**3GPP TSG- Meeting #130**

**St. Julians, , - May, 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **06** | **CR** | **1273** | **rev** | **1** | **Current version:** | **.0** |  |
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| *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:***  | Miscellaneous non-controversial rapporteur corrections |
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| ***Source to WG:*** | Xiaomi |
| ***Source to TSG:*** |  |
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| ***Work item code:*** | NR\_MC\_enh, NR\_MIMO\_evo\_DL\_UL |  | ***Date:*** | 09 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-19 |
|  | *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 canbe 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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | 1. The parameter *uplinkTxSwitchingPeriodForBandPair-r18* despite it being defined in TS 38.331 and referred to indirectly in TS 38.101-1. (On the other hand, TS 38.306 lists the sub-parameters *switchingPeriodFor2T-r18* and *switchingPeriodFor2T-r18* explicitly under *ULTxSwitchingBandPair-r18*.). The definition of *uplinkTxSwitchingPeriodForBandPair-r18* is not captured.
2. As captured in R1-2501388, Component 2 is reported per BC for FG 40-7-2. *nonCodebook-CSI-RS-SRS-PerBC-r18* as component 2 of FG 40-7-2 should be reported simultaneously with nonCodebook-CSI-RS-SRS-r18 (component 1 of FG 40-7-2) as a complete feature. However, such prerequisite is not captured.
3. According to RAN1 116bis meeting, RAN1 agreed to remove the phrase ‘at least’ in FG40-4-1j, but this update was not captured in RAN1 feature list. Current description in *mappingTypeA-1SymbolFL-DMRS-Addition2Symbol-r18* does not match with RAN1 agreement.
4. Corrections of miscellaneous non-controversial editorial correcitons.
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| ***Summary of change:*** | 1. Add the definition of *uplinkTxSwitchingPeriodForBandPair-r18* within *ULTxSwitchingBandPair-r18*.
2. Add *nonCodebook-CSI-RS-SRS-PerBC-r18* as prerequisite of *nonCodebook-CSI-RS-SRS-r18.*
3. remove ‘at least’ in field description of *mappingTypeA-1SymbolFL-DMRS-Addition2Symbol-r18*.
4. Editorial corrections for MIMO capabilities

**Impact Analysis** Impacted 5G architecture options: NR SA, (NG)EN-DC, NE-DC,NR-DC Impacted functionality: MC enhancement, MIMO Inter-operability: 1. Change 1:

If the network is implemented according to the CR and the UE is not, the network might misinterpret whether the UE supports UL Tx switching across two TAGs.If the UE is implemented according to the CR and the network is not there is no inter-operability issue; however, the network might not configure UL Tx switching across two TAGs.2. Change 2:If the network is implemented according to the CR and the UE is not, the network might misinterpret whether the UE supports Association between CSI-RS and SRS for non-codebook case.If the UE is implemented according to the CR and the network is not there is no inter-operability issue; however, the network might not configure Association between CSI-RS and SRS for non-codebook case.3. Change 3:There are no interoperability issues. |
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| ***Consequences if not approved:*** | Miscellaneous typos and editorials will remain in the specification |
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| ***Clauses affected:*** | 4.2.7.1, 4.2.7.2, 4.2.7.4, 4.2.7.5 |
|  |  |
|  | **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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*First change*

#### 4.2.7.1 *BandCombinationList* parameters

| ***uplinkTxSwitching-PowerBoosting-r16***Indicates the support of 3dB boosting on the maximum output power for UE transmission under the operation state in which 2-port transmission can be supported on carrier2 in case of inter-band UL CA case where UE supports dynamic UL Tx switching. A UE shall only indicate this capability in case the UE supports power class 3 for inter-band UL CA for the band combination as defined in TS 38.101-1 [2]. | BC | No | N/A | FR1 only |
| --- | --- | --- | --- | --- |
| ***UplinkTxSwitchingAdditionalPeriodDualUL-r18***Indicates the UL Tx switching period for switching between a band pair and another band pair or another band, as specified in TS 38.101-1 [2], when Rel-18 UL Tx switching is configured by *uplinkTxSwitchingMoreBands-r18*.- *bandPairIndex1-r18*/*bandPairIndex2-r18* xx refers to the xxth band pair entry in the band pair list indicated by *ULTxSwitchingBandPair-r18*. The two band pairs consist of mutually exclusive bands.- *bandIndex-r18* xx refers to the xxth band entry in this band combination, which indicates a different band from those indicated by *bandPairIndex1-r18*.- *switchingAdditionalPeriodDualUL-r18* indicates the length of switching period for switching between one band pair indicated by *bandPairIndex1-r18* and another band pair indicated by *bandPairIndex2-r18* or another band indicated by *bandIndex-r18*. n35us represents 35 µs, n140us represents 140µs, and so on, as specified in TS 38.101-1 [2].A UE supporting this feature shall also indicate the support of dualUL switching option for the band pair(s) indicated in *bandPairIndex1-r18/bandPairIndex2-r18*. | BC | No | N/A | FR1 only |
| ***ULTxSwitchingBandPair-r18, ULTxSwitchingBandPair-v1840***Indicates UE supports R18 dynamic UL Tx switching across up to 4 bands in case of inter-band CA, SUL as defined in TS 38.214 [12] and TS 38.101-1 [2]. The capability signalling comprises of the following parameters:- *bandIndexUL1-r18* and *bandIndexUL2-r18* indicate the band pair on which UE supports dynamic UL Tx switching. *bandindexUL1*/*bandindexUL2* xx refers to the xxth UL band entry in the band combination. UE shall indicate support of 2-layer UL MIMO in *FeatureSet* on both bands for 2Tx-2Tx switching, or indicate support of 2-layer UL MIMO on one band and 1-layer MIMO on the other band for 1Tx-2Tx switching, or indicate support of 1-layer UL MIMO on both bands for 1Tx-1Tx switching.- *uplinkTxSwitchingOptionForBandPair-r18* indicates whether switchedUL or dualUL or both switching options is supported for a given band pair as specified in TS 38.214 [12].- *uplinkTxSwitchingPeriodForBandPair-r18* indicates the supported switching period. - *switchingPeriodFor2T-r18* indicates the length of 2Tx-2Tx switching period. n35us represents 35 µs, n140us represents 140µs, and so on, as specified in TS 38.101-1 [2].- *switchingPeriodFor1T-r18* indicates the length of 1Tx-2Tx switching and/or 1Tx-1Tx switching period, as specified in TS 38.101-1 [2]. n35us represents 35 µs, n140us represents 140µs, and so on, as specified in TS 38.101-1 [2].- *uplinkTxSwitching-DL-Interruption-r18* indicates that DL interruption on the band will occur during UL Tx switching, as specified in TS 38.133 [5]. UE is not allowed to set this field for the band combination of SUL band+TDD band, for which no DL interruption is allowed.Field encoded as a bit map, where bit N is set to "1" if DL interruption on band N will occur during uplink Tx switching as specified in TS 38.133 [5]. The leading / leftmost bit (bit 0) corresponds to the first band of this band combination, the next bit corresponds to the second band of this band combination and so on. The capability is not applicable to the following band combinations, in which DL reception interruption is not allowed:- TDD+TDD CA with the same UL-DL pattern- *SwitchingPeriodUnaffectedBandDualUL-r18* indicates for a given band pair {band X and band Y}, whether/how the switching period is to be applied on band Z (as well as band X and Y), when a UL Tx switching is triggered from band pair {band X and band Z} to band pair {band Y and band Z}, as defined in TS 38.101-1 [2]. If absent for band Z, the UE is not required to transmit on any UL bands during the switching period reported for the band pair of band X and band Y, as defined in TS 38.101-1 [2].- *bandIndexUnaffected-r18* xx indicates the band index of band Z and refers to the xxth UL band entry in the band combination.- *maintainedUL-Trans-r18* indicates that the UE is capable of uplink transmission on band Z and is not required to transmit on band X and Y during the switching period reported for the band pair of band X and band Y, as specified in TS 38.101-1 [2].- *periodOnULBands-r18* indicates the switching period to be applied on any UL bands as specified in TS 38.101-1 [2]. n35us represents 35 µs, n140us represents 140µs, and so on.- *configured1T1T-OnTwoBands-r18* indicates the support of 2-band configuration of 1T-1T UL Tx switching using Rel-18 UL Tx switching configurations. This capability is applicable for a band pair where the UE reports no UL-MIMO on both bands and indicate support of switchedUL. | BC | FD | N/A | FR1 only |
| ***UplinkTxSwitchingBandParameters-v1700***Contains the UL Tx switching specific band parameters for a given band combination.The capability signalling comprises of the following parameters:- *bandIndex-r17* indicates a band on which UE supports dynamic UL Tx switching with another band in the band combination. *bandIndex* xx refers to the xxth band entry in the band combination.- *uplinkTxSwitching2T2T-PUSCH-TransCoherence-r17* indicates support of the uplink codebook subset for the carrier(s) on a band capable of two antenna connectors on which UE supports dynamic UL 2Tx-2Tx switching with another band in the band combination. UE indicating support of full coherent codebook subset shall also support non-coherent codebook subset. If this field is absent,- When 2Tx-2Tx switching between two bands is configured by *uplinkTxSwitching-2T-Mode-r17*, the per BC UE capability reported in *uplinkTxSwitching-PUSCH-TransCoherence-r16* is applied, and if this field and *uplinkTxSwitching-PUSCH-TransCoherence-r16* are both absent, the UE capability reported in *pusch-TransCoherence* is applied when uplink Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2].- When R18 dynamic UL Tx switching is configured by *uplinkTxSwitchingMoreBands-r18*, the UE capability reported in *pusch-TransCoherence* is applied when uplink Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2].NOTE: If *UplinkTxSwitchingBandParameters-v1700* is absent for one or more bands of a band combination, the per BC UE capability reported in *uplinkTxSwitching-PUSCH-TransCoherence-r16* is applied for corresponding band(s), and if *uplinkTxSwitching-PUSCH-TransCoherence-r16* is also absent, the UE capability reported in *pusch-TransCoherence* is applied for corresponding band(s) when uplink Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2]. | BC | No | N/A | FR1 only |
| ***uplinkTxSwitchingMinimumSeparationTime-r18***Indicates the minimum separation time for two uplink switching on more than 2 bands within any two consecutive reference slots as specified in TS 38.214 [12]. The field is mandatory when UE supports dynamic UL Tx switching across more than two bands. | BC | CY | N/A | FR1 only |
| ***uplinkTxSwitching-PUSCH-TransCoherence-r16***Indicates support of the uplink codebook subset when uplink 1Tx-2Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2].UE indicating support of full coherent codebook subset shall also support non-coherent codebook subset.If the field is absent, the supported uplink codebook subset indicated by *pusch-TransCoherence* applies when the uplink switching is triggered between last transmitted SRS and scheduled transmission. | BC | No | N/A | FR1 only |

*Second change*

#### 4.2.7.2 *BandNR parameters*

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
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| ***codebookParametersetype2CJT-r18***Indicates the UE support of additional codebooks and the corresponding parameters supported by the UE of Enhanced Type II Codebook (eType-II) with refinement for multi-TRP CJT.The UE shall include *eType2CJT-r18* to indicate basic features of eType-II codebook with refinement for multi-TRP CJT. This capability signalling comprises the following parameters:*-* *supportedCSI-RS-ResourceList-r18* indicates the list of supported CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*. The following parameters are included in *codebookVariantsList*:- *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in one NZP CSI-RS resource associated with multi-TRP CJT- *maxNumberResourcesPerBand* indicates the maximum total number of NZP CSI-RS resource associated with multi-TRP CJT- *totalNumberTxPortsPerBand* indicates the total number of Tx ports of NZP CSI-RS resources associated with multi-TRP CJT- *scalingfactor-r18* indicates the scaling factor X for CPU occupation counting for CJT etype-II codebook- *maxNumberNZP-CSI-RS-MultiTRP-CJT-r18* indicates the maximum number of NZP CSI-RS resources in one NZP CSI-RS resource set associated with multi-TRP CJTThe UE indicating *eType2CJT-r18* shall support N=N\_TRP only, N\_L=1 only, support mode 2 for eType-II codebook refinement for multi-TRP CJT, support for PMI subband R=1, support of parameter combinations with L=2,4, support rank 1,2, and support frequency basis selection mode 2, i.e., common frequency basis selection among different TRPs.The UE indicating support of *eType2CJT-r18* shall also indicate support of *csi-ReportFramework* and *simultaneousCSI-ReportsAllCC.*NOTE 1:When NTRP=1 TRP is configured, OCPU =1. When NTRP>1 TRPS are configured, OCPU = ceil(X \* NTRP).NOTE 2:A-CSI is supported, and whether UE supports SP-CSI on PUSCH is dependent on *sp-CSI-ReportPUSCH*.The UE optionally includes *eType2CJT-FD-IO-r18* to indicate whether the UE supports mode 1 for CJT eType-II codebook with FD basis selection integer frequency offset. This capability signalling comprises the list of supported NZP CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*. The UE indicating *eType2CJT-FD-IO-r18* shall also support frequency basis selection mode 1, i.e., common frequency basis selection among different TRPs with FD basis selection integer frequency offset.The UE optionally indicates *eType2CJT-FD-FO-r18* to indicate whether the UE supports frequency basis selection mode 1 with FD basis selection fractional frequency offset for eType-II based CJT codebook. The UE indicating *eType2CJT-FD-FO-r18* shall also indicate support of *eType2CJT-FD-IO-r18.*The UE optionally indicates *eType2CJT-R2-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with PMI subbands R=2. This capability signalling comprises the list of supported NZP CSI-RS resources with R=2 across all CCs in a band by referring to *codebookVariantsList* across all CCs.The UE optionally indicates *eType2CJT-PV-Beta-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with parameter combination pv={1/2,1/2,1/2,1/2} and beta=1/2.The UE optionally indicates *eType2CJT-2NN1N2-r18* to indicate whether the UE supports 2NN1N2 >32 for eType-II CJT codebook. The UE indicates themaximum number of ports across all TRPs for one CJT CSI measurement.The UE optionally indicates *eType2CJT-Rank3Rank4-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with rank 3,4.The UE optionally indicates *eType2CJT-L6-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with parameter combination with L=6. The UE supports this capability only for N\_TRP=1.The UE optionally indicates *eType2CJT-NN-r18* to indicate whether the UE supports selection of N <= N\_TRP CSI-RS resource by UE for multi-TRP CJT based on eType-II codebook.The UE optionally indicates *eType2CJT-NL-SD-r18* to indicate whether the UE supports N\_L>1 combinations of number of SD basis across CSI-RS resources for CJT eType-II codebook. The UE indicates themaximum number of lists for spatial basis selection, i.e., N\_L, for multi-TRP CJT based on eType-II codebook.The UE optionally indicates *eType2CJT-Unequal-r18* to indicate whether the UE supports unequal number of spatial basis selection configuration across CSI-RS resources for multi-TRP CJT including eType-II codebook refinement.For *codebookVariantsList* related to the eType-II:*-* The minimum of *maxNumberTxPortsPerResource* is '*p4*';*-* The minimum of *maxNumberResourcesPerBand* is 2;*-* The minimum value of *totalNumberTxPortsPerBand* is 4. | Band | No | N/A | N/A |
| ***codebookParametersetype2DopplerCSI-r18***Indicates the UE support of additional codebooks and the corresponding parameters supported by the UE of Enhanced Type II Codebook (eType-II) based on doppler CSI as specified in TS 38.214 [12].The UE shall include *eType2Doppler-r18* to indicate basic features of eType-II doppler codebook. This capability signalling comprises the following parameters:*-* *supportedCSI-RS-ResourceList-r18* indicates the list of supported CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*. The following parameters are included in *codebookVariantsList*:- *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource of a band- *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs in a band, simultaneously- *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs in a band, simultaneously- *valueY-P-SP-CSI-RS-r18* indicates value of Y for CPU occupation (OCPU = Y\* *vectorLengthDD-r18*), when P/SP-CSI-RS is configured for CMR- *valueY-A-CSI-RS-r18* indicates value of Y for CPU occupation (OCPU = Y\*K), when A-CSI-RS is configured for CMR- *scalingfactor-r18* indicates scaling factor for active resource counting KpThe UE indicating *eType2Doppler-r18* shall support X=1 CQI based on the first/earliest slot of the CSI reporting window and the first/earliest predicted PMI (TDCQI='1-1'), support eType-II regular codebook refinement for predicted PMI with PMI subband R=1, support parameter combinations with L=2,4, support for rank = 1,2, and support for the size of DD-basis, *vectorLengthDD-r18* =1.The UE indicating support of *eType2Doppler-r18* shall also indicate support of *csi-ReportFramework* and *simultaneousCSI-ReportsAllCC.*NOTE 1:When *vectorLengthDD-r18* =1, OCPU =4.NOTE 2:OCPU ≥ 4 when P/SP-CSI-RS is configured for CMR.NOTE 3:when K=12, OCPU =8NOTE 4:A UE that supports CSI enhancement for Rel-16 based type-II doppler must support this feature.The UE optionally includes *eType2DopplerN4-r18* to indicate whether the UE supports doppler measurement with *vectorLengthDD-r18* >1 for eType-II doppler codebook. This capability signalling comprises the following parameters:- *supportedCSI-RS-ReportSettingList1-r18* indicates the list of supported combinations across all CCs in a band simultaneously by referring to *supportedCSI-RS-ReportSettingList* The following parameters are included in *supportedCSI-RS-ReportSettingList-r18*- *maxN4-r18* indicates the max number of *vectorLengthDD-r18*- *maxNumberTxPortsPerResource-r18* indicates the maximum number of Tx ports in a resource of a band- *maxNumberResourcesPerBand-r18* indicates the maximum number of resources across all CCs in a band, simultaneously- *totalNumberTxPortsPerBand-r18* indicates the total number of Tx ports across all CCs in a band, simultaneously- *supportedCSI-RS-ReportSettingList2-r18* indicates the list of supported combinations for one CSI report setting by referring to *supportedCSI-RS-ReportSettingList-r18.*The UE indicating support of *eType2DopplerN4-r18* shall also indicate support for the size of DD-basis, *vectorLengthDD-r18* >1, and Value of *unitDurationDD-r18*=m for the DD unit size when A-CSI-RS is configured for CMR.The UE optionally includes *ddUnitSize-A-CSI-RS-CMR-r18* to indicate the support of value of *unitDurationDD-r18*=1 for the DD unit duration when A-CSI-RS is configured for CMR.A UE supporting this feature shall also indicate support of *eType2DopplerN4-r18*.The UE optionally includes *maxNumberAperiodicCSI-RS-Resource-r18* to indicate the maximum number of aperiodic CSI-RS resources that can be configured in the same CSI report setting for eType-II doppler measurement.The UE optionally includes *eType2DopplerR2-r18* to indicate whether the UE supports R=2 for eType-II doppler codebook. This capability signalling comprises the list of supported CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*.The UE optionally includes *eType2DopplerX1-r18* to indicate whether the UE support X=1 based on first and last slot of WCSI, for eType-II doppler codebook.The UE optionally includes *eType2DopplerX2-r18* to indicate whether the UE support X=2 CQI based on 2 slots for eType-II doppler codebook.The UE optionally includes *eType2DopplerL-N4D1-r18* to indicate whether the UE support l = (n – nCSI,ref ) for CSI reference slot for eType-II doppler codebook.The UE optionally includes *eType2DopplerL6-r18* to indicate whether the UE support L=6 for eType-II doppler codebook.The UE optionally includes *eType2DopplerR3R4-r18* to indicate whether the UE support rank equals 3 and 4 for eType-II doppler codebook.For *codebookVariantsList-r16* related to the eType-II:*-* The minimum of *maxNumberTxPortsPerResource* is '*p4*';*-* The minimum of *maxNumberResourcesPerBand* is 2, except for *eType2DopplerR2-r18*.*-* The minimum value of *totalNumberTxPortsPerBand* is 4. | Band | No | N/A | N/A |
| ***codebookParametersfetype2-r17***Indicates the UE support of additional codebooks and the corresponding parameters supported by the UE of Further Enhanced Port-Selection Type II Codebook (FeType-II) as specified in TS 38.214 [12] clause 5.2.2.2.7.The UE indicating this feature shall include *fetype2basic-r17* to indicate basic features of FeType-II. This capability signalling comprises the following parameters:*-* indicates the list of supported CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*. The following parameters are included in *codebookVariantsList*:- *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource of a band- *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs in a band, simultaneously- *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs in a band, simultaneouslyThe UE indicating *fetype2basic-r17* shall support parameter combinations with M=1 and support rank 1 and 2. UE indicating this feature shall also include *csi-ReportFramework*.The UE optionally includes *fetype2R1-r17* to indicate whether the UE supports M=2 and R=1 for FeType-II. This capability signalling comprises the following parameters:*-* indicates the list of supported CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*.The UE indicating support of *fetype2R1-r17* shall also indicate support of *fetype2basic-r17* and parameter combinations with M=2.The UE optionally includes *fetype2R2-r17* to indicate whether the UE supports R=2 for FeType-II. This capability signalling comprises the following parameters:*-* indicates the list of supported CSI-RS resources across all CCs in a band by referring to *codebookVariantsList*.UE indicating support of *fetype2R2-r17* shall also indicate support of *fetype2R1-r17*.The UE optionally includes *fetype2Rank3Rank4-r17* to indicate whether the UE supports rank = 3 and rank = 4 for FeType-II. UE indicating support of *fetype2Rank3Rank4-r17* shall indicate support of *fetype2basic-r17*.For *codebookVariantsList* related to the FeType-II:- The minimum of *maxNumberTxPortsPerResource* is '*p4*';- The minimum value of *totalNumberTxPortsPerBand* is 4. | Band | No | N/A | N/A |

*Third change*

#### 4.2.7.4 *CA-ParametersNR*

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***codebookParametersetype2CJT-PerBC-r18***Indicates the UE support of additional codebooks and the corresponding parameters supported by the UE of Enhanced Type II Codebook (eType-II) with refinement for multi-TRP CJT.The UE shall include *eType2CJT-r18* to indicate basic features of eType-II codebook with refinement for multi-TRP CJT. This capability signalling comprises the following parameters:*-* *supportedCSI-RS-ResourceList-r18* indicates the list of supported CSI-RS resources across all CCs in a band combination by referring to *codebookVariantsList*. The following parameters are included in *codebookVariantsList*:- *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in one NZP CSI-RS resource associated with multi-TRP CJT- *maxNumberResourcesPerBand* indicates the maximum total number of NZP CSI-RS resource associated with multi-TRP CJT- *totalNumberTxPortsPerBand* indicates the total number of Tx ports of NZP CSI-RS resources associated with multi-TRP CJT- *scalingfactor-r18* indicates the scaling factor X for CPU occupation counting for CJT etype-II codebook- *maxNumberNZP-CSI-RS-MultiTRP-CJT-r18* indicates the maximum number of NZP CSI-RS resources in one NZP CSI-RS resource set associated with multi-TRP CJTThe UE indicating *eType2CJT-r18* shall support N=N\_TRP only, N\_L=1 only, support mode 2 for eType-II codebook refinement for multi-TRP CJT, support for PMI subband R=1, support of parameter combinations with L=2,4, support rank 1,2, and support frequency basis selection mode 2, i.e., common frequency basis selection among different TRPs.The UE indicating support of *eType2CJT-r18* shall also indicate support of *csi-ReportFramework* and *simultaneousCSI-ReportsAllCC.*NOTE 1:When NTRP=1 TRP is configured, OCPU =1. When NTRP>1 TRPS are configured, OCPU = ceil(X \* NTRP).NOTE 2:A-CSI is supported, and whether UE supports SP-CSI on PUSCH is dependent on *sp-CSI-ReportPUSCH*.The UE optionally includes *eType2CJT-FD-IO-r18* to indicate whether the UE supports mode 1 for CJT eType-II codebook with FD basis selection integer frequency offset. This capability signalling comprises the list of supported NZP CSI-RS resources across all CCs in a band combination by referring to *codebookVariantsList*. The UE indicating *eType2CJT-FD-IO-r18* shall also support frequency basis selection mode 1, i.e., common frequency basis selection among different TRPs with FD basis selection integer frequency offset.The UE optionally indicates *eType2CJT-FD-FO-r18* to indicate whether the UE supports FD basis selection fractional offset mode for Rel-16-based CJT codebook with mode1. The UE indicating *eType2CJT-FD-FO-r18* shall also indicate support of *eType2CJT-FD-IO-r18.*The UE optionally indicates *eType2CJT-R2-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with PMI subbands R=2. This capability signalling comprises the list of supported NZP CSI-RS resources with R=2 across all CCs in a band combination by referring to *codebookVariantsList* across all CCs.The UE optionally indicates *eType2CJT-PV-Beta-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with parameter combination pv={1/2,1/2,1/2,1/2} and beta=1/2.The UE optionally indicates *eType2CJT-2NN1N2-r18* to indicate whether the UE supports 2NN1N2 >32 for eType-II CJT codebook. The UE indicates themaximum number of ports across all TRPs for one CJT CSI measurement.The UE optionally indicates *eType2CJT-Rank3Rank4-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with rank 3,4.The UE optionally indicates *eType2CJT-L6-r18* to indicate whether the UE supports eType-II codebook refinement for multi-TRP CJT with parameter combination with L=6. The UE supports this capability only for N\_TRP=1. The UE indicating *eType2CJT-L6-r18* shall also indicate support of *eType2CJT-r18*.The UE optionally indicates *eType2CJT-NN-r18* to indicate whether the UE supports selection of N <= N\_TRP CSI-RS resource by UE for multi-TRP CJT based on eType-II codebook.The UE optionally indicates *eType2CJT-NL-SD-r18* to indicate whether the UE supports N\_L>1 combinations of number of SD basis across CSI-RS resources for CJT eType-II codebook. The UE indicates themaximum number of lists for spatial basis selection, i.e., N\_L, for multi-TRP CJT based on eType-II codebook.The UE optionally indicates *eType2CJT-Unequal-r18* to indicate whether the UE supports unequal number of spatial basis selection configuration across CSI-RS resources for multi-TRP CJT including eType-II codebook refinement.For *codebookVariantsList* related to the eType-II:*-* The minimum of *maxNumberTxPortsPerResource* is '*p4*';*-* The minimum of *maxNumberResourcesPerBand* is 2;*-* The minimum value of *totalNumberTxPortsPerBand* is 4. | BC | No | N/A | N/A |
| ***codebookParametersetype2DopplerCSI-PerBC-r18***Indicates the UE support of additional codebooks and the corresponding parameters supported by the UE of Enhanced Type II Codebook (eType-II) based on doppler CSI as specified in TS 38.214 [12].The UE shall include *eType2Doppler-r18* to indicate basic features of eType-II doppler codebook. This capability signalling comprises the following parameters:*-* *supportedCSI-RS-ResourceList-r18* indicates the list of supported CSI-RS resources across all CCs in a band combination by referring to *codebookVariantsList*. The following parameters are included in *codebookVariantsList*:- *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource of a band combination- *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs in a band combination, simultaneously- *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs in a band combination, simultaneously- *valueY-P-SP-CSI-RS-r18* indicates value of Y for CPU occupation (OCPU = Y\**vectorLengthDD-r18*), when P/SP-CSI-RS is configured for CMR- *valueY-A-CSI-RS-r18* indicates value of Y for CPU occupation (OCPU = Y\*K), when A-CSI-RS is configured for CMR- *scalingfactor-r18* indicates scaling factor for active resource counting KpThe UE indicating *eType2Doppler-r18* shall support X=1 CQI based on the first/earliest slot of the CSI reporting window and the first/earliest predicted PMI (TDCQI='1-1'), support eType-II regular codebook refinement for predicted PMI with PMI subband R=1, support parameter combinations with L=2,4, support for rank = 1,2, and support for the size of DD-basis, *vectorLengthDD-r18* =1.The UE indicating support of *eType2Doppler-r18* shall also indicate support of *csi-ReportFramework* and *simultaneousCSI-ReportsAllCC.*NOTE 1:When *vectorLengthDD-r18* =1, OCPU =4.NOTE 2:OCPU ≥ 4 when P/SP-CSI-RS is configured for CMR.NOTE 3:when K=12, OCPU =8NOTE 4:A UE that supports CSI enhancement for Rel-16-based type-2 doppler must support this feature.The UE optionally includes *eType2DopplerN4-r18* to indicate whether the UE supports doppler measurement with N4>1 for eType-II doppler codebook. This capability signalling comprises the following parameters:- *supportedCSI-RS-ReportSettingList1-r18* indicates the list of supported combinations across all CCs in a band combination simultaneously by referring to *supportedCSI-RS-ReportSettingList* The following parameters are included in *supportedCSI-RS-ReportSettingList-r18*- *maxN4-r18* indicates the max number of *vectorLengthDD-r18*- *maxNumberTxPortsPerResource-r18* indicates the maximum number of Tx ports in a resource of a band combination- *maxNumberResourcesPerBand-r18* indicates the maximum number of resources across all CCs in a band combination, simultaneously- *totalNumberTxPortsPerBand-r18* indicates the total number of Tx ports across all CCs in a band combination, simultaneously- *supportedCSI-RS-ReportSettingList2-r18* indicates the list of supported combinations for one CSI report setting by referring to *supportedCSI-RS-ReportSettingList-r18.*The UE indicating support of *eType2DopplerN4-r18* shall also indicate support for the size of DD-basis, *vectorLengthDD-r18* >1, and Value of *unitDurationDD-r18*=m for the DD unit size when A-CSI-RS is configured for CMR.The UE optionally includes *ddUnitSize-A-CSI-RS-CMR-r18* to indicate the support of value of *unitDurationDD-r18*=1 for the DD unit duration when A-CSI-RS is configured for CMR.A UE supporting this feature shall also indicate support of *eType2DopplerN4-r18*.The UE optionally includes *maxNumberAperiodicCSI-RS-Resource-r18* to indicate the maximum number of aperiodic CSI-RS resources that can be configured in the same CSI report setting for eType-II doppler measurement.The UE optionally includes *eType2DopplerR2-r18* to indicate whether the UE supports R=2 for eType-II doppler codebook. This capability signalling comprises the list of supported CSI-RS resources across all CCs in a band combination by referring to *codebookVariantsList*.The UE optionally includes *eType2DopplerX1-r18* to indicate whether the UE support X=1 based on first and last slot of WCSI, for eType-II doppler codebook.The UE optionally includes *eType2DopplerX2-r18* to indicate whether the UE support X=2 CQI based on 2 slots for eType-II doppler codebook.The UE optionally includes *eType2DopplerL-N4D1-r18* to indicate whether the UE support l = (n – nCSI,ref ) for CSI reference slot for eType-II doppler codebook.The UE optionally includes *eType2DopplerL6-r18* to indicate whether the UE support L=6 for eType-II doppler codebook.The UE optionally includes *eType2DopplerR3R4-r18* to indicate whether the UE support rank equals 3 and 4 for eType-II doppler codebook.For *codebookVariantsList-r16* related to the eType-II:- The minimum of *maxNumberTxPortsPerResource* is 'p4';- The minimum of *maxNumberResourcesPerBand* is 2, except for *eType2DopplerR2-r18*.- The minimum value of *totalNumberTxPortsPerBand* is 4. | BC | No | N/A | N/A |

*Fourth change*

#### 4.2.7.5 *FeatureSetDownlink* parameters

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***additionalDMRS-DL-Alt***Indicates whether the UE supports the alternative additional DMRS position for co-existence with LTE CRS. It is applied to 15kHz SCS and one additional DMRS case only. | FS | CY | N/A | FR1 only |
| ***aperiodicCSI-TimeRelaxation-r18***Indicates whether the UE supports aperiodic CSI report timing relaxation for doppler codebook based on eType-II codebook and feType-II codebook. The capability signalling comprises of the following parameters:- *valueW-r18* indicates aperiodic CSI report timing relaxation, w, for doppler codebook based on Type-II codebook. UE reports *valueW-r18*, independently for each SCS in unit of symbols. *value1* indicates 14\*(KP–1)\*d symbols, *value2* indicates 14\*KP\*d symbols, where KP is according to *scalingfactor-r18* of *eType2Doppler-r18*, or according to *scalingfactor-r18* of *feType2Doppler-r18* and d =4 (minimum periodicity of periodic CSI-RS).- *timeRelaxation-r18* indicates Aperiodic CSI report timing relaxation for doppler codebook based on Type-II codebook.For *vectorLengthDD-r18* = 11) For AP CSI-RS: (Z,Z') = (Z2 + 14\*(K–1)\*m, Z'2)2) For P/SP CSI-RS: (Z,Z') = (Z2 + w, Z'2)For *vectorLengthDD-r18* > 1 and *cap1* in *timeRelaxation-r18*:1) For AP CSI-RS: (Z,Z') = (Z2 + 14\*(K–1)\*m, Z'2)2) For P/SP CSI-RS: (Z,Z') = (Z2 + w, Z'2)For *vectorLengthDD-r18* > 1 and *cap2* in *timeRelaxation-r18* *:*1) For AP CSI-RS: (Z,Z') = (Z2 + 14\*(K–1)\*m + Z'2, 2Z'2)2) For P/SP CSI-RS: (Z,Z') = (Z2 + w + Z'2, 2Z'2)Z2/Z'2 are defined in Table 5.4-2 in TS 38.214 [12]. K = {4,8,12}, is the number of AP CSI-RS resources for the CMR in a CSI report setting. M = {1,2}, is the offset between two adjacent AP CSI-RS resources for the CMR in slots.A UE supporting this feature shall also indicate support of at least one of *eType2Doppler-r18* or *feType2Doppler-r18*.NOTE: A UE that supports *eType2Doppler-r18* or *feType2Doppler-r18* must signal this feature. | FS | CY | N/A | N/A |
| ***bwpOperationMeasWithoutInterrupt-r18***Indicates whether the UE supports RLM/BM/BFD and gapless L3 intra-frequency measurements based on CD-SSB outside active BWP without interruptions. For the UE that is capable of this feature, the bandwidth of UE-specific RRC configured BWP need not include bandwidth of the CORESET#0 (if CORESET#0 is present) and CD-SSB for PCell; the bandwidth of UE-specific RRC configured BWP need not include bandwidth of the CORESET#0 (if CORESET#0 is present) and SSB indicated by *absoluteFrequencySSB* (either CD-SSB or NCD-SSB) for PSCell (if configured); and the bandwidth of the UE-specific RRC configured BWP need not include CD-SSB for SCell (if configured). CD-SSB outside active DL BWP but within the bandwidth of the corresponding carrier(s) to be measured can be used as the QCL source for other reference signal. UE performs L3 intra-frequency measurements without gaps based on CD-SSB, where the CD-SSB is outside the active DL BWP but is within the bandwidth of the corresponding carrier(s) to be measured.NOTE 1: The CD-SSB is still within the bandwidth of the carrier configured by *SCS-SpecificCarrier* of *downlinkChannelBW-PerSCS-List* in *ServingCellConfig*.NOTE 2: If a UE is configured with more than one UE-specific DL BWP configurations, the CD-SSB is within the bandwidth of at least one of the UE-specific DL BWP configurations.NOTE 3: Void.NOTE 4: If a UE additionally indicates support of *NeedForGap* or *NeedForGapNCSG* and/or *NeedForInterruption*, the UE shall report no gap and no interruption/no NCSG for intra-frequency measurement.This capability is not applicable to RedCap or eRedCap UEs. | FS | No | N/A | N/A |
| ***cbgPDSCH-ProcessingType1-DifferentTB-PerSlot-r16***Defines whether the UE capable of processing time capability 1 supports CBG based reception with one or with up to two or with up to four or with up to seven unicast PDSCHs per slot per CC. | FS | No | N/A | N/A |
| ***cbgPDSCH-ProcessingType2-DifferentTB-PerSlot-r16***Defines whether the UE capable of processing time capability 2 supports CBG based reception with one or with up to two or with up to four or with up to seven unicast PDSCHs per slot per CC. | FS | No | N/A | N/A |
| ***crossCarrierSchedulingProcessing-DiffSCS-r16***Indicates the UE cross carrier scheduling processing capability for DL carrier aggregation processing up to X unicast DCI scheduling for DL per scheduled CC. X is based on pair of (scheduling CC SCS, scheduled CC SCS) where a pair of (15,120), (15,60), (30,120) kHz SCS can have X = {1,2,4} while a pair of (15,30), (30,60), (60,120) kHz SCS can have X = {2}, and X applies per slot of scheduling CC. | FS | No | N/A | N/A |
| ***csi-RS-MeasSCellWithoutSSB***Defines whether the UE can perform CSI-RSRP and CSI-RSRQ measurement as specified in TS 38.215 [13], where CSI-RS resource is configured for a cell that does not transmit SS/PBCH block. A UE that supports this feature shall also support scellWithoutSSB. | FS | No | N/A | N/A |
| ***dl-MCS-TableAlt-DynamicIndication***Indicates whether the UE supports dynamic indication of MCS table for PDSCH. | FS | No | N/A | N/A |
| ***dmrs-MultiTRP-AdditionRows-r18***Indicates whether the UE supports additional row(s) for antenna ports (0,2,3) for DL DMRS ports for single-DCI based M-TRP.A UE supporting this feature shall also indicate support of *dmrs-MultiTRP-SingleDCI-r18*. | FS | No | N/A | N/A |
| ***dmrs-MultiTRP-MultiDCI-r18***Indicates whether the UE supports Rel-18 DL DMRS with multi- DCI based M-TRP PDSCH operation.A UE supporting this feature shall also indicate support of *pdsch-TypeA-DMRS-r18* or *pdsch-TypeB-DMRS-*r18. | FS | No | N/A | N/A |
| ***dmrs-MultiTRP-SingleDCI-r18***Indicates whether the UE supports Rel-18 DL DMRS with single DCI based M-TRP.A UE supporting this feature shall also indicate support of *pdsch-TypeA-DMRS-r18* or *pdsch-TypeB-DMRS-*r18. | FS | No | N/A | N/A |
| ***dynamicMulticastPCell-r17***Indicates whether the UE supports dynamic scheduling for multicast for PCell comprised of the following functional components:- Supports group-common PDCCH/PDSCH for multicast with CRC scrambled by G-RNTI for PCell;- Supports CFR configuration for multicast;- Supports CORESET and common search space configuration for multicast;- Supports DCI format 4\_1 with CRC scrambled with G-RNTI for multicast;- Supports inter-slot TDM between group-common PDSCH for multicast and other PDSCHs in different slots;- Supports {2, 4, 8} times semi-static slot-level repetition for group-common PDSCH for multicast;- Supports long DRX cycle for MBS multicast reception as specified in TS 38.321 [8].NOTE: One G-RNTI per UE is supported for multicast reception. | FS | No | N/A | N/A |
| ***dynamicSwitchingA-r18***Indicates whether the UE supports dynamic switching between single-TRP and PDSCH SFN scheme A by TCI selection field in DCI formats 1\_1 and 1\_2.The UE supporting this feature shall also indicate support of *tci-SelectionDCI-r18* and *sfn-SchemeA-DynamicSwitching-r17*. | FS | No | N/A | N/A |
| ***dynamicSwitchingB-r18***Indicates whether the UE supports dynamic switching between single-TRP and PDSCH SFN scheme B by TCI selection field in DCI formats 1\_1 and 1\_2.The UE supporting this feature shall also indicate support of *tci-SelectionDCI-r18* and *sfn-SchemeB-DynamicSwitching-r17*. | FS | No | N/A | N/A |
| ***featureSetListPerDownlinkCC***Indicates which features the UE supports on the individual DL carriers of the feature set (and hence of a band entry that refer to the feature set) by *FeatureSetDownlinkPerCC-Id*. The order of the elements in this list is not relevant, i.e., the network may configure any of the carriers in accordance with any of the *FeatureSetDownlinkPerCC-Id* in this list. A fallback per CC feature set resulting from the reported feature set per DL CC is not signalled but the UE shall support it. | FS | N/A | N/A | N/A |
| ***intraBandFreqSeparationDL, intraBandFreqSeparationDL-v1620***Indicates DL frequency separation class the UE supports, which indicates a maximum frequency separation between lower edge of lowest CC and upper edge of highest CC in a frequency band, for intra-band non-contiguous CA. The UE sets the same value in the FeatureSetDownlink of each band entry within a band. The values mhzX correspond to the values XMHz defined in TS 38.101-2 [3]. It is mandatory to report for UE which supports DL intra-band non-contiguous CA in FR2.If the UE sets the field *intraBandFreqSeparationDL-v1620* it shall set *intraBandFreqSeparationDL* (without suffix) to the nearest smaller value. | FS | CY | N/A | FR2 only |
| ***intraBandFreqSeparationDL-Only-r16***Indicates whether the UE supports frequency separation class of DL only extension. If present, the field extends the maximum frequency separation between the lower edge of lowest CC and the upper edge of highest CC in a frequency band that the UE supports according to *intraBandFreqSeparationDL*.The frequency range extension is either above or below the frequency range indicated by *intraBandFreqSeparationDL* and extends it in contiguous manner with no frequency gap, and the network may configure contiguous or non-contiguous downlink serving cells in that extended range. The UE sets the same value in the FeatureSetDownlink of each band entry within a band. The values mhzX correspond to the values XMHz defined in TS 38.101-2 [3]. The sum of *intraBandFreqSeparationDL* and *intraBandFreqSeparationDL-Only* shall not exceed 2400 MHz. If the UE sets this field, the sum of *intraBandFreqSeparationDL* and *intraBandFreqSeparationDL-Only* shall be larger than 1400 MHz.A UE supporting this feature shall also support *intraBandFreqSeparationDL*. | FS | No | N/A | FR2 only |
| ***intraFreqDAPS-r16***Indicates whether UE supports intra-frequency DAPS handover, e.g. support of simultaneous DL reception of PDCCH and PDSCH from source and target cell. A UE indicating this capability shall also support intra-frequency synchronous DAPS handover, single UL transmission and cancelling UL transmission to the source cell for intra-frequency DAPS handover. The capability signalling comprises of the following parameters:- *intraFreqAsyncDAPS-r16* indicates whether the UE supports asynchronous DAPS handover.- *intraFreqDiffSCS-DAPS-r16* indicates whether the UE supports different SCSs in source PCell and intra-frequency target PCell in DAPS handover. The UE only includes this field if different SCSs can be supported in both UL and DL. If absent, the UE does not support either UL or DL SCS being different in DAPS handover. | FS | No | N/A | N/A |
| ***mappingTypeA-1SymbolFL-DMRS-Addition2Symbol-r18***Indicates whether the UE supports Support 1 symbol FL DMRS and 2 additional DMRS symbols for one port for scheduling of mapping type A.A UE supporting this feature shall also indicate support of *pdsch-TypeA-DMRS-r18*. | FS | No | N/A | N/A |
| ***maxNumberDMRS-AcrossAllDL-DCI-r18***Indicates the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell.A UE supporting this feature shall also indicate support of *supportedDMRS-TypeDL* and *pdsch-DMRS-Type-r18*.If a UE does not support this feature, the maximum number of configured DMRS types for PDSCH across all DL DCI formats per cell is defined as the total number of different DMRS types reported by *supportedDMRS-TypeDL* and/or *pdsch-DMRS-Type-r18*. | FS | No | N/A | N/A |
| ***mTRP-PDCCH-Repetition-r17***Indicates the support of intra-slot PDCCH repetition based on two linked SS sets associated with corresponding CORESETs.This feature also includes following parameters:- *numBD-twoPDCCH-r17* indicates the number of BDs for the two PDCCH candidates.- *maxNumOverlaps-r17* indicates the maximum number of overlaps when one of the linked PDCCH candidates uses the same set of CCEs as an individual (unlinked) PDCCH candidate per scheduled component carrier per slot.NOTE 1: UE supports PDCCH repetition for the following (basic) PDCCH monitoring capability: For type 1 CSS with dedicated RRC configuration, type 3 CSS, and UE-SS, the monitoring occasion is within the first 3 OFDM symbols of a slot.NOTE 2: For *maxNumOverlaps-r17*, each unique pair of overlaps is counted as one.NOTE 3: This feature does not include supporting two QCL-TypeD in time-domain overlapping CORESETs in FR2. | FS | No | N/A | N/A |

#### 4.2.7.8 *FeatureSetUplinkPerCC* parameters

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***cgb-2CW-PUSCH-r18***Indicates whether the UE supports CBG based transmission for 2 CWs PUSCH.A UE supporting this feature shall also indicate support of *nonCodebook-8TxPUSCH-r18* or *nonCodebook-CSI-RS-SRS-r18*. | FSPC | No | N/A | N/A |
| ***channelBW-90mhz***Indicates whether the UE supports the channel bandwidth of 90 MHz.For FR1, the UE shall indicate support according to TS 38.101-1 [2], Table 5.3.5-1. | FSPC | CY | N/A | FR1 only |
| ***codebookParameter8TxPUSCH-r18***Indicates whether the UE supports codebook-based 8Tx PUSCH.The UE shall include *codebook-8TxBasic-r18* to indicate basic features of 8Tx PUSCH codebook. This capability signalling comprises the following parameters:- *maxNumberPUSCH-MIMO-Layer-r18* defines the maximum number of PUSCH MIMO layers for codebook based PUSCH.- *maxNumberSRS-Resource-r18* defines the maximum number of 8 port SRS resources per SRS resource set with usage set to '*codebook*' for codebook-based 8Tx PUSCH.- *srs-8TxPorts-r18* defines SRS 8 Tx ports—codebook. Value '*noTDM'* indicates noTDM. Value '*both*' indicates TDM and noTDM. This parameter only applies to *codebook2-8TxPUSCH-r18*, *codebook3-8TxPUSCH-r18*, and *codebook4-8TxPUSCH-r18*.A UE that supports *codebook-8TxBasic-r18* must support of at least one of *codebook1-8TxPUSCH-r18*, *codebook2-8TxPUSCH-r18*, *codebook3-8TxPUSCH-r18*, and *codebook4-8TxPUSCH-r18*.- *codebook1-8TxPUSCH-r18* comprises the following parameters:- *codebookN1N4-r18* indicates whether the UE supports (N1, N2) codebook-based 8Tx PUSCH—codebook1. Value *ng1n4n1* corresponds to (4,1) codebook, value *ng1n2n2* corresponds to (2,2) codebook, value *both* corresponds to both codebooks.- *srs-8TxPorts-r18* defines SRS 8 Tx ports for codebook1—codebook. Value '*noTDM*' indicates noTDM. Value '*both*' indicates TDM and noTDM.- *codebook2-8TxPUSCH-r18* indicates whether the UE supports codebook-based 8Tx PUSCH—codebook2.- *codebook3-8TxPUSCH-r18* indicates whether the UE supports codebook-based 8Tx PUSCH—codebook3.- *codebook4-8TxPUSCH-r18* indicates whether the UE supports codebook-based 8Tx PUSCH—codebook4.The UE optionally indicates *ul-FullPwrTransMode0-r18* to indicate whether the UE supports UL full power transmission mode of fullpower when UE is capable of 8 Tx codebook based PUSCH operation.The UE optionally indicates *ul-FullPwrTransMode1-r18* to indicate whether the UE supports UL full power transmission mode of fullpowerMode1 when UE is capable of 8 Tx codebook based PUSCH operation.The UE optionally indicates *ul-FullPwrTransMode2-r18* to indicate whether the UE supports UL full power transmission mode of fullpowerMode2 when UE is capable of 8 Tx codebook based PUSCH operation. The UE indicates the maximum number of SRS resources in one SRS resource set with usage set to 'codebook' for 8Tx codebook based PUSCH for Mode 2.NOTE 1: A UE that supports *ul-FullPwrTransMode2-r18* supports at least full power operation with single port.The UE optionally indicates *ul-SRS-TransMode2-r18* to indicate whether the UE supports SRS configurations with different number of antenna ports per SRS resource for mode 2. The UE indicates a 3-bit bitmap, where the leading / leftmost bit (bit 0) corresponds to whether SRS resource can be configured with 1 port. The next bit (bit 1) corresponds to whether SRS resource can be configured with 2 port. The rightmost bit (bit 2) corresponds to whether SRS resource can be configured with 4 port.A UE supporting *ul-SRS-TransMode2-r18* shall also indicate support of *ul-FullPwrTransMode2*.NOTE 2: An SRS resource set supported by the UE for uplink full power Mode 2 must contain at least an 8 port SRS resource.NOTE 3: Any of the above values of *ul-SRS-TransMode2-r18* can be used if *ul-FullPwrTransMode2-r18* is reported as value *n2* or *n4*.The UE optionally indicates *tpmi-FullPwrCodebook2-r18* to indicate which TPMI group(s) delivers full power when UE is capable of and configured with 8 Tx codebook based PUSCH operation with codebook2. Value *first* indicates the TPMI group corresponding to only the antenna port group 0. Value *second* indicates the TPMI group corresponding to only the antenna port group 1. Antenna port group is defined in Table 6.3.1.5-8 of TS 38.211 [6].A UE supporting *tpmi-FullPwrCodebook2-r18* shall also indicate support of *ul-FullPwrTransMode2*. | FSPC | No | N/A | N/A |
| ***maxNumberMIMO-LayersNonCB-PUSCH***Defines supported maximum number of MIMO layers at the UE for PUSCH transmission using non-codebook precoding.A UE supporting non-codebook based PUSCH transmission shall indicate support of *maxNumberMIMO-LayersNonCB-PUSCH* and *mimo-NonCB-PUSCH* together. | FSPC | No | N/A | N/A |
| ***mimo-CB-PUSCH***Indicates whether the UE supports codebook based PUSCH MIMO Transmission. If supported, it includes 2 parameters as follows:- *maxNumberMIMO-LayersCB-PUSCH* defines supported maximum number of MIMO layers at the UE for PUSCH transmission with codebook precoding.- *maxNumberSRS-ResourcePerSet* defines the maximum number of SRS resources per SRS resource set configured for codebook based transmission to the UE.A UE indicating support of this feature shall also indicate support of *pusch-TransCoherence*. | FSPC | No | N/A | N/A |
| ***mimo-NonCB-PUSCH***Indicates whether the UE supports non-codebook based PUSCH MIMO Transmission. If supported, it includes 2 parameters as follows:- *maxNumberSimultaneousSRS-ResourceTx* defines the maximum number of simultaneous transmitted SRS resources at one symbol for non-codebook based transmission to the UE.- *maxNumberSRS-ResourcePerSet* defines the maximum number of SRS resources per SRS resource set configured for non-codebook based transmission to the UE. | FSPC | No | N/A | N/A |
| ***mTRP-PUSCH-RepetitionTypeB-r17***Indicates whether the UE supports multi-TRP PUSCH repetition for non-codebook based PUSCH repetition type B with sequential mapping for repetitions larger than 2 and cyclic mapping for 2 repetitions by indicating the supported number of SRS resources in one SRS resource set. The UE shall also support two SRS resource sets with usage set to 'nonCodebook'. The UE indicating support of this feature shall also indicate support of *maxNumberMIMO-LayersNonCB-PUSCH*, *mimo-NonCB-PUSCH* and *pusch-RepetitionTypeB-r16*. | FSPC | No | N/A | N/A |
| ***mTRP-PUSCH-TypeB-CB-r17***Indicates the support of multi-TRP PUSCH repetition based on codebook with PUSCH repetition type B. The value indicates the number of SRS resources in one SRS resource set.This feature includes the following features:- sequential mapping for repetitions larger than 2.- cyclic mapping for 2 repetitions.- two SRS resource sets with usage set to 'codebook'.The UE indicating support of this feature shall also indicate the support of *mimo-CB-PUSCH and pusch-RepetitionTypeB-r16.* | FSPC | No | N/A | N/A |
| ***nonCodebook-8TxPUSCH-r18***Indicates whether the UE supports basic features for Non-Codebook-based 8Tx PUSCH.This capability signalling comprises the following parameters:*-* *maxNumberPUSCH-MIMO-Layer-r18* indicates the maximum number PUSCH MIMO layers for non-codebook based PUSCH.- *maxNumberSRS-Resource-r18* indicates the maximum number of SRS resources per SRS resource set with usage set to 'nonCodebook'- *maxNumberSimultaneousSRS-r18* indicates the maximum number of simultaneous transmitted SRS resources at one symbol. | FSPC | No | N/A | N/A |
| ***nonCodebook-CSI-RS-SRS-r18***Indicates whether the UE supports association between NZP-CSI-RS and SRS resource set via RRC parameter "SRS-ResourceSet" for noncodebook 8Tx PUSCH operation.A UE supporting this feature shall indicate support of *nonCodebook-8TxPUSCH-r18* and *nonCodebook-CSI-RS-SRS-PerBC-r18*. | FSPC | No | N/A | N/A |
| ***pusch-CB-SingleDCI-STx2P-SDM-r18***Indicates whether the UE supports 1) Dynamic switching by DCI 0\_1/0\_2 between single-DCI STx2P SDM and sTRP for PUSCH—codebook; 2) 1 PTRS port for single-DCI based STx2P SDM scheme for PUSCH—codebook 3) Support of two SRS resource sets with usage set to 'codebook'. The feature also comprises following parameters:- *maxNumberSRS-ResourcePerSet-r18* indicates the maximum number of SRS resources in one SRS resource set. If value 4 is reported, UE also reports value 4 in *ul-FullPwrMode2-MaxSRS-ResInSet.*- *maxNumberLayerPerPanel-r18* indicates the maximum number of layers of each panel for Single-DCI STx2P with SDM- *maxNumberNZP-PUSCH-PortsPerSet-r18* indicates the max number of NZP PUSCH ports associated with one SRS resource set. If a row of the TPMI consists of all 0's, the corresponding PUSCH port is not counted.- *maxNumberSRS-AntennaPortsPerSet-r18* indicates the maximum number of SRS antenna ports for each SRS resource in each SRS resource set.A UE indicating support of this feature shall also indicate support of *mimo-CB-PUSCH.* | FSPC | No | N/A | FR2 only |
| ***pusch-CB-SingleDCI-STx2P-SFN-r18***Indicates whether the UE supports 1) Dynamic switching by DCI 0\_1/0\_2 between single-DCI STx2P SFN and sTRP; 2) 1 PTRS port for single-DCI based STx2P SFN scheme for PUSCH—codebook; 3) Support of two SRS resource sets with usage set to 'codebook'. The feature also comprises following parameters:- *maxNumberSRS-ResourcePerSet-r18* indicates the maximum number of SRS resources in one SRS resource set. If value 4 is reported, UE also reports value 4 in *ul-FullPwrMode2-MaxSRS-ResInSet.*- *maxNumberLayerPerSet-r18* indicates the maximum number of MIMO layers of each SRS resource set for CB PUSCH with SFN scheme- *maxNumberSRS-AntennaPortsPerSet-r18* indicates the maximum number of SRS antenna ports for each SRS resource in each SRS resource set.- *maxNumberNZP-PUSCH-PortsPerSet-r18* indicates the max number of NZP PUSCH ports associated with one SRS resource set. If a row of the TPMI consists of all 0's, the corresponding PUSCH port is not counted.A UE indicating support of this feature shall also indicate support of *mimo-CB-PUSCH.* | FSPC | No | N/A | FR2 only |
| ***pusch-NonCB-SingleDCI-STx2P-SDM-r18***Indicates whether the UE supports: 1) Dynamic switching by DCI 0\_1/0\_2 between single-DCI STx2P SDM and sTRP for PUSCH—noncodebook, 2) 1 PTRS port for single-DCI based STx2P SDM scheme for PUSCH—noncodebook, 3) Support of two SRS resource sets with usage set to 'noncodebook'. The feature also comprises following parameters:- *maxNumberSRS-ResourcePerSet-r18* indicates the maximum number of SRS resources in one SRS resource set*.*- *maxNumberLayerPerPanel-r18* indicates the maximum number of layers of each panel for Single-DCI STx2P with SDM.- *maxNumberSimulSRS-OneResourcePerSet-r18* indicates the maximum number of simultaneous transmitted SRS resources from one SRS resource set in one symbol.- *maxNumberSimulSRS-TwoResourcePerSet-r18* indicates the maximum number of simultaneous transmitted SRS resources from two SRS resource sets in one symbol.A UE indicating support of this feature shall also indicate support of *mimo-NonCB-PUSCH.* | FSPC | No | N/A | FR2 only |
| ***pusch-NonCB-SingleDCI-STx2P-SFN-r18***Indicates whether the UE supports: 1) Dynamic switching by DCI 0\_1/0\_2 between single-DCI STx2P SFN and sTRP, 2) 1 PTRS port for single-DCI based STx2P SFN scheme for PUSCH—noncodebook, 3) Support of two SRS resource sets with usage set to 'noncodebook'. The feature also comprises following parameters:- *maxNumberSRS-ResourcePerSet-r18* indicates the maximum number of SRS resources in one SRS resource set*.*- *maxNumberLayerPerSet-r18* indicates the maximum number of MIMO layers of each SRS resource set for NCB PUSCH with SFN scheme.- *maxNumberSimulSRS-OneResourcePerSet-r18* indicates the maximum number of simultaneous transmitted SRS resources from one SRS resource set in one symbol.- *maxNumberSimulSRS-TwoResourcePerSet-r18* indicates the maximum number of simultaneous transmitted SRS resources from two SRS resource sets at one symbol.A UE indicating support of this feature shall also indicate support of *mimo-NonCB-PUSCH.* | FSPC | No | N/A | FR2 only |
| ***supportedBandwidthUL, supportedBandwidthUL-v1710, supportedBandwidthUL-v1780, supportedBandwidthUL-v1840***Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of DAPS handover for the source or target cell), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] / TS 38.101-5 [34] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.For FR1, all the bandwidths listed in TS 38.101-1 [2] / TS 38.101-5 [34], Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2], TS 38.101-2 [3], and TS 38.101-5 [34].For FR2, *supportedBandwidthUL-v1710* is included if the maximum UL channel bandwidth supported by the UE within a single CC is greater than 400MHz. When the *supportedBandwidthUL* and the *supportedBandwidthUL-v1710* are reported together for a CC, the network which is able to decode the *supportedBandwidthUL-v1710* ignores the *supportedBandwidthUL*.When the *supportedBandwidthUL* and the *supportedBandwidthUL-v1840* are reported together for a CC, the network which is able to decode the *supportedBandwidthUL-v1840* ignores the *supportedBandwidthUL*.The UE may report a *supportedBandwidthUL* wider than the *channelBWs-UL*; this *supportedBandwidthUL* may not be included in the Table 5.3.5-1 of TS 38.101-1 [2] / TS 38.101-2 [3] / TS 38.101-5 [34], for the case that the UE is unable to report the actual supported bandwidth according to the Table 5.3.5-1 of TS 38.101-1 [2] / TS 38.101-2 [3] / TS 38.101-5 [34]. For each band, (e)RedCap UEs shall indicate its maximum channel bandwidth, which is the maximum of those channel bandwidths that are less than or equal to 20 MHz for FR1 and less than or equal to 100 Mhz for FR2, taking restrictions in TS 38.101-1 [2] and TS 38.101-2 [3] into consideration.The *supportedBandwidthUL-v1780* is only applicable to Bandwidth Combination Set 5 (BCS5) of FR1 NR CA (including NR CA part of (NG)EN-DC and NE-DC) and FR1 NR-DC. If the UE reports *supportedAggBW-FR1-r17*, the UE shall report *supportedBandwidthUL-v1780*.NOTE: See the note in the field decription of *channelBWs-UL* for the determination of supported UL channel bandwidth. | FSPC | CY | N/A | N/A |
| ***supportedMinBandwidthUL-r17, supportedMinBandwidthUL-v1840***Indicates minimum UL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2. This parameter is only applicable to the Bandwidth Combination Set 5 (BCS5). The UE shall indicate this parameter for at least one CC of a BCS5 band combination. This field does not restrict the bandwidths configured for a single CC (i.e. non-CA case). | FSPC | CY | N/A | N/A |
| ***supportedModulationOrderUL***Indicates the maximum supported modulation order to be applied for uplink in the carrier in the max data rate calculation as defined in 4.1.2. If included, the network may use a modulation order on this serving cell which is higher than the value indicated in this field as long as UE supports the modulation of higher value for uplink. If not included,- for FR1 and FR2, the network uses the modulation order signalled per band i.e. *pusch-256QAM* if signalled*.* If not signalled in a given band, the network shall use the modulation order 64QAM.In all the cases, it shall be ensured that the data rate does not exceed the max data rate (*DataRate*) and max data rate per CC (*DataRateCC*) according to TS 38.214 [12]. | FSPC | No | N/A | N/A |
| ***supportedSubCarrierSpacingUL***Defines the supported sub-carrier spacing for UL by the UE, as defined in 4.2-1 of TS 38.211 [6], indicating the UE supports simultaneous transmission with same or different numerologies in CA, or indicating the UE supports different numerologies on NR UL and SUL within one cell. Support of simultaneous transmissions with same numerology for intra-band NR CA including both contiguous and non-contiguous is mandatory with capability in both FR1 and FR2. Support of simultaneous transmission with two different numerologies between FR1 band(s) and FR2 band(s) in UL is mandatory with capability if UE supports inter-band NR CA including both FR1 band(s) and FR2 band(s). Support of simultaneous transmission with different numerologies in CA for other cases is optional. | FSPC | CY | N/A | N/A |
| ***twoPUSCH-CB-MultiDCI-STx2P-AdditionalTime-r18***Indicates whether the UE supports additional timeline to process multiple TBs for codebook multi-DCI based STx2P PUSCH+PUSCH for DG+DG.A UE supporting this feature shall also indicate support of *twoPUSCH-CB-MultiDCI-STx2P-DG-DG-r18*.NOTE: This feature can also be applied for CG+DG if UE can support *twoPUSCH-CB-MultiDCI-STx2P-CG-DG-r18*. | FSPC | No | N/A | FR2 only |
| ***twoPUSCH-CB-MultiDCI-STx2P-DG-DG-r18***Indicates whether the UE supports multi-DCI based STx2P PUSCH+PUSCH for codebook-based PUSCH with fully overlapping PUSCHs in time and non-overlapping in frequency and two SRS resource sets with usage set to 'codebook' associated with two coresetPoolIndex values***.****-* *maxNumberSRS-ResourcePerSet-r18* indicates the maximum number of SRS resources in one SRS resource set. If value *n4* is reported, the UE also reports value *n4* in *ul-FullPwrMode2-MaxSRS-ResInSet-r16*.*-* *maxNumberLayerOverlapping-r18* indicates the maximum number of layers of each PUSCH of PUSCH+PUSCH overlapping in time domain.*-* *maxNumberNZP-PUSCH-Overlapping-r18* indicates the maximum number of NZP PUSCH ports for each PUSCH of PUSCH+PUSCH overlapping in time domain.*-* *maxNumberPUSCH-PerCORESET-PerSlot-r18* indicates the maximum number of PUSCHs per CORESETPoolIndex per slot*-* *maxNumberTotalLayerOverlapping-r18* indicates the maximum total number of layers across two overlapping PUSCH.*-* *maxNumberSRS-AntennaPortsPerSet-r18* indicates the maximum number of SRS antenna ports for each SRS resource in each SRS resource set.A UE supporting this feature shall also indicate support of *mimo-CB-PUSCH.*NOTE: Processing support of two SRS resource sets with usage set to 'codebook' associated with two *coresetPoolIndex* values is not supported in any CC if at least one CC is configured with two values of *CORESETPoolIndex*. | FSPC | No | N/A | FR2 only |
| ***twoPUSCH-MultiDCI-STx2P-OutOfOrder-r18***Indicates whether the UE supports out-of-order operation for multi-DCI based STx2P PUSCH+PUSCH.A UE supporting this feature shall also indicate support of *twoPUSCH-CB-MultiDCI-STx2P-DG-DG-r18* or *twoPUSCH-NonCB-MultiDCI-STx2P-DG-DG-r18.* | FSPC | No | N/A | FR2 only |
| ***twoPUSCH-MultiDCI-STx2P-TwoTA-r18***Indicates whether the UE supports two TAs for multi-DCI STx2P PUSCH+PUSCH.A UE supporting this feature shall also indicate support of *multiDCI-IntraCellMultiTRP-TwoTA-r18*, *multiDCI-InterCellMultiTRP-TwoTA-r18*, *twoPUSCH-CB-MultiDCI-STx2P-DG-DG-r18* or *twoPUSCH-NonCB-MultiDCI-STx2P-DG-DG-r18*.NOTE: A UE that supports this feature can transmit PUSCH in two consecutive slots using different TA without reducing the later slot. | FSPC | No | N/A | N/A |
| ***twoPUSCH-NonCB-MultiDCI-STx2P-AdditionalTime-r18***Indicates whether the UE supports additional timeline to process multiple TBs for non-codebook multi-DCI based STx2P PUSCH+PUSCH for DG+DG.A UE supporting this feature shall also indicate support of *twoPUSCH-NonCB-MultiDCI-STx2P-DG-DG-r18*.NOTE: This feature can also be applied for CG+DG if UE can support *twoPUSCH-NonCB-MultiDCI-STx2P-CG-DG-r18*. | FSPC | No | N/A | FR2 only |
| ***twoPUSCH-NonCB-MultiDCI-STx2P-DG-DG-r18***Indicates whether the UE supports multi-DCI based STx2P PUSCH+PUSCH for noncodebook-based PUSCH with fully overlapping PUSCHs in time and non-overlapping in frequency and two SRS resource sets with usage set to 'noncodebook' associated with two *coresetPoolInde* values.*-* *maxNumberSRS-ResourcePerSet-r18* indicates the maximum number of SRS resources in one SRS resource set.*-* *maxNumberLayerOverlapping-r18* indicates the maximum number of layers of each PUSCH of PUSCH+PUSCH overlapping in time domain.*-* *maxNumberSimulSRS-ResourcePerSet-r18* indicates the maximum number of simultaneously transmitted SRS resources in one symbol per SRS resource set.*-* *maxNumberPUSCH-PerCORESET-PerSlot-r18* indicates the maximum number of PUSCHs per CORESETPoolIndex per slot*-* *maxNumberTotalLayerOverlapping-r18* indicates the maximum total number of layers across two overlapping PUSCH.A UE supporting this feature shall also indicate support of *mimo-NonCB-PUSCH.*NOTE: Processing support of two SRS resource sets with usage set to 'codebook' associated with two *coresetPoolIndex* values is not supported in any CC if at least one CC is configured with two values of *CORESETPoolIndex*. | FSPC | No | N/A | FR2 only |