**3GPP TSG RAN WG1 #110 R1-22xxxxx**

**Toulouse, France, August 22nd – 26th, 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **[DRAFT] CHANGE REQUEST** | | | | | | | | |
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|  | **38.213** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.2.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](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 power control of mTRP PUSCH repetition | | | | | | | | | |
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| ***Source to WG:*** | Moderator (Nokia), OPPO | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_feMIMO-Core | | | | |  | ***Date:*** | | | 2022-08-24 |
|  |  | | | |  | |  | | |  |
| ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | If a UE is provided two SRS resource sets for PUSCH repetition by RRC, one or two SRI(s)/SRS resource set(s) can be indicated for PUSCH transmission via SRS resource set indicator in DCI. When the SRS resource set indicator value is 10 and 11, two SRS resource sets are associated with different PUSCHs, and two sets of power control parameters would be determined according to 38.213. However, the association between the two sets of power control parameters and the two SRS resource sets is absent in 38.213. It is unclear whether the first and second set of power control parameters (e.g. ) are associated with the first and second set of SRS resource set, or associated with the first and second PUSCH repetition respectively. They are different cases when the SRS resource set indicator value is 10 and 11. When the SRS resource set indicator value is 00 and 01, only one SRS resource set is associated with PUSCH and only one set of power control parameters is determined based on 38.213, and there is no ambiguity for the mapping. | | | | | | | | |
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| ***Summary of change:*** | | The first set of power control parameters is associated with the first SRS resource set, and the second set of power control parameters is associated with the second SRS resource set. | | | | | | | | |
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| ***Consequences if not approved:*** | | The association between the two sets of power control parameters for PUSCH repetition and the two SRS resource sets is absent in 38.213. | | | | | | | | |
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| ***Clauses affected:*** | | 7.1.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | **Isolated impact analysis:**  This CR has no isolated impact on network and UE hehavior. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | First version. | | | | | | | | |

### 7.1.1 UE behaviour

If a UE transmits a PUSCH on active UL BWP of carrier of serving cell using parameter set configuration with index and PUSCH power control adjustment state with index , the UE determines the PUSCH transmission power in PUSCH transmission occasion as

 [dBm]

where,

- is the UE configured maximum output power defined in [8-1, TS 38.101-1], [8-2, TS 38.101-2] and [8-3, TS 38.101-3] for carrier of serving cell in PUSCH transmission occasion .

- is a parameter composed of the sum of a component and a component where .

- If a UE established dedicated RRC connection using a Type-1 random access procedure, as described in clause 8, and is not provided *P0-PUSCH-AlphaSet* or for a PUSCH (re)transmission corresponding to a RAR UL grant as described in clause 8.3,

, , and ,

where is provided by *preambleReceivedTargetPower* [11, TS 38.321] and is provided by *msg3-DeltaPreamble*, or dB if *msg3-DeltaPreamble* is not provided, for carrier of serving cell

- If a UE established dedicated RRC connection using a Type-2 random access procedure, as described in clause 8, and is not provided *P0-PUSCH-AlphaSet*,or for a PUSCH transmission for Type-2 random access procedure as described in clause 8.1A,

, , and ,

where is provided by *msgA-preambleReceivedTargetPower*, or by *preambleReceivedTargetPower* if *msgA-preambleReceivedTargetPower* isnot provided and is provided by *msgA-DeltaPreamble*, or dB if *msgA-DeltaPreamble* is not provided, for carrier of serving cell

- 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 that are respectively associated with the first and second SRS resource set 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

- 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

**<Unchanged parts are omitted>**

- 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 respectively associated with the first and second SRS resource set 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 respectively associated with the first and second SRS resource set from the values of the first and second *P0-PUSCH-AlphaSet* in *p0-AlphaSets*, respectively

- 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 associated with the first and second SRS resource set 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

**<Unchanged parts are omitted>**

- 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 respectively associated with the first and second SRS resource set 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.

**<Unchanged parts are omitted>**

- For a PUSCH transmission configured by *ConfiguredGrantConfig,* if *rrc-ConfiguredUplinkGrant* is included in *ConfiguredGrantConfig*, a RS resource index is provided by a value of *pathlossReferenceIndex* included in *rrc-ConfiguredUplinkGrant* where the RS resource is either on serving cell or, if provided, on a serving cell indicated by a value of *pathlossReferenceLinking*. 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 for configured grant Type 1 PUSCH, first and second RS resource indexes that are respectively associated with the first and second *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant* are provided by respective values of *pathlossReferenceIndex* and *pathlossReferenceIndex2* in *rrc-ConfiguredUplinkGrant*.

- 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 respectively associated with the first and second SRS resource set 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*

- If the UE is provided *enablePL-RS-UpdateForPUSCH-SRS*, a mapping between *sri-PUSCH-PowerControlId* and *PUSCH-PathlossReferenceRS-Id* values can be updated by a MAC CE as described in [11, TS 38.321]

- For a PUSCH transmission scheduled by a DCI format that does not include an SRI field, or for a PUSCH transmission configured by *ConfiguredGrantConfig* and activated, as described in clause 10.2, by a DCI format that does not include an SRI field, the UE determines a RS resource index from the *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0. If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook', the UE determines first and second RS resource indexes from respective *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0 of *sri-PUSCH-MappingToAddModList* and *sri-PUSCH-PowerControlId* = 0 of *sri-PUSCH-MappingToAddModList2*, respectively.

- If the UE is not provided *enablePL-RS-UpdateForPUSCH-SRS*

- For a PUSCH transmission scheduled by a DCI format that does not include an SRI field, if the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook' or 'nonCodebook', the UE determines first and second RS resource indexes respectively associated with the first and second SRS resource set with respective first and second *PUSCH-PathlossReferenceRS-Id* values being equal to 0 and 1.

**<Unchanged parts are omitted>**

- 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 respectively associated with the first and second SRS resource set 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*.

- If the UE is provided two SRS resource sets in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with *usage* set to 'codebook', is provided *SRI-PUSCH-PowerControl*, and a DCI format scheduling the PUSCH transmission includes two SRI fields, the UE obtains a mapping from *sri-PUSCH-PowerControlId* in *SRI-PUSCH-PowerControl* between a set of values for the first and second SRI fields and the values provided by *sri-PUSCH-ClosedLoopIndex*, and determines the values mapped to the values of the first and second SRI fields 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', is provided *SRI-PUSCH-PowerControl*, and a DCI format scheduling the PUSCH transmission includes two SRI fields, 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 the values provided by *sri-PUSCH-ClosedLoopIndex*, and determines the value that is mapped to the first SRI field 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, and the value(s) provided by *sri-PUSCH-ClosedLoopIndex*, and determines the value that is mapped to the 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', is provided *SRI-PUSCH-PowerControl*, and a DCI format scheduling the PUSCH transmission does not include an SRI field

- If the UE is provided twoPUSCH-PC-AdjustmentStates

- the UE determines for the PUSCH transmission corresponding to the first SRS resource set with usage set to 'codebook' or 'nonCodebook', and for the PUSCH transmission corresponding to the second SRS resource set with usage set to 'codebook' or 'nonCodebook'

- else

- the UE determines for the PUSCH transmission