**3GPP TSG-RAN WG2 Meeting #110e *R2-200xxxx***

**E-meeting, 1st – 12th June 2020**

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| *CR-Form-v11.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.306** | **CR** | **xx** | **rev** | **x** | **Current version:** | **15.9.0** |  |
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| *For* [*HELP*](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** | CR tp 38.306 on unnecessary XDD FRX differentiation | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation, Sanechips | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_ newRAT-Core | | | | |  | | ***Date:*** | | 2020-05-19 |
|  |  | | | |  | | |  | |  |
| ***Category:*** | **F** |  | | | | | | ***Release:*** | | Rel-15 |
|  | *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-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | Based on the email discussion in “[Post109bis-e][924][NR15] Unnecessary FRx differentiation”, companies agree the “FDD-TDD DIFF” and “FR1-FR2 DIFF” columns are not applicable to per-band, per-BC, per-FS and per-FSPC level UE features, because the signalling already supports the UE to report different capability values. The exceptional case is to indicate the feature only applicable to specific duplex mode or FR mode (e.g. FDD only, TDD only, FR1 only, FR2 only).  So except “XX only”, the existing “Yes”/”No” values in those columns are no consistent with the defined interpretation, which should be replaced by “N/A”. | | | | | | | | |
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| ***Summary of change:*** | | 1. Clarify in 4.2.1 that “N/A” in “FDD-TDD DIFF” and “FR1-FR2 DIFF” columns indicates “not applicable”. 2. For per-band, per-BC, per-FS and per-FSPC level capabilities, change the “Yes” or ”No” values into “N/A” in “FDD-TDD DIFF” and “FR1-FR2 DIFF” columns. 3. For *csi-ReportFramework*, *csi-RS-IM-ReceptionForFeedback* and *csi-RS-ProcFrameworkForSRS*, change “Band or UE” into “Band” in section 4.2.7.2; and change “Band or UE” into “UE” in section 4.2.7.10. 4. For “tdm-Pattern” in section 4.2.7.9, change the value in column “FR1-FR2 DIFF” into “FR1 only”, because it is applicable to (NG)EN-DC or NE-DC with FR1 serving cells.   **Impact analysis**  Impacted 5G architecture options:  NR SA, MR-DC  Impacted functionality:  UE capability  Inter-operability:   1. This CR only impacts the formality of specification (no ASN.1 change), the UE and network behaviour remain the same, so there is no inter-operability issue. | | | | | | | | |
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| ***Consequences if not approved:*** | | For per-band, per-BC, per-FS and per-FSPC capabilities, the “Yes” or “No” values in “FDD-TDD DIFF” and “FR1-FR2 DIFF” columns are conflict with the defined interpretation, and cause confusing. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.1, 4.2.7 | | | | | | | | |
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|  | | **Y** | **N** |  | | |  | | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | CR R2-200xxxx | | | |
| ***affected:*** | |  | **x** | Test specifications | | | TS/TR ... CR ... | | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | TS/TR ... CR ... | | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

Start of changes

## 4.2 UE Capability Parameters

### 4.2.1 Introduction

The following clauses define the UE radio access capability parameters. Only parameters for which there is the possibility for UEs to signal different values are considered as UE radio access capability parameters. Therefore, mandatory features without capability parameters that are the same for all UEs are not listed here.

The network needs to respect the signalled UE radio access capability parameters when configuring the UE and when scheduling the UE.

The UE may support different functionalities between FDD and TDD, and/or between FR1 and FR2. The UE shall indicate the UE capabilities as follows. In the table of UE capability parameter in subsequent clauses, "Yes" in the column by "FDD-TDD DIFF" and "FR1-FR2 DIFF" indicates the UE capability field can have a different value for between FDD and TDD or between FR1 and FR2 and "No" indicates if it cannot. "FD" in the column indicates to refer the associated field description. "FR1 only" or "FR2 only" in the column indicates the associated feature is only supported in FR1 or FR2 and "TDD only" indicates the associated feature is only supported in TDD. "N/A" in the column indicates it is not applicable to the feature (e,g. the signaling already supports UE to have different values for between FDD and TDD or between FR1 and FR2).

1> set all fields of UE-NR/MRDC-Capability except fdd-Add-UE-NR/MRDC-Capabilities, tdd-Add-UE-NR/MRDC-Capabilities, fr1-Add-UE-NR/MRDC-Capabilities and fr2-Add-UE-NR/MRDC-Capabilities, to include the values applicable for all duplex mode(s) and frequency range(s) that the UE supports;

1> if UE supports both FDD and TDD and if (some of) the UE capability fields have a different value for FDD and TDD

2> if for FDD, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

3> include field fdd-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for FDD;

2> if for TDD, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

3> include field tdd-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for TDD;

1> if UE supports both FR1 and FR2 and if (some of) the UE capability fields have a different value for FR1 and FR2:

2> if for FR1, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

3> include field fr1-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for FR1;

2> if for FR2, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

3> include field fr2-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for FR2;

NOTE: The fields which indicate "shall be set to 1" or "shall be set to *supported*" in the following tables means these features are purely mandatory and are assumed they are the same as mandatory without capability signaling.

For optional features, the UE radio access capability parameter indicates whether the feature has been implemented and successfully tested. For mandatory features with the UE radio access capability parameter, the parameter indicates whether the feature has been successfully tested. In the table of UE capability parameter in subsequent clauses, "Yes" in the column by "M" indicates the associated feature is mandatory and "No" indicates the associated feature is optional. "CY" in the column indicates the associated feature is conditional mandatory and the condition is described in the field description and the associated feature is considered mandatory with capability parameter, when the described condition is satisfied. "FD" in the column indicates to refer the associated field description. Some parameters in subsequent clauses are not related to UE features and in the case, "N/A" is indicated in the column.

UE capability parameters have hierarchical structure. In the table of UE capability parameter in subsequent clauses, "Per" indicates the level the associated parameter is included. "UE" in the column indicates the associated parameter is signalled per UE, "Band" indicates it is signalled per band, "BC" indicates it is signalled per band combination, "FS" indicates it is signalled per feature set (per band per band combination), "FSPC" indicates it is signalled per feature set per component carrier (per CC per band per band combination), and "FD" in the column indicates to refer the associated field description.

Next change

4.2.7 Physical layer parameters

4.2.7.1 *BandCombinationList* parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***bandEUTRA***  Defines supported EUTRA frequency band by NR frequency band number, as specified in TS 36.101 [14]. | Band | Yes | N/A | N/A |
| ***bandList***  Each entry of the list should include at least one bandwidth class for UL or DL. | BC | Yes | N/A | N/A |
| ***bandNR***  Defines supported NR frequency band by NR frequency band number, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. | Band | Yes | N/A | N/A |
| ***ca-BandwidthClassDL-EUTRA***  Defines for DL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 36.101 [14]. When all FeatureSetEUTRA-DownlinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent. | Band | No | N/A | N/A |
| ***ca-BandwidthClassDL-NR***  Defines for DL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. When all FeatureSetDownlinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent. | Band | No | N/A | N/A |
| ***ca-BandwidthClassUL-EUTRA***  Defines for UL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 36.101 [14]. When all FeatureSetEUTRA-UplinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent. | Band | No | N/A | N/A |
| ***ca-BandwidthClassUL-NR***  Defines for UL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. When all FeatureSetUplinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent. | Band | No | N/A | N/A |
| ***ca-ParametersEUTRA***  Contains the EUTRA part of band combination parameters for a given EN-DC band combination. | BC | No | N/A | N/A |
| ***ca-ParametersNR***  Contains the NR band combination parameters for a given EN-DC and/or NR CA band combination. | BC | No | N/A | N/A |
| ***ca-ParametersNRDC***  Indicates whether the UE supports NR-DC for the band combination. It contains the NR band combination parameters applicable across MCG and SCG. | BC | No | N/A | N/A |
| ***featureSetCombination***  Indicates the feature set that the UE supports on the NR and/or MR-DC band combination by FeatureSetCombinationId. | BC | N/A | N/A | N/A |
| ***mrdc-Parameters***  Contains the band combination parameters for a given EN-DC band combination. | BC | No | N/A | N/A |
| ***ne-DC-BC***  Indicates whether the UE supports NE-DC for the band combination. | BC | No | N/A | N/A |
| ***powerClass***  Indicates power class the UE supports when operating according to this band combination. If the field is absent, the UE supports the default power class. If this power class is higher than the power class that the UE supports on the individual bands of this band combination (*ue-PowerClass* in *BandNR*), the latter determines maximum TX power available in each band. The UE sets the power class parameter only in band combinations with two FR1 uplink serving cells. | BC | No | N/A | FR1 only |
| ***SRS-SwitchingTimeNR***  Indicates the interruption time on DL/UL reception within a NR band pair during the RF retuning for switching between a carrier on one band and another (PUSCH-less) carrier on the other band to transmit SRS. *switchingTimeDL/ switchingTimeUL*:n0us represents 0 us, n30us represents 30us, and so on. *switchingTimeDL/ switchingTimeUL* is mandatory present if switching between the NR band pair is supported, otherwise the field is absent. It is signalled per pair of bands per band combination. | FD | No | N/A | N/A |
| ***SRS-SwitchingTimeEUTRA***  Indicates the interruption time on DL/UL reception within a EUTRA band pair during the RF retuning for switching between a carrier on one band and another (PUSCH-less) carrier on the other band to transmit SRS. *switchingTimeDL/ switchingTimeUL:* n0 represents 0 OFDM symbols, n0dot5 represents 0.5 OFDM symbols, n1 represents 1 OFDM symbol and so on. *switchingTimeDL/ switchingTimeUL* is mandatory present if switching between the EUTRA band pair is supported, otherwise the field is absent. It is signalled per pair of bands per band combination. | FD | No | N/A | N/A |
| ***srs-TxSwitch***  Defines whether UE supports SRS for DL CSI acquisition as defined in clause 6.2.1.2 of TS 38.214 [12]. The capability signalling comprises of the following parameters:  - *supportedSRS-TxPortSwitch* indicates SRS Tx port switching pattern supported by the UE. The indicated UE antenna switching capability of ′xTyR′ corresponds to a UE, capable of SRS transmission on ′x′ antenna ports over total of ′y′ antennas, where ′y′ corresponds to all or subset of UE receive antennas, where 2T4R is two pairs of antennas;  - *txSwitchImpactToRx* indicates the entry number of the first-listed band with UL in the band combination that affects this DL;  - *txSwitchWithAnotherBand* indicates the entry number of the first-listed band with UL in the band combination that switches together with this UL.  For *txSwitchImpactToRx* and *txSwitchWithAnotherBand*, value 1 means first entry, value 2 means second entry and so on. All DL and UL that switch together indicate the same entry number.  The UE is restricted not to include fallback band combinations for the purpose of indicating different SRS antenna switching capabilities. | BC | Yes | N/A | N/A |
| ***supportedBandwidthCombinationSet***  Defines the supported bandwidth combination for the band combination set as defined in the TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. For NR SA CA, NR-DC, inter-band EN-DC without intra-band EN-DC component and intra-band EN-DC with additional inter-band NR CA component, the field defines the bandwidth combinations for the NR part of the band combination. For intra-band EN-DC without additional inter-band NR and LTE CA component, the field indicates the supported bandwidth combination set applicable to the NR and LTE band combinations. Field encoded as a bit map, where bit N is set to "1" if UE support Bandwidth Combination Set N for this band combination as defined in the TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. The leading / leftmost bit (bit 0) corresponds to the Bandwidth Combination Set 0, the next bit corresponds to the Bandwidth Combination Set 1 and so on. It is mandatory if the band combination has more than one NR carrier (at least one SCell in an NR cell group) or is an intra-band EN-DC combination or both. | BC | CY | N/A | N/A |
| ***supportedBandwidthCombinationSetIntraENDC***  Defines the supported bandwidth combination for the band combination set as defined in the TS 38.101-3 [4]. For intra-band EN-DC with additional inter-band CA component(s) of LTE and/or NR, the field defines the bandwidth combinations for the intra-band EN-DC component. Field encoded as a bit map, where bit N is set to "1" if UE support Bandwidth Combination Set N for this band combination as defined in the TS 38.101-3 [4]. The leading / leftmost bit (bit 0) corresponds to the Bandwidth Combination Set 0, the next bit corresponds to the Bandwidth Combination Set 1 and so on. It is mandatory if the band combination is an intra-band EN-DC combination with additional inter-band NR/LTE CA component. | BC | CY | N/A | N/A |

4.2.7.2 *BandNR parameters*

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***additionalActiveTCI-StatePDCCH***  Indicates whether the UE supports one additional active TCI-State for control in addition to the supported number of active TCI-States for PDSCH. The UE can include this field only if *maxNumberActiveTCI-PerBWP* in *tci-StatePDSCH* is set to *n1*. Otherwise, the UE does not include this field. | Band | CY | N/A | N/A |
| ***aperiodicBeamReport***  Indicates whether the UE supports aperiodic 'CRI/RSRP' or 'SSBRI/RSRP' reporting on PUSCH. The UE provides the capability for the band number for which the report is provided (where the measurement is performed). | Band | Yes | N/A | N/A |
| ***aperiodicTRS***  Indicates whether the UE supports DCI triggering aperiodic TRS associated with periodic TRS. | Band | No | N/A | N/A |
| ***bandNR***  Defines supported NR frequency band by NR frequency band number, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. | Band | Yes | N/A | N/A |
| ***beamCorrespondenceWithoutUL-BeamSweeping***  Indicates how UE supports FR2 beam correspondence as specified in TS 38.101-2 [3], clause 6.6. The UE that fulfils the beam correspondence requirement without the uplink beam sweeping (as specified in TS 38.101-2 [3], clause 6.6) shall set the field to *supported*. The UE that fulfils the beam correspondence requirement with the uplink beam sweeping (as specified in TS 38.101-2 [3], clause 6.6) shall not report this field. | Band | Yes | N/A | FR2 only |
| ***beamManagementSSB-CSI-RS***  Defines support of SS/PBCH and CSI-RS based RSRP measurements. The capability comprises signalling of  - *maxNumberSSB-CSI-RS-ResourceOneTx* indicates maximum total number of configured one port NZP CSI-RS resources and SS/PBCH blocks that are supported by the UE to measure L1-RSRP as specified in TS 38.215 [13] within a slot and across all serving cells (see NOTE). On FR2, it is mandatory to report >=8; On FR1, it is mandatory with capability signalling to report >=8.  - *maxNumberCSI-RS-Resource* indicates maximum total number of configured NZP-CSI-RS resources that are supported by the UE to measure L1-RSRP as specified in TS 38.215 [13] across all serving cells (see NOTE). It is mandated to report at least n8 for FR1.  - *maxNumberCSI-RS-ResourceTwoTx* indicates maximum total number of two ports NZP CSI-RS resources that are supported by the UE to measure L1-RSRP as specified in TS 38.215 [13] within a slot and across all serving cells (see NOTE).  - *supportedCSI-RS-Density* indicates density of one RE per PRB for one port NZP CSI-RS resource for RSRP reporting, if supported. On FR2, it is mandatory to report either "three" or "oneAndThree"; On FR1, it is mandatory with capability signalling to report either "three" or "oneAndThree".  - *maxNumberAperiodicCSI-RS-Resource* indicates maximum number of configured aperiodic CSI-RS resources across all serving cells (see NOTE). For FR1 and FR2, the UE is mandated to report at least n4.  NOTE: If the UE sets a value other than *n0* in an FR1 band, it shall set that same value in all FR1 bands. If the UE sets a value other than *n0* in an FR2 band, it shall set that same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. | Band | Yes | N/A | FD |
| ***beamReportTiming***  Indicates the number of OFDM symbols between the last symbol of SSB/CSI-RS and the first symbol of the transmission channel containing beam report. The UE provides the capability for the band number for which the report is provided (where the measurement is performed). The UE includes this field for each supported sub-carrier spacing. | Band | Yes | N/A | N/A |
| ***beamSwitchTiming***  Indicates the minimum number of OFDM symbols between the DCI triggering of aperiodic CSI-RS and aperiodic CSI-RS transmission. The number of OFDM symbols is measured from the last symbol containing the indication to the first symbol of CSI-RS. The UE includes this field for each supported sub-carrier spacing. | Band | No | N/A | FR2 only |
| ***bwp-DiffNumerology***  Indicates whether the UE supports BWP adaptation up to 4 BWPs with the different numerologies, via DCI and timer. For the UE capable of this feature, the bandwidth of a UE-specific RRC configured DL BWP includes the bandwidth of the CORESET#0 (if CORESET#0 is present) and SSB for PCell and PSCell (if configured). For SCell(s), the bandwidth of the UE-specific RRC configured DL BWP includes SSB, if there is SSB on SCell(s). | Band | No | N/A | N/A |
| ***bwp-SameNumerology***  Defines type A/B BWP adaptation (up to 2/4 BWPs) with the same numerology, via DCI and timer. For the UE capable of this feature, the bandwidth of a UE-specific RRC configured DL BWP includes the bandwidth of the CORESET#0 (if CORESET#0 is present) and SSB for PCell and PSCell (if configured). For SCell(s), the bandwidth of the UE-specific RRC configured DL BWP includes SSB, if there is SSB on SCell(s). | Band | No | N/A | N/A |
| ***bwp-WithoutRestriction***  Indicates support of BWP operation without bandwidth restriction. The Bandwidth restriction in terms of DL BWP for PCell and PSCell means that the bandwidth of a UE-specific RRC configured DL BWP may not include the bandwidth of CORESET #0 (if configured) and SSB. For SCell(s), it means that the bandwidth of DL BWP may not include SSB. | Band | No | N/A | N/A |
| ***channelBWs-DL***  Indicates for each subcarrier spacing the UE supported channel bandwidths. Absence of the *channelBWs-DL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry.  For FR1, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1.  For FR1, the leading/leftmost bit in *channelBWs-DL-v1590* indicates 70MHz, and all the remaining bits in *channelBWs-DL-v1590* shall be set to 0.  NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingDL* and the *scs-60kHz*. To determine whether the UE supports a channel bandwidth of 90 MHz, the network may ignore this capability for and validate instead the *channelBW-90mhz* and the *supportedBandwidthCombinationSet*. For serving cells with other channel bandwidths the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet* and *supportedBandwidthDL*. | Band | Yes | N/A | N/A |
| ***channelBWs-UL***  Indicates for each subcarrier spacing the UE supported channel bandwidths.  Absence of the *channelBWs-UL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry.  For FR1, the bits in *channelBWs-UL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-UL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1.  For FR1, the leading/leftmost bit in *channelBWs-UL-v1590* indicates 70 MHz, and all the remaining bits in *channelBWs-UL-v1590* shall be set to 0.  NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingUL* and the *scs-60kHz*. To determine whether the UE supports a channel bandwidth of 90 MHz the network may ignore this capability for and validate instead the *channelBW-90mhz* and the *supportedBandwidthCombiantionSet*. For serving cells with other channel bandwidths the network validates the *channelBWs-UL*, the *supportedBandwidthCombinationSet* and *supportedBandwidthUL*. | Band | Yes | N/A | N/A |
| ***codebookParameters***  Indicates the codebooks and the corresponding parameters supported by the UE.  Parameters for type I single panel codebook (type1 singlePanel) supported by the UE, which are mandatory to report:  - *supportedCSI-RS-ResourceList*;  - *modes* indicates supported codebook modes (mode 1, both mode 1 and mode 2);  - *maxNumberCSI-RS-PerResourceSet* indicates the maximum number of CSI-RS resource in a resource set.  Parameters for type I multi-panel codebook (type1 multiPanel) supported by the UE, which are optional:  - *supportedCSI-RS-ResourceList*;  - *modes* indicates supported codebook modes (mode 1, mode 2, or both mode 1 and mode 2);  - *maxNumberCSI-RS-PerResourceSet* indicates the maximum number of CSI-RS resource in a resource set;  - *nrofPanels* indicates supported number of panels.  Parameters for type II codebook (type2) supported by the UE, which are optional:  - *supportedCSI-RS-ResourceList*;  - *parameterLx* indicates the parameter "Lx" in codebook generation where x is an index of Tx ports indicated by *maxNumberTxPortsPerResource*;  - *amplitudeScalingType* indicates the amplitude scaling type supported by the UE (wideband or both wideband and sub-band);  - *amplitudeSubsetRestriction* indicates whether amplitude subset restriction is supported for the UE.  Parameters for type II codebook with port selection (type2-PortSelection) supported by the UE, which are optional:  - *supportedCSI-RS-ResourceList*;  - *parameterLx* indicates the parameter "Lx" in codebook generation where x is an index of Tx ports indicated by *maxNumberTxPortsPerResource*;  - *amplitudeScalingType* indicates the amplitude scaling type supported by the UE (wideband or both wideband and sub-band).  *supportedCSI-RS-ResourceList* includes list of the following parameters:  - *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource;  - *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs within a band simultaneously;  - *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs within a band simultaneously. | Band | FD | N/A | N/A |
| ***crossCarrierScheduling-SameSCS***  Indicates whether the UE supports cross carrier scheduling for the same numerology with carrier indicator field (CIF) in carrier aggregation where numerologies for the scheduling cell and scheduled cell are same. | Band | No | N/A | N/A |
| ***csi-ReportFramework***  Indicates whether the UE supports CSI report framework. This capability signalling comprises the following parameters:  - *maxNumberPeriodicCSI-PerBWP-ForCSI-Report* indicates the maximum number of periodic CSI report setting per BWP for CSI report;  - *maxNumberPeriodicCSI-PerBWP-ForBeamReport* indicates the maximum number of periodic CSI report setting per BWP for beam report.  - *maxNumberAperiodicCSI-PerBWP-ForCSI-Report* indicates the maximum number of aperiodic CSI report setting per BWP for CSI report;  - *maxNumberAperiodicCSI-PerBWP-ForBeamReport* indicates the maximum number of aperiodic CSI report setting per BWP for beam report;  - *maxNumberAperiodicCSI-triggeringStatePerCC* indicates the maximum number of aperiodic CSI triggering states in *CSI-AperiodicTriggerStateList* per CC;  - *maxNumberSemiPersistentCSI-PerBWP-ForCSI-Report* indicates the maximum number of semi-persistent CSI report setting per BWP for CSI report;  - *maxNumberSemiPersistentCSI-PerBWP-ForBeamReport* indicates the maximum number of semi-persistent CSI report setting per BWP for beam report;  - *simultaneousCSI-ReportsPerCC* indicates the number of CSI report(s) for which the UE can measure and process reference signals simultaneously in a CC of the band for which this capability is provided. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in simultaneousCSI-ReportsPerCC includes the beam report and CSI report. | Band | Yes | N/A | N/A |
| ***csi-RS-ForTracking***  Indicates support of CSI-RS for tracking (i.e. TRS). This capability signalling comprises the following parameters:  - *maxBurstLength* indicates the TRS burst length. Value 1 indicates 1 slot and value 2 indicates both of 1 slot and 2 slots. In this release UE is mandated to report value 2;  - *maxSimultaneousResourceSetsPerCC* indicates the maximum number of TRS resource sets per CC which the UE can track simultaneously;  - *maxConfiguredResourceSetsPerCC* indicates the maximum number of TRS resource sets configured to UE per CC. It is mandated to report at least 8 for FR1 and 16 for FR2;  - *maxConfiguredResourceSetsAllCC* indicates the maximum number of TRS resource sets configured to UE across CCs. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. The UE is mandated to report at least 16 for FR1 and 32 for FR2. | Band | Yes | N/A | N/A |
| ***csi-RS-IM-ReceptionForFeedback***  Indicates support of CSI-RS and CSI-IM reception for CSI feedback. This capability signalling comprises the following parameters:  - *maxConfigNumberNZP-CSI-RS-PerCC* indicates the maximum number of configured NZP-CSI-RS resources per CC;  - *maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC* indicates the maximum number of ports across all configured NZP-CSI-RS resources per CC;  - *maxConfigNumberCSI-IM-PerCC* indicates the maximum number of configured CSI-IM resources per CC;  - *maxNumberSimultaneousNZP-CSI-RS-PerCC* indicates the maximum number of simultaneous CSI-RS-resources per CC;  - *totalNumberPortsSimultaneousNZP-CSI-RS-PerCC* indicates the total number of CSI-RS ports in simultaneous CSI-RS resources per CC. | Band | Yes | N/A | N/A |
| ***csi-RS-ProcFrameworkForSRS***  Indicates support of CSI-RS processing framework for SRS. This capability signalling comprises the following parameters:  - *maxNumberPeriodicSRS-AssocCSI-RS-PerBWP* indicates the maximum number of periodic SRS resources associated with CSI-RS per BWP;  - *maxNumberAperiodicSRS-AssocCSI-RS-PerBWP* indicates the maximum number of aperiodic SRS resources associated with CSI-RS per BWP;  - *maxNumberSP-SRS-AssocCSI-RS-PerBWP* indicates the maximum number of semi-persistent SRS resources associated with CSI-RS per BWP;  - *simultaneousSRS-AssocCSI-RS-PerCC* indicates the number of SRS resources that the UE can process simultaneously in a CC, including periodic, aperiodic and semi-persistent SRS. | Band | No | N/A | N/A |
| ***extendedCP***  Indicates whether the UE supports 60 kHz subcarrier spacing with extended CP length for reception of PDCCH, and PDSCH, and transmission of PUCCH, PUSCH, and SRS. | Band | No | N/A | N/A |
| ***groupBeamReporting***  Indicates whether UE supports RSRP reporting for the group of two reference signals. | Band | No | N/A | N/A |
| ***maxNumberCSI-RS-BFD***  Indicates maximal number of CSI-RS resources across all CCs, and across MCG and SCG in case of NR-DC, for UE to monitor PDCCH quality. In this release, the maximum value that can be signalled is 16. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. It is mandatory with capability signalling for FR2 and optional for FR1. | Band | CY | N/A | N/A |
| ***maxNumberCSI-RS-SSB-CBD***  Defines maximal number of different CSI-RS [and/or SSB] resources across all CCs, and across MCG and SCG in case of NR-DC, for new beam identifications. In this release, the maximum value that can be signalled is 128. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. It is mandatory with capability signalling for FR2 and optional for FR1. The UE is mandated to report at least 32 for FR2. | Band | CY | N/A | N/A |
| ***maxNumberNonGroupBeamReporting***  Defines support of non-group based RSRP reporting using N\_max RSRP values reported. | Band | Yes | N/A | N/A |
| ***maxNumberRxBeam***  Defines whether UE supports receive beamforming switching using NZP CSI-RS resource. UE shall indicate a single value for the preferred number of NZP CSI-RS resource repetitions per CSI-RS resource set. Support of Rx beam switching is mandatory for FR2. | Band | CY | N/A | N/A |
| ***maxNumberRxTxBeamSwitchDL***  Defines the number of Tx and Rx beam changes UE can perform on this band within a slot. UE shall report one value per each subcarrier spacing supported by the UE. In this release, the number of Tx and Rx beam changes for scs-15kHz and scs-30kHz are not included. | Band | No | N/A | FR2 only |
| ***maxNumberSSB-BFD***  Defines maximal number of different SSBs across all CCs, and across MCG and SCG in case of NR-DC, for UE to monitor PDCCH quality. In this release, the maximum value that can be signalled is 16. If the UE includes the field in an FR1 band, it shall set the same value in all FR1 bands. If the UE includes the field in an FR2 band, it shall set the same value in all FR2 bands. The UE supports a total number of resources equal to the maximum of the FR1 and FR2 value, but no more than the FR1 value across all FR1 serving cells and no more than the FR2 value across all FR2 serving cells. It is mandatory with capability signalling for FR2 and optional for FR1. | Band | CY | N/A | N/A |
| ***maxUplinkDutyCycle-PC2-FR1***  Indicates the maximum percentage of symbols during a certain evaluation period that can be scheduled for uplink transmission so as to ensure compliance with applicable electromagnetic energy absorption requirements provided by regulatory bodies. This field is only applicable for FR1 power class 2 UE as specified in clause 6.2.1 of TS 38.101-1 [2]. If the field is absent, 50% shall be applied. Value n60 corresponds to 60%, value n70 corresponds to 70% and so on. | Band | No | N/A | FR1 only |
| ***maxUplinkDutyCycle-FR2***  Indicates the maximum percentage of symbols during 1s that can be scheduled for uplink transmission so as to ensure compliance with applicable electromagnetic power density exposure requirements provided by regulatory bodies. This field is applicable for all power classes UE in FR2 as specified in TS 38.101-2 [3]. Value n15 corresponds to 15%, value n20 corresponds to 20% and so on. If the field is absent or the percentage of uplink symbols transmitted within any 1s evaluation period is larger than *maxUplinkDutyCycle-FR2*, the UE behaviour is specified in TS 38.101-2 [3]. | Band | No | N/A | FR2 only |
| ***modifiedMPR-Behaviour***  Indicates whether UE supports modified MPR behaviour defined in TS 38.101-1 [2] and TS 38.101-2 [3]. | Band | No | N/A | N/A |
| ***multipleTCI***  Indicates whether UE supports more than one TCI state configurations per CORESET. UE is only required to track one active TCI state per CORESET. UE is required to support minimum between 64 and number of configured TCI states indicated by *tci-StatePDSCH*. This field shall be set to *supported*. | Band | Yes | N/A | N/A |
| ***pdsch-256QAM-FR2***  Indicates whether the UE supports 256QAM modulation scheme for PDSCH for FR2 as defined in 7.3.1.2 of TS 38.211 [6]. | Band | No | N/A | FR2 only |
| ***periodicBeamReport***  Indicates whether UE supports periodic 'CRI/RSRP' or 'SSBRI/RSRP' reporting using PUCCH formats 2, 3 and 4 in one slot. | Band | Yes | N/A | N/A |
| ***powerBoosting-pi2BPSK***  Indicates whether UE supports power boosting for pi/2 BPSK, when applicable as defined in 6.2 of TS 38.101-1 [2]. | Band | No | TDD only | FR1 only |
| ***ptrs-DensityRecommendationSetDL***  For each supported sub-carrier spacing, indicates preferred threshold sets for determining DL PTRS density. It is mandated for FR2. For each supported sub-carrier spacing, this field comprises:  - two values of *frequencyDensity*;  - three values of *timeDensity*. | Band | CY | N/A | N/A |
| ***ptrs-DensityRecommendationSetUL***  For each supported sub-carrier spacing, indicates preferred threshold sets for determining UL PTRS density. For each supported sub-carrier spacing, this field comprises:  - two values of *frequencyDensity*;  - three values of *timeDensity*;  - five values of *sampleDensity*. | Band | No | N/A | N/A |
| ***pucch-SpatialRelInfoMAC-CE***  Indicates whether the UE supports indication of *PUCCH-spatialrelationinfo* by a MAC CE per PUCCH resource. It is mandatory for FR2 and optional for FR1. | Band | CY | N/A | N/A |
| ***pusch-256QAM***  Indicates whether the UE supports 256QAM modulation scheme for PUSCH as defined in 6.3.1.2 of TS 38.211 [6]. | Band | No | N/A | N/A |
| ***pusch-TransCoherence***  Defines support of the uplink codebook subset by the UE for UL precoding for PUSCH transmission as described in clause 6.1.1.1 of TS 38.214 [12]. UE indicated support of partial coherent codebook subset shall also support non-coherent codebook subset. UE indicated support of full coherent codebook subset shall also support partial and non-coherent codebook subset. | Band | No | N/A | N/A |
| ***rateMatchingLTE-CRS***  Indicates whether the UE supports receiving PDSCH with resource mapping that excludes the REs determined by the higher layer configuration LTE-carrier configuring common RS, as specified in TS 38.214 [12]. | Band | Yes | N/A | N/A |
| ***spatialRelations***  Indicates whether the UE supports spatial relations. The capability signalling comprises the following parameters.  - *maxNumberConfiguredSpatialRelations* indicates the maximum number of configured spatial relations per CC for PUCCH and SRS. It is not applicable to FR1 and applicable to FR2 only. The UE is mandated to report 16 or higher values;  - *maxNumberActiveSpatialRelations* indicates the maximum number of active spatial relations with regarding to PUCCH and SRS for PUSCH, per BWP per CC. It is not applicable to FR1 and applicable and mandatory to report for FR2 only;  - *additionalActiveSpatialRelationPUCCH* indicates support of one additional active spatial relation for PUCCH. It is mandatory with capability signalling if *maxNumberActiveSpatialRelations* is set to n1;  - *maxNumberDL-RS-QCL-TypeD* indicates the maximum number of downlink RS resources used for QCL type D in the active TCI states and active spatial relation information, which is optional. | Band | FD | N/A | FD |
| ***sp-BeamReportPUCCH***  Indicates support of semi-persistent 'CRI/RSRP' or 'SSBRI/RSRP' reporting using PUCCH formats 2, 3 and 4 in one slot. | Band | No | N/A | N/A |
| ***sp-BeamReportPUSCH***  Indicates support of semi-persistent 'CRI/RSRP' or 'SSBRI/RSRP' reporting on PUSCH. | Band | No | N/A | N/A |
| ***srs-AssocCSI-RS***  Parameters for the calculation of the precoder for SRS transmission based on channel measurements using associated NZP CSI-RS resource (srs-AssocCSI-RS) as described in clause 6.1.1.2 of TS 38.214 [12]. UE supporting this feature shall also indicate support of non-codebook based PUSCH transmission.  This capability signalling includes list of the following parameters:  - *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource;  - *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs within a band simultaneously;  *-* *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs within a band simultaneously. | Band | No | N/A | N/A |
| ***tci-StatePDSCH***  Defines support of TCI-States for PDSCH. The capability signalling comprises the following parameters:  - *maxNumberConfiguredTCIstatesPerCC* indicates the maximum number of configured TCI-states per CC for PDSCH. For FR2, the UE is mandated to set the value to 64. For FR1, the UE is mandated to set these values to the maximum number of allowed SSBs in the supported band;  - *maxNumberActiveTCI-PerBWP* indicates the maximum number of activated TCI-states per BWP per CC, including control and data. If a UE reports X active TCI state(s), it is not expected that more than X active QCL type D assumption(s) for any PDSCH and any CORESETs for a given BWP of a serving cell become active for the UE. The UE shall include this field.  Note the UE is required to track only the active TCI states. | Band | Yes | N/A | N/A |
| ***twoPortsPTRS-UL***  Defines whether UE supports PT-RS with 2 antenna ports for UL transmission. | Band | No | N/A | N/A |
| ***ue-PowerClass***  For FR1, if the UE supports the different UE power class than the default UE power class as defined in clause 6.2 of TS 38.101-1 [2], the UE shall report the supported UE power class in this field. For FR2, UE shall report the supported UE power class as defined in clause 6 and 7 of TS 38.101-2 [3] in this field. | Band | Yes | N/A | N/A |
| ***uplinkBeamManagement***  Defines support of beam management for UL. This capability signalling comprises the following parameters:  - *maxNumberSRS-ResourcePerSet-BM* indicates the maximum number of SRS resources per SRS resource set configurable for beam management, supported by the UE.  - *maxNumberSRS-ResourceSet* indicates the maximum number of SRS resource sets configurable for beam management, supported by the UE.  If the UE does not set *beamCorrespondenceWithoutUL-BeamSweeping* to *supported*, the UE shall report this capability. This feature is optional for the UE that supports beam correspondence without uplink beam sweeping as defined in clause 6.6, TS 38.101-2 [3].  NOTE: The network uses *maxNumberSRS-ResourceSet* to determine the maximum number of SRS resource sets that can be configured to the UE for periodic/semi-persistent/aperiodic configurations as below:   |  |  | | --- | --- | | **Maximum number of SRS resource sets across all time domain behaviour (periodic/semi-persistent/aperiodic) reported in *maxNumberSRS-ResourceSet*** | **Additional constraint on the maximum number of SRS resource sets configured to the UE for each supported time domain behaviour (periodic/semi-persistent/aperiodic)** | | 1 | 1 | | 2 | 1 | | 3 | 1 | | 4 | 2 | | 5 | 2 | | 6 | 2 | | 7 | 4 | | 8 | 4 | | Band | No | N/A | FR2 only |

4.2.7.3 *CA-ParametersEUTRA*

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***additionalRx-Tx-PerformanceReq***  *additionalRx-Tx-PerformanceReq* defined in 4.3.5.22, TS 36.306 [15]. | BC | No | N/A | N/A |
| ***dl-1024QAM-TotalWeightedLayers***  Indicates total number of weighted layers for the LTE part of the concerned EN-DC band combination the UE can process for 1024QAM, as described in TS 36.306 [15] equation 4.3.5.31-1. Actual value = (10 + indicated value x 2), i.e. value 0 indicates 10 layers, value 1 indicates 12 layers and so on. For an EN-DC band combination for which this field is not included, *dl-1024QAM-TotalWeightedLayers-r15* as described in TS 36.331 [17] applies, if included. | BC | No | N/A | N/A |
| ***multipleTimingAdvance***  *multipleTimingAdvance* defined in 4.3.5.3, TS 36.306 [15]. | BC | No | N/A | N/A |
| ***simultaneousRx-Tx***  *simultaneousRx-Tx* defined in 4.3.5.4, TS 36.306 [15]. | BC | No | N/A | N/A |
| ***supportedBandwidthCombinationSetEUTRA***  Indicates the set of supported bandwidth combinations for the LTE part for inter-band EN-DC without intra-band EN-DC component and intra-band EN-DC with additional inter-band LTE CA component. The field is encoded as a bit map, where bit N is set to "1" if UE support Bandwidth Combination Set N for this band combination. The leading / leftmost bit (bit 0) corresponds to the Bandwidth Combination Set 0, the next bit corresponds to the Bandwidth Combination Set 1 and so on. The UE shall neither include the field for a EN-DC combination which has only one LTE carrier, nor for a EN-DC combination which has more than one LTE carrier for which the UE only supports Bandwidth Combination Set 0 for the LTE part. If the inter-band EN-DC has more than one LTE carrier, the UE shall support at least one bandwidth combination for the supported LTE part. | BC | CY | N/A | N/A |
| ***supportedNAICS-2CRS-AP***  *supportedNAICS-2CRS-AP* defined in 4.3.5.8, TS 36.306 [15]. | BC | No | N/A | N/A |
| ***fd-MIMO-TotalWeightedLayers***  Indicates total number of weighted layers for the LTE part of the concerned EN-DC band combination the UE can process for FD-MIMO, as described in TS 36.306 [15] equation 4.3.28.13-1 and TS 36.331 [17] clause 6.3.6, NOTE 8 in *UE-EUTRA-Capability* field descriptions. For an EN-DC band combination for which this field is not included, *totalWeightedLayers-r13* as described in TS 36.331 [17] applies, if included. | BC | No | N/A | N/A |
| ***ue-CA-PowerClass-N***  *ue-CA-PowerClass-N* defined in 4.3.5.1.3, TS 36.306 [15]. | BC | No | N/A | N/A |

4.2.7.4 *CA-ParametersNR*

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***csi-RS-IM-ReceptionForFeedbackPerBandComb***  Indicates support of CSI-RS and CSI-IM reception for CSI feedback. This capability signalling comprises the following parameters:  - *maxNumberSimultaneousNZP-CSI-RS-ActBWP-AllCC* indicates the maximum number of simultaneous CSI-RS resources in active BWPs across all CCs, and across MCG and SCG in case of NR-DC. This parameter limits the total number of NZP-CSI-RS resources that the NW may configure across all CCs, and across MCG and SCG in case of NR-DC (irrespective of the associated codebook type). The network applies this limit in addition to the limits signalled in *MIMO-ParametersPerBand-> maxNumberSimultaneousNZP-CSI-RS-PerCC* and in *Phy-ParametersFRX-Diff-> maxNumberSimultaneousNZP-CSI-RS-PerCC*;  - *totalNumberPortsSimultaneousNZP-CSI-RS-ActBWP-AllCC* indicates the total number of CSI-RS ports in simultaneous CSI-RS resources in active BWPs across all CCs, and across MCG and SCG in case of NR-DC. This parameter limits the total number of ports that the NW may configure across all NZP-CSI-RS resources across all CCs, and across MCG and SCG in case of NR-DC (irrespective of the associated codebook type). The network applies this limit in addition to the limits signalled in *MIMO-ParametersPerBand-> totalNumberPortsSimultaneousNZP-CSI-RS-PerCC* and in *Phy-ParametersFRX-Diff-> totalNumberPortsSimultaneousNZP-CSI-RS-PerCC*. | BC | Yes | N/A | N/A |
| ***diffNumerologyAcrossPUCCH-Group***  Indicates whether different numerology across two NR PUCCH groups for data and control channel at a given time in NR CA and EN-DC is supported by the UE. | BC | No | N/A | N/A |
| ***diffNumerologyWithinPUCCH-GroupLargerSCS***  Indicates whether UE supports different numerology across carriers within a PUCCH group and a same numerology between DL and UL per carrier for data/control channel at a given time in NR CA, EN-DC/NE-DC and NR-DC.  In case of NR CA and EN-DC/NE-DC with one NR PUCCH group and in case of NR CA with two NR PUCCH groups, it also indicates whether the UE supports different numerologies across NR carriers within the same NR PUCCH group up to two different numerologies within the same NR PUCCH group, wherein NR PUCCH is sent on the carrier with larger SCS for data and control channel at a given time.  In case of EN-DC/NE-DC with two NR PUCCH groups, it indicates whether the UE supports different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1, wherein NR PUCCH is sent on the carrier with larger SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data and control channel at a given time.  In case of NR-DC, it indicates whether the UE supports different numerologies across NR carriers within the same NR PUCCH group in MCG (in FR1) up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with larger SCS for data/control channel at a given time; and same numerology across NR carriers in SCG (in FR2). | BC | No | N/A | N/A |
| ***diffNumerologyWithinPUCCH-GroupSmallerSCS***  Indicates whether UE supports different numerology across carriers within a PUCCH group and a same numerology between DL and UL per carrier for data/control channel at a given time in NR CA, EN-DC/NE-DC and NR-DC.  In case of NR CA and EN-DC/NE-DC with one NR PUCCH group and in case of NR CA with two NR PUCCH groups, it also indicates whether the UE supports different numerologies across NR carriers within the same NR PUCCH group up to two different numerologies within the same NR PUCCH group, wherein NR PUCCH is sent on the carrier with smaller SCS for data and control channel at a given time.  In case of EN-DC/NE-DC with two NR PUCCH groups, it indicates whether the UE supports different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1, wherein NR PUCCH is sent on the carrier with smaller SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data and control channel at a given time.  In case of NR-DC, it indicates whether the UE supports different numerologies across NR carriers within the same NR PUCCH group in MCG (in FR1) up to two different numerologies within the same NR PUCCH group wherein NR PUCCH is sent on the carrier with smaller SCS for data/control channel at a given time; and same numerology across NR carriers in SCG (in FR2). | BC | No | N/A | N/A |
| ***dualPA-Architecture***  For band combinations with single-band with UL CA, this field indicates the support of dual PA. If absent in such band combinations, the UE supports single PA for all the ULs. For other band combinations, this field is not applicable. | BC | No | N/A | N/A |
| ***parallelTxSRS-PUCCH-PUSCH***  Indicates whether the UE supports parallel transmission of SRS and PUCCH/ PUSCH across CCs in an inter-band CA band combination. | BC | No | N/A | N/A |
| ***parallelTxPRACH-SRS-PUCCH-PUSCH***  Indicates whether the UE supports parallel transmission of PRACH and SRS/PUCCH/PUSCH across CCs in an inter-band CA band combination. | BC | No | N/A | N/A |
| ***simultaneousCSI-ReportsAllCC***  Indicates whether the UE supports CSI report framework and the number of CSI report(s) which the UE can simultaneously process across all CCs, and across MCG and SCG in case of NR-DC. The CSI report comprises periodic, semi-persistent and aperiodic CSI and any latency classes and codebook types. The CSI report in *simultaneousCSI-ReportsAllCC* includes the beam report and CSI report. This parameter may further limit *simultaneousCSI-ReportsPerCC* in *MIMO-ParametersPerBand* and *Phy-ParametersFRX-Diff* for each band in a given band combination. | BC | Yes | N/A | N/A |
| ***simultaneousRxTxInterBandCA***  Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band NR CA. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. | BC | CY | N/A | N/A |
| ***simultaneousRxTxSUL***  Indicates whether the UE supports simultaneous reception and transmission for a NR band combination including SUL. Mandatory/Optional support depends on band combination and captured in TS 38.101-1 [2]. | BC | CY | N/A | N/A |
| ***simultaneousSRS-AssocCSI-RS-AllCC***  Indicates support of CSI-RS processing framework for SRS and the number of SRS resources that the UE can process simultaneously across all CCs, and across MCG and SCG in case of NR-DC, including periodic, aperiodic and semi-persistent SRS. This parameter may further limit *simultaneousSRS-AssocCSI-RS-PerCC* in *MIMO-ParametersPerBand* and *Phy-ParametersFRX-Diff* for each band in a given band combination. | BC | No | N/A | N/A |
| ***supportedNumberTAG***  Defines the number of timing advance groups supported by the UE. It is applied to NR CA, NR-DC and EN-DC/NE-DC. For EN-DC/NE-DC, it indicates number of TAGs only for NR CG. The number of TAGs for the LTE MCG is signalled by existing LTE TAG capability signalling. For NR CA/NR-DC band combination, if the band combination comprised of more than one band entry (i.e., inter-band or intra-band non-contiguous band combination), it indicates that different timing advances on different band entries are supported. If absent, the UE supports only one TAG for the NR part. It is mandatory for the UE to support more than one TAG for NR-DC. | BC | CY | N/A | N/A |

4.2.7.5 *FeatureSetDownlink* parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***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 | No | N/A | FR1 only |
| ***crossCarrierScheduling-OtherSCS***  Indicates whether the UE supports cross carrier scheduling for the different numerologies with carrier indicator field (CIF) in DL carrier aggregation where numerologies for the scheduling cell and scheduled cell are different.  NOTE: Cross-carrier scheduling with different numerologies is not supported in this release of specification. | 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 |
| ***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 UE shall hence include as many *FeatureSetDownlinkPerCC-Id* in this list as the number of carriers it supports according to the *ca-bandwidthClassDL*. 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***  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 c1, c2 and c3 correspond to the values defined in TS 38.101-2 [3]. It is mandatory to report for UE which supports DL intra-band non-contiguous CA in FR2. | FS | CY | N/A | FR2 only |
| ***oneFL-DMRS-ThreeAdditionalDMRS-DL***  Defines whether the UE supports DM-RS pattern for DL transmission with 1 symbol front-loaded DM-RS with three additional DM-RS symbols. | FS | No | N/A | N/A |
| ***oneFL-DMRS-TwoAdditionalDMRS-DL***  Defines support of DM-RS pattern for DL transmission with 1 symbol front-loaded DM-RS with 2 additional DM-RS symbols and more than 1 antenna ports. | FS | Yes | N/A | N/A |
| ***pdcch-MonitoringAnyOccasions***  Defines the supported PDCCH search space monitoring occasions. withoutDCI-gap indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot for Type 1-PDCCH common search space configured by dedicated RRC signaling, for a Type 3-PDCCH common search space, or for a UE-specific search space with the capability of supporting at least 44, 36, 22, and 20 blind decodes in a slot for 15 kHz, 30 kHz, 60kHz, and 120 kHz subcarrier spacing values respectively. withDCI-gap indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot with minimum time separation of two OFDM symbols for 15 kHz, four OFDM symbols for 30 kHz, seven OFDM symbols for 60 kHz with NCP, and 14OFDM symbols for 120kHz between two consecutive transmissions of PDCCH scrambled with C-RNTI, MCS-C-RNTI, or CS-RNTI for Type 1-PDCCH common search space configured by dedicated RRC signaling, for a Type 3-PDCCH common search space, or for a UE-specific search space, with the capability of supporting at least 44, 36, 22, and 20 blind decodes in a slot for 15 kHz, 30 kHz, 60kHz, and 120 kHz subcarrier spacing values respectively. | FS | No | N/A | N/A |
| ***pdcch-MonitoringAnyOccasionsWithSpanGap***  Indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot with minimum time separation between two consecutive transmissions of PDCCH with span up to two OFDM symbols for two OFDM symbols or span up to three OFDM symbols for four and seven OFDM symbols. Value set1 indicates the supported value set (X,Y) is (7,3), value set2 indicates the supported value set (X,Y) is (4,3) and (7,3) and value set 3 indicates the supported value set (X,Y) is (2,2), (4,3) and (7,3). | FS | No | N/A | N/A |
| ***pdsch-ProcessingType1-DifferentTB-PerSlot***  Defines whether the UE capable of processing time capability 1 supports reception of up to two, four or seven unicast PDSCHs for several transport blocks with PDSCH scrambled using C-RNTI, TC-RNTI, or CS-RNTI in one serving cell within the same slot per CC that are multiplexed in time domain only.  Note PDSCH(s) for Msg.4 is included. | FS | No | N/A | N/A |
| ***pdsch-ProcessingType2***  Indicates whether the UE supports PDSCH processing capability 2. The UE supports it only if all serving cells are self-scheduled and if all serving cells in one band on which the network configured processingType2 use the same subcarrier spacing. This capability signalling comprises the following parameters for each sub-carrier spacing supported by the UE.  - *fallback* indicates whether the UE supports PDSCH processing capability 2 when the number of configured carriers is larger than *numberOfCarriers* for a reported value of *differentTB-PerSlot*. If *fallback* = 'sc', UE supports capability 2 processing time on lowest cell index among the configured carriers in the band where the value is reported, if *fallback* = 'cap1-only', UE supports only capability 1, in the band where the value is reported;  - *differentTB-PerSlot* indicates whether the UE supports processing type 2 for 1, 2, 4 and/or 7 unicast PDSCHs for different transport blocks per slot per CC; and if so, it indicates up to which number of CA serving cells the UE supports that number of unicast PDSCHs for different TBs. The UE shall include at least one of *numberOfCarriers* for 1, 2, 4 or 7 transport blocks per slot in this field if *pdsch-ProcessingType2* is indicated. | FS | No | N/A | FR1 only |
| ***pdsch-ProcessingType2-Limited***  Indicates whether the UE supports PDSCH processing capability 2 with scheduling limitation for SCS 30kHz. This capability signalling comprises the following parameter.  - *differentTB-PerSlot-SCS-30kHz* indicates the number of different TBs per slot.  The UE supports this limited processing capability 2 only if:  1) One carrier is configured in the band, independent of the number of carriers configured in the other bands;  2) The maximum bandwidth of PDSCH is 136 PRBs;  3) N1 based on Table 5.3-2 of TS 38.214 [12] for SCS 30 kHz. | FS | No | N/A | FR1 only |
| ***pdsch-SeparationWithGap***  Indicates whether the UE supports separation of two unicast PDSCHs with a gap, applicable to Sub-carrier spacings of 30 kHz and 60 kHz only. For any two consecutive slots n and n+1, if there are more than 1 unicast PDSCH in either slot, the minimum time separation between starting time of any two unicast PDSCHs within the duration of these slots is 4 OFDM symbols for 30kHz and 7 OFDM symbols for 60kHz. | FS | No | N/A | N/A |
| ***scalingFactor***  Indicates the scaling factor to be applied to the band in the max data rate calculation as defined in 4.1.2. Value f0p4 indicates the scaling factor 0.4, f0p75 indicates 0.75, and so on. If absent, the scaling factor 1 is applied to the band in the max data rate calculation. | FS | No | N/A | N/A |
| ***scellWithoutSSB***  Defines whether the UE supports configuration of SCell that does not transmit SS/PBCH block. This is conditionally mandatory with capability signalling for intra-band CA but not supported for inter-band CA. | FS | CY | N/A | N/A |
| ***searchSpaceSharingCA-DL***  Defines whether the UE supports DL PDCCH search space sharing for carrier aggregation operation. | FS | No | N/A | N/A |
| ***timeDurationForQCL***  Defines minimum number of OFDM symbols required by the UE to perform PDCCH reception and applying spatial QCL information received in DCI for PDSCH processing as described in TS 38.214 [12] clause 5.1.5. UE shall indicate one value of the minimum number of OFDM symbols per each subcarrier spacing of 60kHz and 120kHz. | FS | Yes | N/A | FR2 only |
| ***twoFL-DMRS-TwoAdditionalDMRS-DL***  Defines whether the UE supports DM-RS pattern for DL transmission with 2 symbols front-loaded DM-RS with one additional 2 symbols DM-RS. | FS | No | N/A | N/A |
| ***type1-3-CSS***  Defines whether the UE is able to receive PDCCH in FR2 in a Type1-PDCCH common search space configured by dedicated RRC signaling, in a Type3-PDCCH common search space or a UE-specific search space if those are associated with a CORESET with a duration of 3 symbols. | FS | Yes | N/A | FR2 only |
| ***ue-SpecificUL-DL-Assignment***  Indicates whether the UE supports dynamic determination of UL and DL link direction and slot format based on Layer 1 scheduling DCI and higher layer configured parameter UL-DL-configuration-dedicated as specified in TS 38.213 [11]. | FS | No | N/A | N/A |

4.2.7.6 *FeatureSetDownlinkPerCC* parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***channelBW-90mhz***  Indicates whether the UE supports the channel bandwidth of 90 MHz. | FSPC | No | N/A | FR1 only |
| ***maxNumberMIMO-LayersPDSCH***  Defines the maximum number of spatial multiplexing layer(s) supported by the UE for DL reception. For single CC standalone NR, it is mandatory with capability signaling to support at least 4 MIMO layers in the bands where 4Rx is specified as mandatory for the given UE and at least 2 MIMO layers in FR2. If absent, the UE does not support MIMO on this carrier. | FSPC | CY | N/A | N/A |
| ***supportedBandwidthDL***  Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC, 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.  For FR1, all the bandwidths listed in TS38.101-1 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] and TS 38.101-2 [3].  NOTE: To determine whether the UE supports a channel bandwidth of 90 MHz, the network may ignore this capability for and validate instead the *channelBW-90mhz* and the *supportedBandwidthCombinationSet*. For serving cells with other channel bandwidths the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet* and *supportedBandwidthDL*. | FSPC | CY | N/A | N/A |
| ***supportedModulationOrderDL***  Indicates the maximum supported modulation order to be applied for downlink 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 downlink. If not included:  - for FR1, the network uses the modulation order signalled in *pdsch-256QAM-FR1.*  - for FR2, the network uses the modulation order signalled per band i.e. *pdsch-256QAM-FR2* 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 |
| ***supportedSubCarrierSpacingDL***  Defines the supported sub-carrier spacing for DL by the UE, as defined in clause 4.2-1 of TS 38.211 [6], indicating the UE supports simultaneous reception with same or different numerologies in CA. Support of simultaneous reception 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 reception with two different numerologies between FR1 band(s) and FR2 band(s) in DL is mandatory with capability if UE supports inter-band NR CA including both FR1 band(s) and FR2 band(s). Optional for other cases. Support of simultaneous reception of with different numerologies in CA for other cases is optional. | FSPC | CY | N/A | N/A |

4.2.7.7 *FeatureSetUplink* parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***scalingFactor***  Indicates the scaling factor to be applied to the band in the max data rate calculation as defined in 4.1.2. Value f0p4 indicates the scaling factor 0.4, f0p75 indicates 0.75, and so on. If absent, the scaling factor 1 is applied to the band in the max data rate calculation. | FS | No | N/A | N/A |
| ***crossCarrierScheduling-OtherSCS***  Indicates whether the UE supports cross carrier scheduling for the different numerologies with carrier indicator field (CIF) in UL carrier aggregation where numerologies for the scheduling cell and scheduled cell are different. The UE shall set this field to the same value as *crossCarrierScheduling-OtherSCS* in the associated *FeatureSetDownlink* (if present).  NOTE: Cross-carrier scheduling with different numerologies is not supported in this release of specification. | FS | No | N/A | N/A |
| ***dynamicSwitchSUL***  Indicates whether the UE supports supplemental uplink with dynamic switch (DCI based selection of PUSCH carrier). | FS | No | N/A | N/A |
| ***featureSetListPerUplinkCC***  Indicates which features the UE supports on the individual UL carriers of the feature set (and hence of a band entry that refer to the feature set) by *FeatureSetUplinkPerCC-Id*. The UE shall hence include as many *FeatureSetUplinkPerCC-Id* in this list as the number of carriers it supports according to the *ca-bandwidthClassUL*. 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 *FeatureSetUplinkPerCC-Id* in this list. A fallback per CC feature set resulting from the reported feature set per UL CC is not signalled but the UE shall support it. | FS | N/A | N/A | N/A |
| ***intraBandFreqSeparationUL***  Indicates UL 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 FeatureSetUplink of each band entry within a band. The values c1, c2 and c3 corresponds to the values defined in TS 38.101-2 [3]. It is mandatory to report for UE which supports UL non-contiguous CA in FR2. | FS | CY | N/A | FR2 only |
| ***pa-PhaseDiscontinuityImpacts***  Indicates incapability motivated by impacts of PA phase discontinuity with overlapping transmissions with non-aligned starting or ending times or hop boundaries across carriers for intra-band EN-DC, intra-band CA and FDM based ULSUP. | FS | No | N/A | N/A |
| ***pusch-ProcessingType1-DifferentTB-PerSlot***  Indicates whether the UE capable of processing time capability 1 supports transmission of up to two, four or seven unicast PUSCHs for several transport blocks in one serving cell within the same slot per CC that are multiplexed in time domain only. | FS | No | N/A | N/A |
| ***pusch-ProcessingType2***  Indicates whether the UE supports PUSCH processing capability 2. The UE supports it only if all serving cells are self-scheduled and if all serving cells in one band on which the network configured processingType2 use the same subcarrier spacing. This capability signalling comprises the following parameters for each sub-carrier spacing supported by the UE.  - *fallback* indicates whether the UE supports PUSCH processing capability 2 when the number of configured carriers is larger than *numberOfCarriers* for a reported value of *differentTB-PerSlot*. If *fallback* = 'sc', UE supports capability 2 processing time on lowest cell index among the configured carriers in the band where the value is reported, if *fallback* = 'cap1-only', UE supports only capability 1, in the band where the value is reported;  - *differentTB-PerSlot* indicates whether the UE supports processing type 2 for 1, 2, 4 and/or 7 unicast PUSCHs for different transport blocks per slot per CC; and if so, it indicates up to which number of CA serving cells the UE supports that number of unicast PUSCHs for different TBs. The UE shall include at least one of *numberOfCarriers* for 1, 2, 4 or 7 transport blocks per slot in this field if *pusch-ProcessingType2* is indicated. | FS | No | N/A | FR1 only |
| ***pusch-SeparationWithGap***  Indicates whether the UE supports separation of two unicast PUSCHs with a gap, applicable to Sub-carrier spacings of 15 kHz, 30 kHz and 60 kHz only. For any two consecutive slots n and n+1, if there are more than 1 unicast PUSCH in either slot, the minimum time separation between starting time of any two unicast PUSCHs within the duration of these slots is 2 OFDM symbols for 15kHz, 4 OFDM symbols for 30kHz and 7 OFDM symbols for 60kHz. | FS | No | N/A | N/A |
| ***searchSpaceSharingCA-UL***  Defines whether the UE supports UL PDCCH search space sharing for carrier aggregation operation. | FS | No | N/A | N/A |
| ***simultaneousTxSUL-NonSUL***  Indicates whether the UE supports simultaneous transmission of SRS on an SUL/non-SUL carrier and PUSCH/PUCCH/SRS on the other UL carrier in the same cell. | FS | No | N/A | N/A |
| ***supportedSRS-Resources***  Defines support of SRS resources. The capability signalling comprising indication of:  - *maxNumberAperiodicSRS-PerBWP* indicates supported maximum number of aperiodic SRS resources that can be configured for the UE per each BWP  - *maxNumberAperiodicSRS-PerBWP-PerSlot* indicates supported maximum number of aperiodic SRS resources per slot in the BWP  - *maxNumberPeriodicSRS-PerBWP* indicates supported maximum number of periodic SRS resources per BWP  - *maxNumberPeriodicSRS-PerBWP-PerSlot* indicates supported maximum number of periodic SRS resources per slot in the BWP  - *maxNumberSemiPersistentSRS-PerBWP* indicate supported maximum number of semi-persistent SRS resources that can be configured for the UE per each BWP  - *maxNumberSemiPersistentSRS-PerBWP-PerSlot* indicates supported maximum number of semi-persistent SRS resources per slot in the BWP  - *maxNumberSRS-Ports-PerResource* indicates supported maximum number of SRS antenna port per each SRS resource | FS | Yes | N/A | N/A |
| ***twoPUCCH-Group***  Indicates whether two PUCCH group in CA with a same numerology across CCs for data and control channel [at a given time] is supported by the UE. For NR CA, two PUCCH group is supported with the same numerology across NR carriers for data and control channel at a given time. For EN-DC, two PUCCH group is supported with the same numerology across NR carriers for data and control channel at a given time, wherein an NR PUCCH group is configured in FR1 and another NR PUCCH group is configured in FR2. | FS | No | N/A | N/A |
| ***ul-MCS-TableAlt-DynamicIndication***  Indicates whether the UE supports dynamic indication of MCS table using MCS-C-RNTI for PUSCH. | FS | No | N/A | N/A |
| ***zeroSlotOffsetAperiodicSRS***  Indicates whether the UE supports 0 slot offset between aperiodic SRS triggering and transmission, for SRS for CB PUSCH and antenna switching on FR1. | FS | No | N/A | N/A |

4.2.7.8 *FeatureSetUplinkPerCC* parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***channelBW-90mhz***  Indicates whether the UE supports the channel bandwidth of 90 MHz. | FSPC | No | N/A | FR1 only |
| ***maxNumberMIMO-LayersCB-PUSCH***  Defines supported maximum number of MIMO layers at the UE for PUSCH transmission with codebook precoding. UE indicating support of this feature shall also indicate support of PUSCH codebook coherency subset. This feature is not supported for SUL. | 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. This feature is not supported for SUL.  UE supporting non-codebook based PUSCH transmission shall indicate support of *maxNumberMIMO-LayersNonCB-PUSCH, maxNumberSRS-ResourcePerSet* and *maxNumberSimultaneousSRS-ResourceTx* together. | FSPC | No | N/A | N/A |
| ***maxNumberSimultaneousSRS-ResourceTx***  Defines the maximum number of simultaneous transmitted SRS resources at one symbol for non-codebook based transmission to the UE. This feature is not supported for SUL. | FSPC | No | N/A | N/A |
| ***maxNumberSRS-ResourcePerSet***  Defines the maximum number of SRS resources per SRS resource set configured for codebook or non-codebook based transmission to the UE. This feature is not supported for SUL. | FSPC | No | N/A | N/A |
| ***supportedBandwidthUL***  Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC, which is defined in Table 5.3.5-1 in TS38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.  For FR1, all the bandwidths listed in TS38.101-1 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] and TS 38.101-2 [3].  NOTE: To determine whether the UE supports a channel bandwidth of 90 MHz the network may ignore this capability for and validate instead the *channelBW-90mhz* and the *supportedBandwidthCombiantionSet*. For serving cells with other channel bandwidths the network validates the *channelBWs-UL*, the *supportedBandwidthCombinationSet* and *supportedBandwidthUL*. | 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 |

4.2.7.9 *MRDC-Parameters*

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***asyncIntraBandENDC***  Indicates whether the UE supports asynchronous FDD-FDD intra-band EN-DC with MRTD and MTTD as specified in clause 7.5 and 7.6 of TS 38.133 [5]. If asynchronous FDD-FDD intra-band EN-DC is not supported, the UE supports only synchronous FDD-FDD intra-band EN-DC. | BC | No | FDD only | FR1 only |
| ***dualPA-Architecture***  For an intra-band band combination, this field indicates the support of dual PAs. If absent in an intra-band band combination, the UE supports single PA for all the ULs in the intra-band band combination. For other band combinations, this field is not applicable. | BC | No | N/A | N/A |
| ***dynamicPowerSharingENDC***  Indicates whether the UE supports dynamic (NG)EN-DC power sharing between NR FR1 carriers and the LTE carriers. If the UE supports this capability the UE supports the dynamic power sharing behaviour as specified in clause 7 of TS 38.213 [11]. | BC | Yes | N/A | FR1 only |
| ***dynamicPowerSharingNEDC***  Indicates whether the UE supports dynamic NE-DC power sharing between NR FR1 carriers and the LTE carriers. If the UE supports this capability, the UE supports the dynamic power sharing behavior as specified in clause 7 of TS 38.213 [11]. | BC | Yes | N/A | FR1 only |
| ***intraBandENDC-Support***  Indicates whether the UE supports intra-band EN-DC with only non-contiguous spectrum, or with both contiguous and non-contiguous spectrum for the EN-DC combination as specified in TS 38.101-3 [4].  If the UE does not include this field for an intra-band EN-DC combination the UE only supports the contiguous spectrum for the intra-band EN-DC combination. | BC | No | N/A | N/A |
| ***interBandContiguousMRDC***  Indicates for an inter-band (NG)EN-DC/NE-DC combination, where the frequency range of the E-UTRA band is a subset of the frequency range of the NR band (as specified in Table 5.5B.4.1-1 of TS 38.101-3 [4]), that the UE supports intra-band contiguous (NG)EN-DC/NE-DC requirements (see TS 38.101-3 [4]). If the field is absent for such an inter-band (NG)EN-DC/NE-DC combination, the UE supports intra-band non-contiguous (NG)EN-DC/NE-DC requirements. | BC | CY | N/A | N/A |
| ***simultaneousRxTxInterBandENDC***  Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band EN-DC. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-3 [4]. | BC | CY | N/A | N/A |
| ***singleUL-Transmission***  Indicates that the UE does not support simultaneous UL transmissions as defined in TS 38.101-3 [4]. The UE may only include this field for certain band combinations defined in TS 38.101-3 [4]. If included for a particular band combination, the field applies to all fallback band combinations of this band combination that are defined in TS 38.101-3 [4] as being allowed to include this field and does not apply to any other fallback band combinations defined in TS 38.101-3 [4]. | BC | No | N/A | N/A |
| ***tdm-Pattern***  Indicates whether the UE supports the *tdm-PatternConfig* for *single UL-transmission* associated functionality, as specified in TS 36.331 [17]. Support is conditionally mandatory in (NG)EN-DC for UEs that do not support dynamicPowerSharingENDC and for UEs that indicate single UL transmission for any (NG)EN-DC BC. Support is conditionally mandatory in NE-DC for UEs that do not support dynamicPowerSharingNEDC and for UEs that indicate single UL transmission for any NE-DC BC. The feature is optional otherwise. | BC | CY | N/A | FR1 only |
| ***ul-SharingEUTRA-NR***  Indicates whether the UE supports EN-DC with EUTRA-NR coexistence in UL sharing via TDM only, FDM only, or both TDM and FDM from UE perspective as specified in TS 38.101-3 [4]. | BC | No | N/A | FR1 only |
| ***ul-SwitchingTimeEUTRA-NR***  Indicates support of switching type between LTE UL and NR UL for EN-DC with LTE-NR coexistence in UL sharing from UE perspective as defined in clause 6.3B of TS 38.101-3 [4]. It is mandatory to report switching time type 1 or type 2 if UE reports *ul-SharingEUTRA-NR* is *tdm* or *both*. | BC | CY | N/A | FR1 only |
| ***ul-TimingAlignmentEUTRA-NR***  Indicates whether to apply the same UL timing between NR and LTE for dynamic power sharing capable UE operating in a synchronous intra-band contiguous (NG)EN-DC. If this field is absent, UE shall be capable of handling a timing difference up to applicable MTTD requirements when operating in a synchronous intra-band contiguous (NG)EN-DC network, as specified in TS 38.133 [5]. If this capability is included in an inter-band (NG)EN-DC BC with an intra-band (NG)EN-DC BC part, this capability is used to indicate the restriction to the intra-band (NG)EN-DC BC part. | BC | No | N/A | N/A |

4.2.7.10 *Phy-Parameters*

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***absoluteTPC-Command***  Indicates whether the UE supports absolute TPC command mode. | UE | No | No | Yes |
| ***almostContiguousCP-OFDM-UL***  Indicates whether the UE supports almost contiguous UL CP-OFDM transmissions as defined in clause 6.2 of TS 38.101-1 [2]. | UE | No | No | Yes |
| ***bwp-SwitchingDelay***  Defines whether the UE supports DCI and timer based active BWP switching delay type1 or type2 specified in clause 8.6.2 of TS 38.133 [5]. It is mandatory to report type 1 or type 2. | UE | Yes | No | No |
| ***cbg-FlushIndication-DL***  Indicates whether the UE supports CBG-based (re)transmission for DL using CBG flushing out information (CBGFI) as specified in TS 38.214 [12]. | UE | No | No | No |
| ***cbg-TransIndication-DL***  Indicates whether the UE supports CBG-based (re)transmission for DL using CBG transmission information (CBGTI) as specified in TS 38.214 [12]. | UE | No | No | No |
| ***cbg-TransIndication-UL***  Indicates whether the UE supports CBG-based (re)transmission for UL using CBG transmission information (CBGTI) as specified in TS 38.214 [12]. | UE | No | No | No |
| ***configuredUL-GrantType1***  Indicates whether the UE supports Type 1 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value of one. | UE | No | No | No |
| ***configuredUL-GrantType2***  Indicates whether the UE supports Type 2 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value of one. | UE | No | No | No |
| ***cqi-TableAlt***  Indicates whether UE supports the CQI table with target BLER of 10^-5. | UE | No | No | Yes |
| ***csi-ReportFramework***  See *csi-ReportFramework* in 4.2.7.2. For a band combination comprised of FR1 and FR2 bands, this parameter, if present, limits the corresponding parameter in *MIMO-ParametersPerBand*. | UE | Yes | No | Yes |
| ***csi-ReportWithoutCQI***  Indicates whether UE supports CSI reporting with report quantity set to 'CRI/RI/i1' as defined in clause 5.2.1.4 of TS 38.214 [12]. | UE | No | No | Yes |
| ***csi-ReportWithoutPMI***  Indicates whether UE supports CSI reporting with report quantity set to 'CRI/RI/CQI' as defined in clause 5.2.1.4 of TS 38.214 [12]. | UE | No | No | Yes |
| ***csi-RS-CFRA-ForHO***  Indicates whether the UE can perform reconfiguration with sync using a contention free random access on PRACH resources that are associated with CSI-RS resources of the target cell. | UE | No | No | No |
| ***csi-RS-IM-ReceptionForFeedback***  See *csi-RS-IM-ReceptionForFeedback* in 4.2.7.2. For a band combination comprised of FR1 and FR2 bands, this parameter, if present, limits the corresponding parameter in *MIMO-ParametersPerBand*. | UE | Yes | No | Yes |
| ***csi-RS-ProcFrameworkForSRS***  See *csi-RS-ProcFrameworkForSRS* in 4.2.7.2. For a band combination comprised of FR1 and FR2 bands, this parameter, if present, limits the corresponding parameter in *MIMO-ParametersPerBand*. | UE | No | No | Yes |
| ***dl-64QAM-MCS-TableAlt***  Indicates whether the UE supports the alternative 64QAM MCS table for PDSCH. | UE | No | No | Yes |
| ***dl-SchedulingOffset-PDSCH-TypeA***  Indicates whether the UE supports DL scheduling slot offset (K0) greater than 0 for PDSCH mapping type A. | UE | Yes | Yes | Yes |
| ***dl-SchedulingOffset-PDSCH-TypeB***  Indicates whether the UE supports DL scheduling slot offset (K0) greater than 0 for PDSCH mapping type B. | UE | Yes | Yes | Yes |
| ***downlinkSPS***  Indicates whether the UE supports PDSCH reception based on semi-persistent scheduling. | UE | No | No | No |
| ***dynamicBetaOffsetInd-HARQ-ACK-CSI***  Indicates whether the UE supports indicating beta-offset (UCI repetition factor onto PUSCH) for HARQ-ACK and/or CSI via DCI among the RRC configured beta-offsets. | UE | No | No | No |
| ***dynamicHARQ-ACK-Codebook***  Indicates whether the UE supports HARQ-ACK codebook dynamically constructed by DCI(s). This field shall be set to *supported*. | UE | Yes | No | No |
| ***dynamicHARQ-ACK-CodeB-CBG-Retx-DL***  Indicates whether the UE supports HARQ-ACK codebook size for CBG-based (re)transmission based on the DAI-based solution as specified in TS 38.213 [11]. | UE | No | No | No |
| ***dynamicPRB-BundlingDL***  Indicates whether UE supports DCI-based indication of the PRG size for PDSCH reception. | UE | No | No | No |
| ***dynamicSFI***  Indicates whether the UE supports monitoring for DCI format 2\_0 and determination of slot formats via DCI format 2\_0. | UE | No | Yes | Yes |
| ***dynamicSwitchRA-Type0-1-PDSCH***  Indicates whether the UE supports dynamic switching between resource allocation Types 0 and 1 for PDSCH as specified in TS 38.212 [10]. | UE | No | No | No |
| ***dynamicSwitchRA-Type0-1-PUSCH***  Indicates whether the UE supports dynamic switching between resource allocation Types 0 and 1 for PUSCH as specified in TS 38.212 [10]. | UE | No | No | No |
| ***pucch-F0-2WithoutFH***  Indicates whether the UE supports transmission of a PUCCH format 0 or 2 without frequency hopping. When included, the UE does not support PUCCH formats 0 and 2 without frequency hopping. When not included, the UE supports the PUCCH formats 0 and 2 without frequency hopping. | UE | Yes | No | Yes |
| ***pucch-F1-3-4WithoutFH***  Indicates whether the UE supports transmission of a PUCCH format 1, 3 or 4 without frequency hopping. When included, the UE does not support PUCCH formats 1, 3 and 4 without frequency hopping. When not included, the UE supports the PUCCH formats 1, 3 and 4 without frequency hopping. | UE | Yes | No | Yes |
| ***interleavingVRB-ToPRB-PDSCH***  Indicates whether the UE supports receiving PDSCH with interleaved VRB-to-PRB mapping as specified in TS 38.211 [6]. | UE | Yes | No | No |
| ***interSlotFreqHopping-PUSCH***  Indicates whether the UE supports inter-slot frequency hopping for PUSCH transmissions. | UE | No | No | No |
| ***intraSlotFreqHopping-PUSCH***  Indicates whether the UE supports intra-slot frequency hopping for PUSCH transmission, except for PUSCH scheduled by PDCCH in the Type1-PDCCH common search space before RRC connection establishment. | UE | Yes | No | Yes |
| ***maxLayersMIMO-Indication***  Indicates whether the UE supports the network configuration of *maxMIMO-Layers* as specified in TS 38.331 [9]. | UE | Yes | No | No |
| ***maxNumberSearchSpaces***  Indicates whether the UE supports up to 10 search spaces in an SCell per BWP. | UE | No | No | No |
| ***multipleCORESET***  Indicates whether the UE supports configuration of more than one PDCCH CORESET per BWP in addition to the CORESET with CORESET-ID 0 in the BWP. It is mandatory with capability signaling for FR2 and optional for FR1. | UE | CY | No | Yes |
| ***mux-HARQ-ACK-PUSCH-DiffSymbol***  Indicates whether the UE supports HARQ-ACK piggyback on a PUSCH with/without aperiodic CSI once per slot when the starting OFDM symbol of the PUSCH is different from the starting OFDM symbols of the PUCCH resource that HARQ-ACK would have been transmitted on. | UE | Yes | No | Yes |
| ***mux-MultipleGroupCtrlCH-Overlap***  Indicates whether the UE supports more than one group of overlapping PUCCHs and PUSCHs per slot per PUCCH cell group for control multiplexing. | UE | No | No | Yes |
| ***mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot***  Indicates whether the UE supports multiplexing SR, HARQ-ACK and CSI on a PUCCH or piggybacking on a PUSCH more than once per slot when SR, HARQ-ACK and CSI are supposed to be sent with the same or different starting symbol in a slot. | UE | No | No | Yes |
| ***mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot***  *sameSymbol* indicates the UE supports multiplexing SR, HARQ-ACK and CSI on a PUCCH or piggybacking on a PUSCH once per slot, when SR, HARQ-ACK and CSI are supposed to be sent with the same starting symbols on the PUCCH resources in a slot. *diffSymbol* indicates the UE supports multiplexing SR, HARQ-ACK and CSI on a PUCCH or piggybacking on a PUSCH once per slot, when SR, HARQ-ACK and CSI are supposed to be sent with the different starting symbols in a slot. The UE is mandated to support the multiplexing and piggybacking features indicated by *sameSymbol* while the UE is optional to support the multiplexing and piggybacking features indicated by *diffSymbol*.  If the UE indicates *sameSymbol* in this field and does not support *mux-HARQ-ACK-PUSCH-DiffSymbol*, the UE supports HARQ-ACK/CSI piggyback on PUSCH once per slot, when the starting OFDM symbol of the PUSCH is the same as the starting OFDM symbols of the PUCCH resource(s) that would have been transmitted on.  If the UE indicates *sameSymbol* in this field and supports *mux-HARQ-ACK-PUSCH-DiffSymbol*, the UE supports HARQ-ACK/CSI piggyback on PUSCH once per slot for which case the starting OFDM symbol of the PUSCH is the different from the starting OFDM symbols of the PUCCH resource(s) that would have been transmitted on. | UE | FD | No | Yes |
| ***mux-SR-HARQ-ACK-PUCCH***  Indicates whether the UE supports multiplexing SR and HARQ-ACK on a PUCCH or piggybacking on a PUSCH once per slot, when SR and HARQ-ACK are supposed to be sent with the different starting symbols in a slot. | UE | No | No | Yes |
| ***nzp-CSI-RS-IntefMgmt***  Indicates whether the UE supports interference measurements using NZP CSI-RS. | UE | No | No | No |
| ***oneFL-DMRS-ThreeAdditionalDMRS-UL***  Defines whether the UE supports DM-RS pattern for UL transmission with 1 symbol front-loaded DM-RS with three additional DM-RS symbols. | UE | No | No | Yes |
| ***oneFL-DMRS-TwoAdditionalDMRS-UL***  Defines support of DM-RS pattern for UL transmission with 1 symbol front-loaded DM-RS with 2 additional DM-RS symbols and more than 1 antenna ports. | UE | Yes | No | Yes |
| ***onePortsPTRS***  Defines whether UE supports PT-RS with 1 antenna port in DL reception and/or UL transmission. It is mandatory with UE capability signalling for FR2 and optional for FR1. The left most in the bitmap corresponds to DL reception and the right most bit in the bitmap corresponds to UL transmission. | UE | CY | No | Yes |
| ***onePUCCH-LongAndShortFormat***  Indicates whether the UE supports transmission of one long PUCCH format and one short PUCCH format in TDM in the same slot. | UE | No | No | Yes |
| ***pCell-FR2***  Indicates whether the UE supports PCell operation on FR2. | UE | Yes | No | FR2 only |
| ***pdcch-MonitoringSingleOccasion***  Indicates whether the UE supports receiving PDCCH scrambled with C-RNTI or CS-RNTI in a search space configured to be monitored within a single span of any three contiguous OFDM symbols in a slot with the capability of supporting at least 44 blind decodes in a slot for 15 kHz subcarrier spacing. | UE | No | No | FR1 only |
| ***pdcch-BlindDetectionCA***  Indicates PDCCH blind decoding capabilities supported by the UE for CA with more than 4 CCs as specified in TS 38.213 [11]. The field value is from 4 to 16.  NOTE: FR1-FR2 differentiation is not allowed in this release, although the capability signalling is supported for FR1-FR2 differentiation. | UE | No | No | No |
| ***pdcch-BlindDetectionMCG-UE***  Indicates PDCCH blind decoding capabilities supported for MCG when in NR DC. The field value is from 1 to 15. The UE sets the value in accordance with the constraints specified in TS 38.213 [11].  Additionally, if the UE does not report *pdcch-BlindDetectionCA*, and if X is the maximum number of CCs supported by the UE across all NR-DC band combinations then there is at least one parameter pair (X1, X2) such that X1 + X2 = X and the UE supports at least one NR-DC band combination with X1 CCs in MCG and X2 CCs in SCG and for which X1 <= *pdcch-BlindDetectionMCG-UE* and X2 <= *pdcch-BlindDetectionSCG-UE*. | UE | No | No | Yes |
| ***pdcch-BlindDetectionSCG-UE***  Indicates PDCCH blind decoding capabilities supported for SCG when in NR DC. The field value is from 1 to 15. The UE sets the value in accordance with the constraints specified in TS 38.213 [11].  Additionally, if the UE does not report *pdcch-BlindDetectionCA*, and if X is the maximum number of CCs supported by the UE across all NR-DC band combinations then there is at least one parameter pair (X1, X2) such that X1 + X2 = X and the UE supports at least one NR-DC band combination with X1 CCs in MCG and X2 CCs in SCG and for which X1 <= *pdcch-BlindDetectionMCG-UE* and X2 <= *pdcch-BlindDetectionSCG-UE*. | UE | No | No | Yes |
| ***pdsch-256QAM-FR1***  Indicates whether the UE supports 256QAM modulation scheme for PDSCH for FR1 as defined in 7.3.1.2 of TS 38.211 [6]. | UE | Yes | No | FR1 only |
| ***pdsch-MappingTypeA***  Indicates whether the UE supports receiving PDSCH using PDSCH mapping type A with less than seven symbols. This field shall be set to *supported*. | UE | Yes | No | No |
| ***pdsch-MappingTypeB***  Indicates whether the UE supports receiving PDSCH using PDSCH mapping type B. | UE | Yes | No | No |
| ***pdsch-RepetitionMultiSlots***  Indicates whether the UE supports receiving PDSCH scheduled by DCI format 1\_1 when configured with higher layer parameter *pdsch-AggregationFactor* > 1, as defined in 5.1.2.1 of TS 38.214 [12]. | UE | No | No | No |
| ***pdsch-RE-MappingFR1-PerSymbol/pdsch-RE-MappingFR1-PerSlot***  Indicates the maximum number of supported PDSCH Resource Element (RE) mapping patterns for FR1, each described as a resource (including NZP/ZP CSI-RS, CRS, CORESET and SSB) or bitmap. The number of patterns coinciding in a symbol in a CC and in a slot in a CCare limited by the respective capability parameters. Value n10 means 10 RE mapping patterns and n16 means 16 RE mapping patterns, and so on. | UE | Yes | No | FR1 only |
| ***pdsch-RE-MappingFR2-PerSymbol/pdsch-RE-MappingFR2-PerSlot***  Indicates the maximum number of supported PDSCH Resource Element (RE) mapping patterns for FR2, each described as a resource (including NZP/ZP CSI-RS, CORESET and SSB) or bitmap. The number of patterns coinciding in a symbol in a CC and in a slot in a CC are limited by the respective capability parameters. Value n6 means 6 RE mapping patterns and n16 means 16 RE mapping patterns, and so on. | UE | Yes | No | FR2 only |
| ***precoderGranularityCORESET***  Indicates whether the UE supports receiving PDCCH in CORESETs configured with CORESET-precoder-granularity equal to the size of the CORESET in the frequency domain as specified in TS 38.211 [6]. | UE | No | No | No |
| ***pre-EmptIndication-DL***  Indicates whether the UE supports interrupted transmission indication for PDSCH reception based on reception of DCI format 2\_1 as defined in TS 38.213 [11]. | UE | No | No | No |
| ***pucch-F2-WithFH***  Indicates whether the UE supports transmission of a PUCCH format 2 (2 OFDM symbols in total) with frequency hopping in a slot. This field shall be set to *supported*. | UE | Yes | No | Yes |
| ***pucch-F3-WithFH***  Indicates whether the UE supports transmission of a PUCCH format 3 (4~14 OFDM symbols in total) with frequency hopping in a slot. This field shall be set to *supported*. | UE | Yes | No | Yes |
| ***pucch-F3-4-HalfPi-BPSK***  Indicates whether the UE supports pi/2-BPSK for PUCCH format 3/4 as defined in 6.3.2.6 of TS 38.211 [6]. It is optional for FR1 and mandatory with capability signalling for FR2. | UE | CY | No | Yes |
| ***pucch-F4-WithFH***  Indicates whether the UE supports transmission of a PUCCH format 4 (4~14 OFDM symbols in total) with frequency hopping in a slot. | UE | Yes | No | Yes |
| ***pusch-RepetitionMultiSlots***  Indicates whether the UE supports transmitting PUSCH scheduled by DCI format 0\_1 when configured with higher layer parameter *pusch-AggregationFactor* > 1, as defined in clause 6.1.2.1 of TS 38.214 [12]. | UE | Yes | No | No |
| ***pucch-Repetition-F1-3-4***  Indicates whether the UE supports transmission of a PUCCH format 1 or 3 or 4 over multiple slots with the repetition factor 2, 4 or 8. | UE | Yes | No | No |
| ***pusch-HalfPi-BPSK***  Indicates whether the UE supports pi/2-BPSK modulation scheme for PUSCH as defined in 6.3.1.2 of TS 38.211 [6]. It is optional for FR1 and mandatory with capability signalling for FR2. | UE | CY | No | Yes |
| ***pusch-LBRM***  Indicates whether the UE supports limited buffer rate matching in UL as specified in TS 38.212 [10]. | UE | No | No | Yes |
| ***ra-Type0-PUSCH***  Indicates whether the UE supports resource allocation Type 0 for PUSCH as specified in TS 38.214 [12]. | UE | No | No | No |
| ***rateMatchingCtrlResrcSetDynamic***  Indicates whether the UE supports dynamic rate matching for DL control resource set. | UE | Yes | No | No |
| ***rateMatchingResrcSetDynamic***  Indicates whether the UE supports receiving PDSCH with resource mapping that excludes the REs corresponding to resource sets configured with RB-symbol level granularity based on dynamic indication in the scheduling DCI as specified in TS 38.214 [12]. | UE | No | No | No |
| ***rateMatchingResrcSetSemi-Static***  Indicates whether the UE supports receiving PDSCH with resource mapping that excludes the REs corresponding to resource sets configured with RB-symbol level granularity following the semi-static configuration as specified in TS 38.214 [12]. | UE | Yes | No | No |
| ***scs-60kHz***  Indicates whether the UE supports 60kHz subcarrier spacing for data channel in FR1 as defined in clause 4.2-1 of TS 38.211 [6]. | UE | No | No | FR1 only |
| ***semiOpenLoopCSI***  Indicates whether UE supports CSI reporting with report quantity set to 'CRI/RI/i1/CQI ' as defined in clause 5.2.1.4 of TS 38.214 [12]. | UE | No | No | Yes |
| ***semiStaticHARQ-ACK-Codebook***  Indicates whether the UE supports HARQ-ACK codebook constructed by semi-static configuration. | UE | Yes | No | No |
| ***spatialBundlingHARQ-ACK***  Indicates whether the UE supports spatial bundling of HARQ-ACK bits carried on PUCCH or PUSCH per PUCCH group. With spatial bundling, two HARQ-ACK bits for a DL MIMO data is bundled into a single bit by logical "AND" operation. | UE | Yes | No | No |
| ***sp-CSI-IM***  Indicates whether the UE supports semi-persistent CSI-IM. | UE | No | No | Yes |
| ***sp-CSI-ReportPUCCH***  Indicates whether UE supports semi-persistent CSI reporting using PUCCH formats 2, 3 and 4. | UE | No | No | No |
| ***sp-CSI-ReportPUSCH***  Indicates whether UE supports semi-persistent CSI reporting using PUSCH. | UE | No | No | No |
| ***sp-CSI-RS***  Indicates whether the UE supports semi-persistent CSI-RS. | UE | Yes | No | Yes |
| ***supportedDMRS-TypeDL***  Defines supported DM-RS configuration types at the UE for DL reception. Type 1 is mandatory with capability signaling. Type 2 is optional. | UE | CY | No | Yes |
| ***supportedDMRS-TypeUL***  Defines supported DM-RS configuration types at the UE for UL transmission. Support of both type 1 and type 2 is mandatory with capability signalling. | UE | Yes | No | Yes |
| ***tdd-MultiDL-UL-SwitchPerSlot***  Indicates whether the UE supports more than one switch points in a slot for actual DL/UL transmission(s). | UE | No | TDD only | Yes |
| ***tpc-PUCCH-RNTI***  Indicates whether the UE supports group DCI message based on TPC-PUCCH-RNTI for TPC commands for PUCCH. | UE | No | No | Yes |
| ***tpc-PUSCH-RNTI***  Indicates whether the UE supports group DCI message based on TPC-PUSCH-RNTI for TPC commands for PUSCH. | UE | No | No | Yes |
| ***tpc-SRS-RNTI***  Indicates whether the UE supports group DCI message based on TPC-SRS-RNTI for TPC commands for SRS. | UE | No | No | Yes |
| ***twoDifferentTPC-Loop-PUCCH***  Indicates whether the UE supports two different TPC loops for PUCCH closed loop power control. | UE | Yes | Yes | Yes |
| ***twoDifferentTPC-Loop-PUSCH***  Indicates whether the UE supports two different TPC loops for PUSCH closed loop power control. | UE | Yes | Yes | Yes |
| ***twoFL-DMRS***  Defines whether the UE supports DM-RS pattern for DL reception and/or UL transmission with 2 symbols front-loaded DM-RS without additional DM-RS symbols.  The left most in the bitmap corresponds to DL reception and the right most bit in the bitmap corresponds to UL transmission. | UE | Yes | No | Yes |
| ***twoFL-DMRS-TwoAdditionalDMRS-UL***  Defines whether the UE supports DM-RS pattern for UL transmission with 2 symbols front-loaded DM-RS with one additional 2 symbols DM-RS. | UE | Yes | No | Yes |
| ***twoPUCCH-AnyOthersInSlot***  Indicates whether the UE supports transmission of two PUCCH formats in TDM in the same slot, which are not covered by *twoPUCCH-F0-2-ConsecSymbols* and *onePUCCH-LongAndShortFormat*. | UE | No | No | Yes |
| ***twoPUCCH-F0-2-ConsecSymbols***  Indicates whether the UE supports transmission of two PUCCHs of format 0 or 2 in consecutive symbols in a slot. | UE | No | Yes | Yes |
| ***type1-PUSCH-RepetitionMultiSlots***  Indicates whether the UE supports Type 1 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value equal to 2, 4, or 8 with a single repetition of the transport block within each slot, and redundancy version pattern as indicated by UL-TWG-RV-rep. A UE supporting this feature shall also support Type 1 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value of one. | UE | No | No | No |
| ***type2-PUSCH-RepetitionMultiSlots***  Indicates whether the UE supports Type 2 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value equal to 2, 4, or 8 with a single repetition of the transport block within each slot, and redundancy version pattern as indicated by UL-TWG-RV-rep. A UE supporting this feature shall also support Type 2 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value of one. | UE | No | No | No |
| ***type2-SP-CSI-Feedback-LongPUCCH***  Indicates whether UE supports Type II CSI semi-persistent CSI reporting over PUCCH Formats 3 and 4 as defined in clause 5.2.4 of TS 38.214 [12]. | UE | No | No | No |
| ***uci-CodeBlockSegmentation***  Indicates whether the UE supports segmenting UCI into multiple code blocks depending on the payload size. | UE | Yes | No | Yes |
| ***ul-64QAM-MCS-TableAlt***  Indicates whether the UE supports the alternative 64QAM MCS table for PUSCH with and without transform precoding respectively. | UE | No | No | Yes |
| ***ul-SchedulingOffset***  Indicates whether the UE supports UL scheduling slot offset (K2) greater than 12. | UE | Yes | Yes | Yes |

4.2.7.11 Other PHY parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD**  **DIFF** | **FR1-FR2**  **DIFF** |
| --- | --- | --- | --- | --- |
| ***appliedFreqBandListFilter***  Mirrors the *FreqBandList* that the NW provided in the capability enquiry, if any. The UE filtered the band combinations in the *supportedBandCombinationList* in accordance with this *appliedFreqBandListFilter*. | UE | No | No | No |
| ***downlinkSetEUTRA***  Indicates the features that the UE supports on the DL carriers corresponding to one EUTRA band entry in a band combination by FeatureSetEUTRA-DownlinkId. The FeatureSetEUTRA-DownlinkId = 0 means that the UE does not support a EUTRA DL carrier in this band of a band combination. | Band | N/A | N/A | N/A |
| ***downlinkSetNR***  Indicates the features that the UE supports on the DL carriers corresponding to one NR band entry in a band combination by FeatureSetDownlinkId. The FeatureSetDownlinkId = 0 means that the UE does not support a DL carrier in this band of a band combination. A fallback per band feature set resulting from the reported DL feature set that has fallback per CC feature set is not signalled but the UE shall support it. | Band | N/A | N/A | N/A |
| ***featureSetCombinations***  Pools of feature sets that the UE supports on the NR or MR-DC band combinations. | UE | N/A | No | No |
| ***featureSets***  Pools of downlink and uplink features sets as well as a pool of FeatureSetCombination elements. A FeatureSetCombination refers to the IDs of the feature set(s) that the UE supports in that FeatureSetCombination. The BandCombination entries in the BandCombinationList then indicate the ID of the FeatureSetCombination that the UE supports for that band combination. | UE | N/A | No | No |
| ***naics-Capability-List***  Indicates that UE in MR-DC supports NAICS as defined in TS 36.331 [17]. | UE | No | No | No |
| ***receivedFilters***  Contains all filters requested with UE-CapabilityRequestFilterNR from version 15.6.0 onwards. | UE | No | No | No |
| ***supportedBandCombinationList***  Defines the supported NR and/or MR-DC band combinations by the UE. For each band combination the UE identifies the associated feature set combination by featureSetCombinations index referring to featureSetCombination. A fallback band combination resulting from the reported CA and MR-DC band combination is not signalled but the UE shall support it. For intra-band non-contiguous CA band combinations, the UE only includes one band combination, and exclude the others for which the presence of uplink CA bandwidth class in the band combination entry is different. One band combination entry can also indicate support of any other possible permutations in the presence of uplink CA bandwidth class where a paired downlink CA bandwidth class is the same or where the number of UL CCs is smaller than the one of paired DL CCs expressed by the CA bandwidth class, as specified in TS 36.306 [15]. For these band combinations not included in the capability, the supported feature set is the same as the ones for the band combination included in the UE capability. | UE | Yes | No | No |
| ***supportedBandCombinationListNEDC-Only***  Defines the supported NE-DC only type of band combinations by the UE. | UE | No | No | No |
| ***supportedBandListNR***  Includes the supported NR bands as defined in TS 38.101-1 [2] and TS 38.101-2 [3]. | UE | Yes | No | No |
| ***uplinkSetEUTRA***  Indicates the features that the UE supports on the UL carriers corresponding to one EUTRA band entry in a band combination by FeatureSetEUTRA-UplinkId. The FeatureSetUplinkId = 0 means that the UE does not support a UL carrier in this band of a band combination. | Band | N/A | N/A | N/A |
| ***uplinkSetNR***  Indicates the features that the UE supports on the UL carriers corresponding to one NR band entry in a band combination by FeatureSetUplinkId. The FeatureSetUplinkId = 0 means that the UE does not support a UL carrier in this band of a band combination. A fallback per band feature set resulting from the reported UL feature set that has fallback per CC feature set is not signalled but the UE shall support it. | Band | N/A | N/A | N/A |

End of changes