets provided for a PUCCH resource for M-TRP PUCCH operation in FR1 in clause 7.2.1. 13. Unclear default power control parameter set per TRP (for that case SRI field is absent) for virtual PHR determination in clause 7.7.1. 14. Missing description for determination of power control parameters when sTRP mode is indicated for mTRP PUSCH repetition in clause 7.1.1. 15. Missing PHR determination for reference PUSCH when a UE is provided *DLorJoint-TCIState* or *UL-TCIstate* in clause 7.7.1. 16. Miscellaneous editorial corrections for typos, syntax, missing or redundant words, etc. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Clarify that a CSI-RS is an aperiodic CSI-RS resource in a CSI-RS resource set in clause 6. 2. Add that a UE can determine the set from a *DLorJointTCIState* in clause 6. 3. Add description that a UE can provide and at least one of and in a same MAC CE in clause 6. 4. Define the number of symbols after successful BFR that a UE transmits PUCCH, PUSCH, and SRS using the specified spatial domain filter and the corresponding power control procedure in clause 6. 5. Add RRC parameters providing periodic CSI-RS resource configuration indexes in clause 6. 6. Remove “first” from SRS resource in clause 7. 7. Remove “indicated” in clause 7. 8. Define ‘*p0-PUSCH-Alpha*’ and ‘*powerControlLoopToUse*’ association to SRS resource sets for m-TRP Type 1 CG PUSCH repetitions in clause 7.1.1. 9. Clarify the BWP/carrier/serving cell for PUCCH resource with lowest index in m-TRP operation when a PUCCH resource is activated with two spatial relations in clause 7.1.1. 10. Add an ‘s’ to “RS resource” to allow for two RS resources for DL PL estimates when *pathlossReferenceLinking* is provided in clause 7.1.1. 11. Add description for determination of power control parameters when sTRP mode is indicated for mTRP PUSCH repetition in clause 7.1.1. 12. Clarify how to obtain a TPC command value when more than one sets of power control parameters are applicable in clause 7.2.1 13. Clarify default power control parameter set per TRP (for that case SRI field is absent) for virtual PHR determination in clause 7.7.1. 14. Define virtual PHR determination for default power control parameter set per TRP in clause 7.7.1. 15. Capture PHR determination for reference PUSCH when a UE is provided *DLorJoint-TCIState* or *UL-TCIstate* in clause 7.7.1. 16. Miscellaneous editorial corrections. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incomplete support for MIMO enhancements in NR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6, 7, 7.1, 7.1.1, 7.2.1, 7.7.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS 38.212, TS 38.214, TS 38.321, TS 38.331 | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### \*\*\* Unchanged text is omitted \*\*\*

# 6 Link recovery procedures

A UE can be provided, for each BWP of a serving cell, a set of periodic CSI-RS resource configuration indexes by *failureDetectionResourcesToAddModList* and a set of periodic CSI-RS resource configuration indexes and/or SS/PBCH block indexes by *candidateBeamRSList* or *candidateBeamRSListExt* or *candidateBeamRSSCellList* for radio link quality measurements on the BWP of the serving cell. Instead of the sets and , for each BWP of a serving cell, the UE can be provided respective two sets and of periodic CSI-RS resource configuration indexes by failureDetectionSet1 and failureDetectionSet2 that can be activated by a MAC CE [11 TS 38.321] and corresponding two sets and of periodic CSI-RS resource configuration indexes and/or SS/PBCH block indexes by *candidateBeamRSList1* and *candidateBeamRSList2*, respectively, for radio link quality measurements on the BWP of the serving cell. The set is associated with the set and the set is associated with the set .

If the UE is not provided by *failureDetectionResourcesToAddModList* for a BWP of the serving cell, the UE determines the set to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* or *DLorJointTCIState* for respective CORESETs that the UE uses for monitoring PDCCH. If the UE is not provided or for a BWP of the serving cell, the UE determines the set or to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by *TCI-State* for first and second CORESETs that the UE uses for monitoring PDCCH, where the UE is provided two coresetPoolIndex values 0 and 1 for the first and second CORESETs, or is not provided coresetPoolIndex value for the first CORESETs and is provided coresetPoolIndex value of 1 for the second CORESETs, respectively. If there are two RS indexes in a TCI state, the set or , or includes RS indexes configured with *qcl-Type* set to 'typeD' for the corresponding TCI states. If a CORESET that the UE uses for monitoring PDCCH includes two TCI states and the UE is provided *sfnSchemePdcch* set to 'sfnSchemeA' or 'sfnSchemeB', the set includes RS indexes in the RS sets associated with the two TCI states.

The UE expects the set to include up to two RS indexes. If the UE is provided or , the UE expects the set or the set to include up to a number of RS indexes indicated by *capabilityparametername*. If the UE is not provided or , and if a number of active TCI states for PDCCH receptions in the first or second CORESETs is larger than , the UE determines the set or to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets associated with the active TCI states for PDCCH receptions in the first or second CORESETs corresponding to search space sets according to an ascending order for PDCCH monitoring periodicity. If more than one first or second CORESETs correspond to search space sets with same monitoring periodicity, the UE determines the order of the first or second CORESETs according to a descending order of a CORESET index.

If a UE

- is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs on an active DL BWP of a serving cell,

- is provided *coresetPoolIndex* with a value of 1 for second CORESETs on the active DL BWP of the serving cells, and

- is provided *SSB-MTCAdditionalPCI*

SS/PBCH block indexes associated with a physical cell identity other than the one provided by *physCellId* in *ServingCellConfigCommon* can be provided in either or set and the corresponding or set is associated with the physical cell identity.

The UE expects single port RS in the set , or , or . The UE expects single-port or two-port CSI-RS with frequency density equal to 1 or 3 REs per RB in the set , or , or . The thresholds Qout,LR and Qin,LR correspond to the default value of *rlmInSyncOutOfSyncThreshold*, as described in [10, TS 38.133] for Qout, and to the value provided by *rsrp-ThresholdSSB* or *rsrp-ThresholdBFR*, respectively.

The physical layer in the UE assesses the radio link quality according to the set , , or , of resource configurations against the threshold Qout,LR. For the set , the UE assesses the radio link quality only according to SS/PBCH blocks on the PCell or the PSCell or periodic CSI-RS resource configurations that are quasi co-located, as described in [6, TS 38.214], with the DM-RS of PDCCH receptions by the UE. The UE applies the Qin,LR threshold to the L1-RSRP measurement obtained from a SS/PBCH block. The UE applies the Qin,LR threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by *powerControlOffsetSS*.

In non-DRX mode operation, the physical layer in the UE provides an indication to higher layers when the radio link quality for all corresponding resource configurations in the set , or in the set or , that the UE uses to assess the radio link quality is worse than the threshold Qout,LR. The physical layer informs the higher layers when the radio link quality is worse than the threshold Qout,LR with a periodicity determined by the maximum between the shortest periodicity among the SS/PBCH blocks on the PCell or the PSCell and/or the periodic CSI-RS configurations in the set , , or that the UE uses to assess the radio link quality and 2 msec. In DRX mode operation, the physical layer provides an indication to higher layers when the radio link quality is worse than the threshold Qout,LR with a periodicity determined as described in [10, TS 38.133].

For the PCell or the PSCell, upon request from higher layers, the UE provides to higher layers the periodic CSI-RS configuration indexes and/or SS/PBCH block indexes from the set , or , or and the corresponding L1-RSRP measurements that are larger than or equal to the Qin,LR threshold.

For the SCell, upon request from higher layers, the UE indicates to higher layers whether there is at least one periodic CSI-RS configuration index or SS/PBCH block index from the set , or , or with corresponding L1-RSRP measurements that is larger than or equal to the Qin,LR threshold, and provides the periodic CSI-RS configuration indexes and/or SS/PBCH block indexes from the set , or , or and the corresponding L1-RSRP measurements that are larger than or equal to the Qin,LR threshold, if any.

For the PCell or the PSCell, a UE can be provided a CORESET through a link to a search space set provided by *recoverySearchSpaceId,* as described in clause 10.1, for monitoring PDCCH in the CORESET. If the UE is provided *recoverySearchSpaceId*, the UE does not expect to be provided another search space set for monitoring PDCCH in the CORESET associated with the search space set provided by *recoverySearchSpaceId*.

For the PCell or the PSCell, the UE can be provided, by *PRACH-ResourceDedicatedBFR*, a configuration for PRACH transmission as described in clause 8.1. For PRACH transmission in slot and according to antenna port quasi co-location parameters associated with periodic CSI-RS resource configuration or with SS/PBCH block associated with index provided by higher layers [11, TS 38.321], the UE monitors PDCCH in a search space set provided by *recoverySearchSpaceId* for detection of a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI starting from slot , where is the SCS configuration for the PRACH transmission and is a number of slots provided by *K-Mac* [12, TS 38.331] or if *K-Mac* is not provided, within a window configured by *BeamFailureRecoveryConfig*. For PDCCH monitoring in a search space set provided by *recoverySearchSpaceId* and for corresponding PDSCH receptions, the UE assumes the same antenna port quasi-collocation parameters as the ones associated with index until the UE receives by higher layers an activation for a TCI state or any of the parameters *tci-StatesPDCCH-ToAddList* and/or *tci-StatesPDCCH-ToReleaseList*. After the UE detects a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI in the search space set provided by *recoverySearchSpaceId*, the UE continues to monitor PDCCH candidates in the search space set provided by *recoverySearchSpaceId* until the UE receives a MAC CE activation command for a TCI state or *tci-StatesPDCCH-ToAddList* and/or *tci-StatesPDCCH-ToReleaseList.*

For the PCell or the PSCell, after 28 symbols from a last symbol of a first PDCCH reception in a search space set provided by *recoverySearchSpaceId* for which the UE detects a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI and until the UE receives an activation command for *PUCCH-SpatialRelationInfo* [11, TS 38.321] or is provided *PUCCH-SpatialRelationInfo* for PUCCH resource(s), the UE transmits a PUCCH on a same cell as the PRACH transmission using

- a same spatial filter as for the last PRACH transmission

- a power determined as described in clause 7.2.1 with , , and

For the PCell or the PSCell and for sets and , after 28 symbols from a last symbol of a first PDCCH reception in a search space set provided by *recoverySearchSpaceId* where a UE detects a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI, the UE assumes same antenna port quasi-collocation parameters as the ones associated with index for PDCCH monitoring in a CORESET with index 0.

If a UE is provided *TCI-State\_r17* indicating a unified TCI state for the PCell or the PSCell [6, TS 38.214], after 28 symbols from a last symbol of a first PDCCH reception in a search space set provided by *recoverySearchSpaceId* where the UE detects a DCI format with CRC scrambled by C-RNTI or MCS-C-RNTI, the UE

- if *AdditionalPCIInfo* is not provided, monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS resource in a CSI-RS resource set with same indicated TCI state as for the PDCCH and PDSCH, using the same antenna port quasi co-location parameters as the ones associated with the corresponding index , if any

- transmits PUSCH, PUCCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUSCH and the PUCCH, using a same spatial domain filter as for the last PRACH transmission using the following parameters for determination of a corresponding power as described in clauses 7.1.1, 7.2.1, and 7.3.1

- the RS index for obtaining the downlink pathloss estimate

- the values of , , and the PUSCH power control adjustment state provided by *p0-Alpha-CLID-PUSCH-Set* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell

- the value of and the PUCCH power control adjustment state provided by *p0-Alpha-CLID-PUCCH-Set* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell

- the values of , , and the SRS power control adjustment state provided by *p0-Alpha-CLID-SRS-Set* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell

For the remaining of this clause, if a PDCCH reception includes two PDCCH candidates from two linked search space sets based on *searchSpaceLinking*, as described in clause 10.1, the last symbol of the PDCCH reception is the last symbol of the PDCCH candidate that ends later. The PDCCH reception includes the two PDCCH candidates also when the UE is not required to monitor one of the two PDCCH candidates as described in clauses 10, 11.1, and 11.1.1.

For the PCell or the PSCell, if BFR MAC CE [11, TS 38.321] is provided in Msg3 or MsgA of contention based random access procedure, and if a PUCCH resource is provided with *PUCCH-SpatialRelationInfo*, after 28 symbols from the last symbol of the PDCCH reception that determines the completion of the contention based random access procedure as described in clause 5.1.4a or in clause 5.1.5 of [11, TS 38.321], the UE transmits the PUCCH on a same cell as the PRACH transmission using

- a same spatial filter as for the last PRACH transmission

- a power determined as described in clause 7.2.1 with , , and , where is the SS/PBCH block index selected for the last PRACH transmission.

If a UE is provided *TCI-State\_r17* indicating a unified TCI state for the PCell or the PSCell and the UE provides BFR MAC CE in Msg3 or MsgA of contention based random access procedure, after 28 symbols from the last symbol of the PDCCH reception that determines the completion of the contention based random access procedure as described in [11, TS 38.321], the UE

- if *AdditionalPCIInfo* is not provided, monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS resource in a CSI-RS resource set with same indicated TCI state as for the PDCCH and PDSCH using the same antenna port quasi co-location parameters as the ones associated with the corresponding index , if any

- transmits PUSCH, PUCCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUSCH and PUCCH, using a same spatial domain filter as for the last PRACH transmission using the following parameters for determination of a corresponding power as described in clauses 7.1.1, 7.2.1, and 7.3.1

- the RS index for obtaining the downlink pathloss estimate

- the values of , , and the PUSCH power control adjustment state provided by *p0-Alpha-CLID-PUSCH-Set* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell

- the value of and the PUCCH power control adjustment state provided by *p0-Alpha-CLID-PUCCH-Set* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell

- the values of , , and the SRS power control adjustment state provided by *p0-Alpha-CLID-SRS-Set* associated with the smallest value of *ul-powercontrolId* for the PCell or the PSCell

A UE can be provided, by *schedulingRequestID-BFR-SCell*, a configuration for PUCCH transmission with a link recovery request (LRR) as described in clause 9.2.4 for the UE to transmit PUCCH [11, TS 38.321]. If the PCell or the PSCell is associated with sets and , and with sets and , the UE can be provided by *schedulingRequestIDForMTRPBFR* a first configuration for PUCCH transmission with a LRR and, if the UE provides *twoLRRcapability*, a second configuration for PUCCH transmission with a LRR. If the UE is provided only the first configuration, the UE transmits a PUCCH with LRR for either set or . If the UE is provided both the first and second configurations, the UE uses the first configuration to transmt a PUCCH with LRR associated with set and the second configuration to transmit a PUCCH with LRR associated with set [11, TS 38.321].

The UE can provide in a first PUSCH MAC CE index(es) for at least corresponding SCell(s) with radio link quality worse than Qout,LR, indication(s) of presence of for corresponding SCell(s), and index(es) for a periodic CSI-RS configuration or for a SS/PBCH block provided by higher layers, as described in [11, TS 38.321], if any, for corresponding SCell(s). After 28 symbols from a last symbol of a PDCCH reception with a DCI format scheduling a PUSCH transmission with a same HARQ process number as for the transmission of the first PUSCH and having a toggled NDI field value, the UE

- monitors PDCCH in all CORESETs on the SCell(s) indicated by the MAC CE using the same antenna port quasi co-location parameters as the ones associated with the corresponding index(es) , if any

- transmits PUCCH on a PUCCH-SCell using a same spatial domain filter as the one corresponding to , if any, for periodic CSI-RS or SS/PBCH block reception, as described in clause 9.2.2, and using a power determined as described in clause 7.2.1 with , , and , if

- the UE is provided *PUCCH-SpatialRelationInfo* for the PUCCH,

- a PUCCH with the LRR was either not transmitted or was transmitted on the PCell or the PSCell, and

- the PUCCH-SCell is included in the SCell(s) indicated by the MAC-CE

where the SCS configuration for the 28 symbols is the smallest of the SCS configurations of the active DL BWP for the PDCCH reception and of the active DL BWP(s) of the at least one SCell.

If a UE is provided *TCI-State\_r17* indicating a unified TCI state, after 28 symbols from a last symbol of a PDCCH reception with a DCI format scheduling a PUSCH transmission with a same HARQ process number as for the transmission of the first PUSCH and having a toggled NDI field value, the UE

- monitors PDCCH in all CORESETs, and receives PDSCH and aperiodic CSI-RS resource in a CSI-RS resource set using the same antenna port quasi co-location parameters as the ones associated with the corresponding index , if any

- transmits PUSCH, PUCCH and SRS that uses a same spatial domain filter with same indicated TCI state as for the PUSCH and PUCCH, using a same spatial domain filter as the one corresponding to , if any, and using the following parameters for determination of a corresponding power as described in clauses 7.1.1, 7.2.1, and 7.3.1

- the RS index for obtaining the downlink pathloss estimate

- the values of , , and the PUSCH power control adjustment state provided by *p0-Alpha-CLID-PUSCH-Set* associated with the smallest value of *ul-powercontrolId* for the corresponding SCell

- the value of and the PUCCH power control adjustment state provided by *p0-Alpha-CLID-PUCCH-Set* associated with the smallest value of *ul-powercontrolId* for the corresponding SCell

- the values of , , and the SRS power control adjustment state provided by *p0-Alpha-CLID-SRS-Set* associated with the smallest value of *ul-powercontrolId* for the corresponding SCell

If there is at least one serving cell associated with sets and , and with sets and , the UE can provide in a second PUSCH MAC CE index(es) for cell(s) with and/or with at least one of and having radio link quality worse than Qout,LR, the index(es) of those and/or , and indication(s) of presence of and of index(es) , if any, from and/or corresponding sets and/or for the serving cells.

For serving cells associated with sets and , and with sets and , and having radio link quality worse than Qout,LR, after 28 symbols from a last symbol of a first PDCCH reception with a DCI format scheduling a PUSCH transmission with a same HARQ process number as for transmission of the second PUSCH and having a toggled NDI field value, the UE assumes antenna port quasi-collocation parameters

- corresponding to from , if any, for the first CORESETs,

- corresponding to from , if any, for the second CORESETs

where the SCS configuration for the 28 symbols is the smallest of the SCS configurations of the active DL BWP for the PDCCH reception and of the active DL BWP(s) of the serving cells.

# 7 Uplink Power control

### \*\*\* Unchanged text is omitted \*\*\*

In the remaining of this clause, if a UE is provided *DLorJoint-TCIState* or *UL-TCIstate* and for an indicated *DLorJoint-TCIState* or *UL-TCIstate* as described in [6, TS 38.214]

- in clauses 7.1.1, 7.2.1, and 7.3.1, the RS index for obtaining the downlink pathloss estimate for PUSCH, PUCCH, and SRS transmission is provided by *PL-RS* associated with or included in the indicated *DLorJoint-TCIState* or *UL-TCIstate* except for SRS transmission that is not provided *useIndicatedTCIState*

- in clause 7.1.1, if *p0-Alpha-CLID-PUSCH-Set* is provided, the values of , , and the PUSCH power control adjustment state are provided by *p0-Alpha-CLID-PUSCH-Set* associated with the indicated *DLorJoint-TCIState* or *UL-TCIstate*

- in clause 7.2.1, if *p0-Alpha-CLID-PUCCHSet* is provided, the values of and the PUCCH power control adjustment state are provided by *p0-Alpha-CLID-PUCCH-Set* associated with the indicated *DLorJoint-TCIState* or *UL-TCIstate*

- in clause 7.3.1, if *p0-Alpha-CLID-SRS-Set* is provided,

- if *useIndicatedTCIState* is provided for a SRS resource set, the values of , , and SRS power control adjustment state are provided by *p0-Alpha-CLID-SRS-Set* associated with the indicated *DLorJoint-TCIState* or *UL-TCIState*

- else, if *useIndicatedTCIState* is not provided for a SRS resource set and for a SRS resource from the SRS resource set, the values of , , and SRS power control adjustment state are provided by *p0-Alpha-CLID-SRS-Set* associated with *DLorJoint-TCIState* or *UL-TCIState* of an SRS resource with lowest *SRS-ResourceId* in the SRS resource set and a RS index for obtaining a pathloss estimate for the SRS transmission is provided by PL-RS associated with or included in the *DLorJoint-TCIState* or *UL-TCIState* of an SRS resource with lowest *SRS-ResourceId* in the SRS resource set

In the remaining of this clause, if a PDCCH reception by a UE includes two PDCCH candidates from corresponding search space sets, as described in clause 10.1

- a PDCCH monitoring occasion is the union of the PDCCH monitoring occasions for the two PDCCH candidates

- the end of the PDCCH reception is the end of the PDCCH candidate that ends later

The PDCCH reception includes the two PDCCH candidates also when the UE is not required to monitor one of the two PDCCH candidates as described in clauses 10, 11.1, and 11.1.1.

### \*\*\* Unchanged text is omitted \*\*\*

## 7.1 Physical uplink shared channel

### \*\*\* Unchanged text is omitted \*\*\*

- if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *fullpowerMode2*,

- for full power TPMIs reported by the UE [18, TS 38.306], and is the ratio of a number of antenna ports with non-zero PUSCH transmission power over a number of SRS ports for remaining TPMIs, where the number of SRS ports is associated with an SRS resource indicated by an SRI field in a DCI format scheduling the PUSCH transmission if more than one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, or the number of SRS ports is associated with the SRS resource if only one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook',

### \*\*\* Unchanged text is omitted \*\*\*

### 7.1.1 UE behaviour

### \*\*\* Unchanged text is omitted \*\*\*

- For a PUSCH (re)transmission configured by *ConfiguredGrantConfig*, , is provided by *p0-NominalWithoutGrant*, or if *p0-NominalWithoutGrant* is not provided.

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook' and is provided *p0-PUSCH-Alpha2*, for a retransmission of a configured grant Type 1 PUSCH, or for activation or retransmission of a configured grant Type 2 PUSCH, scheduled by a DCI format that includes a SRS resource set indicator field, and for active UL BWP of carrier of serving cell

- If the SRS resource set indicator value is 00, first value is provided by the value of *p0-PUSCH-Alpha* in *ConfiguredGrantConfig*.

- If the SRS resource set indicator value is 01, second value is provided by the value of *p0-PUSCH-Alpha2* in *ConfiguredGrantConfig*.

- If the SRS resource set indicator value is 10 or 11, first and second values are respectively provided by the values of *p0-PUSCH-Alpha* and by *p0-PUSCH-Alpha2* in *ConfiguredGrantConfig*.

- else if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’ and is provided *p0-PUSCH-Alpha2*, for a transmission of a configured grant Type 1 PUSCH and for active UL BWP of carrier of serving cell

- a first value is provided by the value of *p0-PUSCH-Alpha* in *ConfiguredGrantConfig* that is associated with the first *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*

- a second value is provided by the value of *p0-PUSCH-Alpha2* in *ConfiguredGrantConfig* that is associated with the second *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*

- else if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’ and is provided *p0-PUSCH-Alpha2*, for a retransmission of a configured grant Type 1 PUSCH, or for activation or retransmission of a configured grant Type 2 PUSCH, scheduled by a DCI format 0\_0, and for active UL BWP of carrier of serving cell

- a first value is provided by the value of *p0-PUSCH-Alpha* in *ConfiguredGrantConfig*

- else, is provided by *p0* obtained from *p0-PUSCH-Alpha* in *ConfiguredGrantConfig* that provides an index *P0-PUSCH-AlphaSetId* to a set of *P0-PUSCH-AlphaSet*, or by *p0-PUSCH* for a PUSCH (re)transmission as described in clause 19.1, for active UL BWP of carrier of serving cell

### \*\*\* Unchanged text is omitted \*\*\*

- For , a value, applicable for all , is provided by *p0-NominalWithGrant,* or if *p0-NominalWithGrant* is not provided, for each carrier of serving cell and a set of values are provided by a set of *p0* in *P0-PUSCH-AlphaSet* indicated by a respective set of *p0-PUSCH-AlphaSetId* for active UL BWP of carrier of serving cell

- If the UE is provided by *SRI-PUSCH-PowerControl* more than one values of *p0-PUSCH-AlphaSetId* and if a DCI format scheduling the PUSCH transmission includes an SRI field, the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for the SRI field in the DCI format [5, TS 38.212] and a set of indexes provided by *p0-PUSCH-AlphaSetId* that map to a set of *P0-PUSCH-AlphaSet* values and determines the value of from the *p0-PUSCH-AlphaSetId* value that is mapped to the SRI field value. If the UE is provided by *SRI-PUSCH-PowerControl* more than one values of *p0-PUSCH-AlphaSetId*

- if the DCI format scheduling the PUSCH transmission includes two SRI fields and the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' and if, the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for the two SRI fields and a set of indexes provided by *p0-PUSCH-AlphaSetId* that map to a set of *P0-PUSCH-AlphaSet* values, and determines first and second values of from the *p0-PUSCH-AlphaSetId* values that are mapped to the values of the first and second SRI fields, respectively.

- if the DCI format scheduling the PUSCH transmission includes two SRI fields and the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'nonCodebook', the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between

- a set of values for the first SRI field value and a set of indexes provided by *p0-PUSCH-AlphaSetId* that map to a set of *P0-PUSCH-AlphaSet* values, and determines the first value of from the *p0-PUSCH-AlphaSetId* value that is mapped to the first SRI field value, and

- a set of values associated with the second SRI field value for a same number of layers as indicated by the first SRI field [5, TS 38.212], and a set of indexes provided by *p0-PUSCH-AlphaSetId* that map to a set of *P0-PUSCH-AlphaSet* values, and determines the second value of from the *p0-PUSCH-AlphaSetId* value that is mapped to the second SRI field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212].

- If the DCI format also includes an open-loop power control parameter set indication field and a value of the open-loop power control parameter set indication field is '1' and if the DCI format scheduling the PUSCH transmission includes an SRI field, the UE determines a value of from a first value in *P0-PUSCH-Set* with a *p0-PUSCH-SetId* value mapped to the SRI field value.

- If the UE is provided by *SRI-PUSCH-PowerControl* more than one values of *p0-PUSCH-AlphaSetId*

- if a DCI format scheduling the PUSCH transmission includes two SRI fields and an open-loop power control parameter set indication field and the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook'

- if a value of the open-loop power control parameter set indication field is '0', the UE determines two values of from the *p0-PUSCH-AlphaSetId* values in *SRI-PUSCH-PowerControl* that are mapped to the two SRI values corresponding to each SRS resource set with *usage* set to 'codebook'.

- if a value of the open-loop power control parameter set indication field is '1', the UE determines two values of from first values in *P0-PUSCH-Set* in *P0-PUSCH-SetList* and *P0-PUSCH-Set* in *P0-PUSCH-SetList*2 with *p0-PUSCH-SetId* values mapped to the two SRI values corresponding to each SRS resource set with *usage* set to 'codebook', respectively.

- if a DCI format scheduling the PUSCH transmission includes two SRI fields and an open-loop power control parameter set indication field and the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'nonCodebook',

- if a value of the open-loop power control parameter set indication field is '0', the UE determines two values of from the *p0-PUSCH-AlphaSetId* values in *SRI-PUSCH-PowerControl* that are mapped to the first SRI field value corresponding to the first SRS resource set with *usage* set to 'nonCodebook' and to a second value, that is associated with the second SRI field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212] for a same number of layers as indicated by the first SRI field value, corresponding to the second SRS resource set with *usage* set to 'nonCodebook'

- if a value of the open-loop power control parameter set indication field is '1', the UE determines two values of from first values in *P0-PUSCH-Set* in *P0-PUSCH-SetList* and *P0-PUSCH-Set* in *P0-PUSCH-SetList*2 with *p0-PUSCH-SetId* values mapped to the first SRI field value corresponding to the first SRS resource set with *usage* set to 'nonCodebook, and a second value, that is associated with the second SRS field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212] for a same number of layers as indicated by the first SRI field value, corresponding to the second SRS resource set with *usage* set to 'nonCodebook', respectively.

- if the UE is not provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook' and if the PUSCH transmission, except for the PUSCH retransmission corresponding to a RAR UL grant, is scheduled by a DCI format that does not include an SRI field, or if *SRI-PUSCH-PowerControl* is not provided to the UE, ,

- if *P0-PUSCH-Set* is provided to the UE and the DCI format includes an open-loop power control parameter set indication field, the UE determines a value of from

- a first *P0-PUSCH-AlphaSet* in *p0-AlphaSets* if a value of the open-loop power control parameter set indication field is '0' or '00'

- a first value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value if a value of the open-loop power control parameter set indication field is '1' or '01'

- a second value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value if a value of the open-loop power control parameter set indication field is '10'

- else, the UE determines from the value of the first *P0-PUSCH-AlphaSet* in *p0-AlphaSets*

- if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook' and the PUSCH transmission is scheduled by a DCI format that does not include an SRI field and includes an SRS resource set indicator field with value 10 or 11

- if *P0-PUSCH-Set* is provided to the UE and the DCI format includes an open-loop power control parameter set indication field, the UE determines first and second values of as

- first and second *P0-PUSCH-AlphaSet* in *p0-AlphaSets* if the open-loop power control parameter set indication value is '0' or '00'

- first value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value in *p0-PUSCH-SetList* and first value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value in *p0-PUSCH-SetList2*, respectively, if the open-loop power control parameter set indication value is '1' or '01'

- second value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value in *p0-PUSCH-SetList* and second value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* in *p0-PUSCH-SetList2*, respectively, if the open-loop power control parameter set indication value is '10' or '11'

- else, the UE determines first and second values from the values of the first and second *P0-PUSCH-AlphaSet* in *p0-AlphaSets*, respectively

- if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook', and the PUSCH transmission is scheduled by a DCI format that does not include an SRI field and includes an SRS resource set indicator field with value '00'

- if the UE is provided *P0-PUSCH-Set* and the DCI format includes an open-loop power control parameter set indication field, the UE determines a value of as

- first *P0-PUSCH-AlphaSet* in *p0-AlphaSets* if the open-loop power control parameter set indication value is '0' or '00'

- first value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value in *p0-PUSCH-SetList*, if the open-loop power control parameter set indication value is '1' or '01'

- second value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value in *p0-PUSCH-SetList*, if the open-loop power control parameter set indication value is '10' or '11'

- else, the UE determines a value of from the value of the first *P0-PUSCH-AlphaSet* in *p0-AlphaSets*

- if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook', and the PUSCH transmission is scheduled by a DCI format that does not include an SRI field and includes an SRS resource set indicator field with value '01'

- if *P0-PUSCH-Set* is provided to the UE and the DCI format includes an open-loop power control parameter set indication field, the UE determines a value of as

- second *P0-PUSCH-AlphaSet* in *p0-AlphaSets* if the open-loop power control parameter set indication value is '0' or '00'

- first value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* value in *p0-PUSCH-SetList2*, if the open-loop power control parameter set indication value is '1' or '01'

- second value in *P0-PUSCH-Set* with the lowest *p0-PUSCH-SetID* in *p0-PUSCH-SetList2*, if the open-loop power control parameter set indication value is '10' or '11'

- else, the UE determines a value of from the value of the first *P0-PUSCH-AlphaSet* in *p0-AlphaSets*

- For

- For ,

- if and *msgA-Alpha* is provided, is the value of *msgA-Alpha*

- elseif or *msgA-Alpha* is not provided, and *msg3-Alpha* is provided, is the value of *msg3-Alpha*

- else,

- For ,

- if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook' and is provided *p0-PUSCH-Alpha2*, for a retransmission of a configured grant Type 1 PUSCH, or for activation or retransmission of a configured grant Type 2 PUSCH, scheduled by a DCI format that includes an SRS resource set indicator field, and for active UL BWP of carrier of serving cell

- if the SRS resource set indicator value is '00', first value is provided by *p0-PUSCH-Alpha* in *ConfiguredGrantConfig*

- if the SRS resource set indicator value is '01', first value is provided by *p0-PUSCH-Alpha2* in *ConfiguredGrantConfig*

- if the SRS resource set indicator value is '10' or '11', first and second values are respectively provided by *p0-PUSCH-Alpha* and *p0-PUSCH-Alpha2* in *ConfiguredGrantConfig*

* else if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’ and is provided *p0-PUSCH-Alpha2*, for a transmission of a configured grant Type 1 PUSCH and for active UL BWP of carrier of serving cell

- a first value is provided by the value of *p0-PUSCH-Alpha* in *ConfiguredGrantConfig* that is associated with the first *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*.

- a second value is provided by the value of *p0-PUSCH-Alpha2* in *ConfiguredGrantConfig* that is associated with the second *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*.

* else if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’ and is provided *p0-PUSCH-Alpha2*, for a retransmission of a configured grant Type 1 PUSCH, or for activation or retransmission of a configured grant Type 2 PUSCH, scheduled by a DCI format 0\_0 and for active UL BWP of carrier of serving cell

- a first value is provided by the value of *p0-PUSCH-Alpha* in *ConfiguredGrantConfig.*

- else is provided by *alpha* obtained from *p0-PUSCH-Alpha* in *ConfiguredGrantConfig* providing an index *P0-PUSCH-AlphaSetId* to a set of *P0-PUSCH-AlphaSet*, or by *alpha* for a PUSCH (re)transmission as described in clause 19.1, for active UL BWP of carrier of serving cell

- For , a set of values are provided by a set of *alpha* in *P0-PUSCH-AlphaSet* indicated by a respective set of *p0-PUSCH-AlphaSetId* for active UL BWP of carrier of serving cell

- If the UE is provided *SRI-PUSCH-PowerControl* and more than one values of *p0-PUSCH-AlphaSetId* in *p0-AlphaSets*,

- if a DCI format scheduling the PUSCH transmission includes two SRI fields and the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook', the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for

- the two SRI fields and a set of indexes provided by *P0-PUSCH-AlphaSetId* that map to *P0-PUSCH-AlphaSet* values, and determines first and second values of from the *P0-PUSCH-AlphaSetID* values that are mapped to the values of the first and second SRI field values, respectively.

- if a DCI format scheduling the PUSCH transmission includes two SRI fields and the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'nonCodebook', the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for

- the first SRI field and a set of indexes provided by *P0-PUSCH-AlphaSetId* that map to *P0-PUSCH-AlphaSet* values, and determines first value of from the *P0-PUSCH-AlphaSetID* value that is mapped to the first SRI field value, and

- the second value, associated with the second SRI field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212] for a same number of layers as indicated by the first SRI field value, and a set of indexes provided by *p0-PUSCH-AlphaSetId* that map to a set of *P0-PUSCH-AlphaSet* values, and determines the second value of from the *p0-PUSCH-AlphaSetId* value that is mapped to the second SRI field value

- if a DCI format scheduling the PUSCH transmission includes one SRI field, the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for the SRI field in the DCI format [5, TS 38.212] and a set of indexes provided by *p0-PUSCH-AlphaSetId* that map to a set of *P0-PUSCH-AlphaSet* values and determines the values of from the *p0-PUSCH-AlphaSetId* value that is mapped to the SRI field value

- If the UE is not provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook' and if the PUSCH transmission except for the PUSCH retransmission corresponding to a RAR UL grant is scheduled by a DCI format that does not include an SRI field, or if *SRI-PUSCH-PowerControl* is not provided to the UE, , and the UE determines from the value of the first *P0-PUSCH-AlphaSet* in *p0-AlphaSets*

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook' and the PUSCH transmission is scheduled by a DCI format that does not include an SRI field and includes an SRS resource set indicator field with value '10' or '11', the UE determines from first and second *P0-PUSCH-AlphaSet* in *p0-AlphaSets*

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook', and the PUSCH transmission is scheduled by a DCI format that does not include an SRI field and includes an SRS resource set indicator field with value '00' or '01', the UE determines from first *P0-PUSCH-AlphaSet* or second *P0-PUSCH-AlphaSet* in *p0-AlphaSets*, respectively.

- is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks for PUSCH transmission occasion on active UL BWP of carrier of serving cell and is a SCS configuration defined in [4, TS 38.211]

- is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index for the active DL BWP, as described in clause 12, of carrier of serving cell

### \*\*\* Unchanged text is omitted \*\*\*

- for and for where is provided by *deltaMCS* for each UL BWP of each carrier and serving cell . If the PUSCH transmission is over more than one layer [6, TS 38.214], . and , for active UL BWP of each carrier and each serving cell , are computed as below

- for PUSCH with UL-SCH data and for CSI transmission in a PUSCH without UL-SCH data, where

- is a number of transmitted code blocks, is a size for code block , and is a number of resource elements determined as , where is provided by *numberOfSlotsTBoMS* as described in [6, TS 38.214] and if *numberOfSlotsTBoMS* is not provided, is a number of symbols for PUSCH transmission occasion on active UL BWP of carrier of serving cell, is a number of subcarriers excluding DM-RS subcarriers and phase-tracking RS samples [4, TS 38.211] in PUSCH symbol and assuming no segmentation for a nominal repetition in case the PUSCH transmission is with repetition Type B, , and , are defined in [5, TS 38.212]

- when the PUSCH includes UL-SCH data and , as described in clause 9.3, when the PUSCH includes CSI and does not include UL-SCH data

- is the modulation order and is the target code rate, as described in [6, TS 38.214], provided by the DCI format scheduling the PUSCH transmission that includes CSI and does not include UL-SCH data

- For the PUSCH power control adjustment state for active UL BWP of carrier of serving cell in PUSCH transmission occasion

- is a TPC command value included in a DCI format that schedules the PUSCH transmission occasion on active UL BWP of carrier of serving cell or jointly coded with other TPC commands in a DCI format 2\_2 with CRC scrambled by TPC-PUSCH-RNTI, as described in clause 11.3

- if the UE is configured with *twoPUSCH-PC-AdjustmentStates* and if the UE is not configured with *twoPUSCH-PC-AdjustmentStates* or if the PUSCH transmission is scheduled by a RAR UL grant as described in clause 8.3

- if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook', and is provided *p0-PUSCH-Alpha2*, for a retransmission of a configured grant Type 1 PUSCH, or for activation or retransmission of a configured grant Type 2 PUSCH, scheduled by a DCI format that includes a SRS resource set indicator field, and for active UL BWP of carrier of serving cell

- if the SRS resource set indicator value is 00, is equal to the value of *powerControlLoopToUse* in *ConfiguredGrantConfig*

- if the SRS resource set indicator value is 01, is equal to the value of *powerControlLoopToUse2* in *ConfiguredGrantConfig*

- if the SRS resource set indicator value is 10 or 11, a first and a second are respectively equal to *powerControlLoopToUse* and *powerControlLoopToUse2* in *ConfiguredGrantConfig*

- else if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’ and is provided *p0-PUSCH-Alpha2*, for a transmission of a configured grant Type 1 PUSCH and for active UL BWP of carrier of serving cell

- a first is equal to the value of *powerControlLoopToUse* in *ConfiguredGrantConfig* that is associated with the first *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*

- a second is equal to the value of *powerControlLoopToUse2* in *ConfiguredGrantConfig* that is associated with the second *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*

- else if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’ and is provided *p0-PUSCH-Alpha2*, for a retransmission of a configured grant Type 1 PUSCH, or for activation or retransmission of a configured grant Type 2 PUSCH, scheduled by a DCI format 0\_0 and for active UL BWP of carrier of serving cell

- is equal to the value of *powerControlLoopToUse* in *ConfiguredGrantConfig*

- else, for a PUSCH (re)transmission configured by *ConfiguredGrantConfig*, the value of is provided to the UE by *powerControlLoopToUse* in *ConfiguredGrantConfig*.

### \*\*\* Unchanged text is omitted \*\*\*

- is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index for the active DL BWP, as described in clause 12, of carrier of serving cell

### \*\*\* Unchanged text is omitted \*\*\*

- If the PUSCH transmission is scheduled by DCI format 0\_0, and

- if two spatial settings from PUCCH-SpatialRelationInfo are activated for a PUCCH resource with a lowest index for active UL BWP of each carrier and serving cell , the UE uses the same RS resource index as for a PUCCH transmission with a spatial setting from the two spatial settings with lowest index in the PUCCH resource with the lowest index for active UL BWP of each carrier and serving cell

- else, if the UE is provided a spatial setting by PUCCH-SpatialRelationInfo for a PUCCH resource with a lowest index for active UL BWP of each carrier and serving cell , as described in clause 9.2.2, the UE uses the same RS resource index as for a PUCCH transmission in the PUCCH resource with the lowest index

- If the PUSCH transmission is not scheduled by DCI format 0\_0, and if the UE is provided *enableDefaultBeamPL-ForSRS* and is not provided *PUSCH-PathlossReferenceRS* and *PUSCH-PathlossReferenceRS-r16,* the UE uses the same RS resource index as for an SRS resource set with an SRS resource associated with the PUSCH transmission

### \*\*\* Unchanged text is omitted \*\*\*

- For a PUSCH transmission configured by *ConfiguredGrantConfig* that does not include *rrc-ConfiguredUplinkGrant*, the UE determines a RS resource index from a value of *PUSCH-PathlossReferenceRS-Id* that is mapped to a SRI field value in a DCI format activating the PUSCH transmission.

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' and the DCI format activating the PUSCH transmission includes two SRI fields, the UE determines first and second RS resource indexes from respective first and second values of *PUSCH-PathlossReferenceRS-Id* that are mapped to the first and second SRI values corresponding to each SRS resource set with *usage* set to 'codebook', respectively.

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'nonCodebook'and the DCI format activating the PUSCH transmission includes two SRI fields, the UE determines first and second RS resource indexes from respective first and second values of *PUSCH-PathlossReferenceRS-Id* that are mapped to the first SRI value corresponding to the first SRS resource set with *usage* set to 'nonCodebook', and the value, associated with the second SRI field value corresponding to Tables 7.3.1.1.2-28/29/30/31 of [5, TS 38.212] for a same number of layers as indicated by the first SRI field value, corresponding to the second SRS resource set with *usage* set to 'nonCodebook'.

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook'and the DCI format activating the PUSCH transmission does not include an SRI field, the UE determines first and second RS resource indexes with respective first and second *PUSCH-PathlossReferenceRS-Id* value being equal to zero and one.

- If the DCI format activating the PUSCH transmission does not include an SRI field, the UE determines a RS resource index with a respective *PUSCH-PathlossReferenceRS-Id* value being equal to zero

where the RS resources are either on serving cell or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking*

### \*\*\* Unchanged text is omitted \*\*\*

### 7.2.1 UE behaviour

### \*\*\* Unchanged text is omitted \*\*\*

- For the PUCCH power control adjustment state for active UL BWP of carrier of primary cell and PUCCH transmission occasion

- is a TPC command value included in a DCI format associated with the PUCCH transmission for active UL BWP of carrier of the primary cell that the UE detects for PUCCH transmission occasion , or is jointly coded with other TPC commands in a DCI format 2\_2 with CRC scrambled by TPC-PUCCH-RNTI [5, TS 38.212], as described in clause 11.3

- if the UE is provided *twoPUCCH-PC-AdjustmentStates* and *PUCCH-SpatialRelationInfo*, or more than one sets of power control parameters for operation in FR1, and if the UE is not provided *twoPUCCH-PC-AdjustmentStates* or *PUCCH-SpatialRelationInfo*, and more than one sets of power control parameters

- If the UE obtains a TPC command value from a DCI format associated with the PUCCH transmission and if the UE is provided *PUCCH-SpatialRelationInfo*, the UE obtains a mapping, by an index provided by *p0-PUCCH-Id*, between a set of *pucch-SpatialRelationInfoId* values and a set of values for *closedLoopIndex* that provide the value(s). If the UE receives an activation command indicating a value of *pucch-SpatialRelationInfoId*, the UE determines the value *closedLoopIndex* that provides the value of through the link to a corresponding *p0-PUCCH-Id* index

- If the UE obtains a TPC command value from a DCI format associated with the PUCCH transmission, and if the UE is provided more than one sets of power control parameters for operation in FR1, and if the UE receives an activation command [11, TS 38.321] indicating one or two sets of the more than one sets of power control parameters, the UE determines the value of based on the *closedLoopIndex* value in the one or two sets of power control parameters

- If the UE obtains a TPC command from a DCI format 2\_2 with CRC scrambled by a TPC-PUCCH-RNTI, the value is provided by the closed loop indicator field in DCI format 2\_2

### \*\*\* Unchanged text is omitted \*\*\*

### 7.7.1 Type 1 PH report

### \*\*\* Unchanged text is omitted \*\*\*

If the UE determines that a Type 1 power headroom report for an activated serving cell is based on a reference PUSCH transmission then, for PUSCH transmission occasion on active UL BWP of carrier of serving cell , the UE computes the Type 1 power headroom report as

 [dB]

where is computed assuming MPR=0 dB, A-MPR=0 dB, P-MPR=0 dB. TC = 0 dB. MPR, A-MPR, P-MPR and TC are defined in [8-1, TS 38.101-1], [8-2, TS38.101-2] and [8-3, TS 38.101-3]. The remaining parameters are defined in clause 7.1.1 and, if the UE is provided *DLorJoint-TCIState* or *UL-TCIstate* are provided by a corresponding *ul-powerControl*, where and are obtained using and *p0-PUSCH-AlphaSetId* *=* 0, is obtained using *pusch-PathlossReferenceRS-Id =* 0, and .

If a UE is configured with two UL carriers for a serving cell and the UE determines a Type 1 power headroom report for the serving cell based on a reference PUSCH transmission, the UE computes a Type 1 power headroom report for the serving cell assuming a reference PUSCH transmission on the UL carrier provided by *pusch-Config*. If the UE is provided *pusch-Config* for both UL carriers, the UE computes a Type 1 power headroom report for the serving cell assuming a reference PUSCH transmission on the UL carrier provided by *pucch-Config*. If *pucch-Config* is not provided to the UE for any of the two UL carriers, the UE computes a Type 1 power headroom report for the serving cell assuming a reference PUSCH transmission on the non-supplementary UL carrier.

If a UE transmits a PUSCH associated with a RS resource index , as described in clause 7.1.1, on active UL BWP of carrier of serving cell in slot and provides a Type 1 power headroom report for an actual PUSCH repetition associated with the RS resource index , the Type 1 power headroom report is for the first PUSCH repetition associated with the RS resource index that overlaps with slot .

If a UE is provided *twoPHRMode* on active UL BWP of carrier of serving cell and is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to ‘codebook’ or ‘nonCodebook’, the UE provides two Type 1 power headroom reports in a slot , where

- if the UE provides a first Type 1 power headroom report for an actual PUSCH repetition of a PUSCH transmission starting earliest in slot that is associated with one RS resource set,

- if the UE transmits PUSCH repetitions associated with the other SRS resource set in slot , the UE provides a second Type 1 power headroom report for a first actual PUSCH repetition associated with the other SRS resource set that overlaps with slot

- else, the UE provides a second Type 1 power headroom report for a reference PUSCH transmission associated with the other SRS resource set, where

- if the other SRS resource set is the first SRS resource set, and are obtained using and *p0-PUSCH-AlphaSetId* *=* 0, is obtained using *pusch-PathlossReferenceRS-Id =* 0 if the UE is not provided *enablePL-RS-UpdateForPUSCH-SRS* or is obtained from *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0 of *sri-PUSCH-MappingToAddModList* if the UE is provided *enablePL-RS-UpdateForPUSCH-SRS*, and

- else, and are obtained using and *p0-PUSCH-AlphaSetId* *= 1*, is obtained using *pusch-PathlossReferenceRS-Id* = 1 if the UE is not provided *enablePL-RS-UpdateForPUSCH-SRS* or is obtained from *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0 of *sri-PUSCH-MappingToAddModList2* if the UE is provided *enablePL-RS-UpdateForPUSCH-SRS*, and if the UE is provided *twoPUSCH-PC-AdjustmentStates*, or if the UE is not provided *twoPUSCH-PC-AdjustmentStates*

- else, if the UE provides a Type 1 power headroom report for a reference PUSCH transmission associated with the first SRS resource set, the UE provides a Type 1 power headroom report for a reference PUSCH transmission associated with the second SRS resource set, where

- for the first Type 1 power headroom report, and are obtained using and *p0-PUSCH-AlphaSetId* *=* 0, is obtained using *pusch-PathlossReferenceRS-Id =* 0 if the UE is not provided *enablePL-RS-UpdateForPUSCH-SRS*, or is obtained from the *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0 of *sri-PUSCH-MappingToAddModList* if the UE is provided *enablePL-RS-UpdateForPUSCH-SRS*, and .

- for the second Type 1 power headroom report, and are obtained using and *p0-PUSCH-AlphaSetId* *= 1*, is obtained using *pusch-PathlossReferenceRS-Id = 1* if the UE is not provided *enablePL-RS-UpdateForPUSCH-SRS*,or is obtained from the *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0 of *sri-PUSCH-MappingToAddModList2* if the UE is provided *enablePL-RS-UpdateForPUSCH-SRS*, and if the UE is provided *twoPUSCH-PC-AdjustmentStates* or if the UE is not provided *twoPUSCH-PC-AdjustmentStates*

### \*\*\* Unchanged text is omitted \*\*\*