**3GPP TSG-** **RAN WG2 Meeting #125 *R2-240xxxx***

**Athens, Greece, Feb. 26th - Mar. 1st, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.306** | **CR** | **Draft** | **rev** | **-** | **Current version:** | **18.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:*** | UE capability for Rel-18 Multi-carrier enhancements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon, [] | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MC\_enh-Core | | | | |  | ***Date:*** | | | 2024-03-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | To capture the RAN2 #125 agreement related to MC cenh:   * For a given BC supporting UL Tx switching across up to 4 bands: * When the optional capability is not reported, it means all the fallback BCs are supported by the UE as legacy with the same switching capabilities reported in the parent BC including switching period as legacy. * When the optional capability is reported, it means all the fallback BCs are supported by the UE with the largest switching period value, i.e. 210us. * No matter the optional capability is reported or not, the UE can advertise fallback band combinations with different/same switching period by separate BandCombination entries as legacy in case of different fallback. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | In 4.2.7.1,   * Add defination of *switchingPeriodRestriction* | | | | | | | | |
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| ***Consequences if not approved:*** | | Without this new UE capability, the UE can not idicate it can only support fallback combination with the largest switching period value. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.7.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

-----------------Start of the changes---------------------------------------------------------------------------------------------------------------

#### 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. For FR1, the value 'F' shall not be used as it is invalidated in TS 38.101-1 [2]. | Band | No | N/A | N/A |
| ***ca-BandwidthClassDL-NR-r17***  Defines for DL, additional FR2 CA bandwidth class (e.g., R, S, T, U ) as specified in TS 38.101-2 [3]. When all FeatureSetDownlinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent.  If this field is indicated for a band, the UE shall also set *ca-BandwidthClassDL-NR* (without suffix) to the highest bandwidth class from the same fallback group that it supports in this band combination and with the given bandwidth combination set ID in case that the bandwidth combination consists of a sub-set of carriers and the same or a sub-set of carrier bandwidths on those carriers with respect to the bandwidth combination corresponding to *ca-BandwidthClassDL-NR-r17*; otherwise, it shall omit the *ca-BandwidthClassDL-NR* (without suffix) field.  NOTE: If the UE includes ca-BandwidthClassDL-NR-r17 in a BandParameter the network ignores the ca-BandwidthClassDL-NR therein, if signalled. | Band | No | N/A | FR2 only |
| ***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. For FR1, the value 'F' shall not be used as it is invalidated in TS 38.101-1 [2]. | Band | No | N/A | N/A |
| ***ca-BandwidthClassUL-NR-r17***  Defines for UL, additional FR2 CA bandwidth class (e.g., R, S, T, U ) as specified in TS 38.101-2 [3]. When all FeatureSetUplinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent.  If this field is indicated for a band, the UE shall also set *ca-BandwidthClassUL-NR* (without suffix) to the highest bandwidth class from the same fallback group that it supports in this band combination and with the given bandwidth combination set ID in case that the bandwidth combination consists of a sub-set of carriers and the same or a sub-set of carrier bandwidths on those carriers with respect to the bandwidth combination corresponding to *ca-BandwidthClassUL-NR-r17*; otherwise, it shall omit the *ca-BandwidthClassUL-NR* (without suffix) field.  NOTE: If the UE includes *ca-BandwidthClassUL-NR-r17* in a BandParameter the network ignores the *ca-BandwidthClassUL-NR* therein, if signalled. | Band | No | N/A | FR2 only |
| ***ca-ParametersEUTRA***  Contains the EUTRA part of band combination parameters for a given (NG)EN-DC/NE-DC band combination. | BC | No | N/A | N/A |
| ***ca-ParametersNR***  Contains the NR band combination parameters for a given (NG)EN-DC/NE-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. If the band combination includes both FR1 and FR2 bands, a UE indicating support for NR-DC shall support synchronous NR-DC configuration where all serving cells of the MCG are in FR1 and all serving cells of the SCG are in FR2. | 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 |
| ***featureSetCombinationDAPS-r16***  Indicates the feature set that the UE supports for DAPS handover on the NR band combination by FeatureSetCombinationId. A UE shall include this field if intra-frequency or inter-frequency DAPS handover is supported for this band combination. For a band entry where it indicates the support for intra-frequency DAPS handover, the UE shall include at least two CCs and shall support intra-frequency DAPS handover between any CC pair within the same band entry. If the number of CCs within a band combination is more than one and if inter-frequency DAPS handover is supported, UE shall support inter-frequency DAPS handover between every CC pair in the same or different band entries in the band combination, except for the CC pair within a band entry with bandwidth class A. A feature set including *intraFreqDAPS-r16* can only be referred to by *featureSetCombinationDAPS-r16*, not by *featureSetCombination*. A feature set without *intraFreqDAPS-r16* is only applied to inter-freq DAPS handover if it is referred to by *featureSetCombinationDAPS*. Both feature sets with and without *intraFreqDAPS-r16* can be referred to by the same *featureSetCombinationDAPS-r16*. | BC | N/A | N/A | N/A |
| ***intrabandConcurrentOperationPowerClass-r16***  Indicates the power class, of a particular Uu band combination and the intra-band PC5 band combination(s) on which the UE supports transmission of PC5 simultaneous with Uu uplink (as indicated by *supportedTxBandCombListPerBC-Sidelink-r16*). The leading/leftmost value corresponds to the band combination of the particular Uu band combination and the first intra-band PC5 band combination included in *BandCombinationListSidelinkEUTRA-NR* which is indicated with value 1 by *supportedTxBandCombListPerBC-Sidelink-r16*, the next value corresponds to the band combination of the particular Uu band combination and the second intra-band PC5 band combination included in *BandCombinationListSidelinkEUTRA-NR* which is indicated with value 1 by *supportedTxBandCombListPerBC-Sidelink-r16* and so on. If this power class is higher than the power class that the UE supports on the individual Uu or PC5 interface of this band combination, the latter determines maximum TX power available in each interface. | BC | No | N/A | N/A |
| ***mrdc-Parameters***  Contains the band combination parameters for a given (NG)EN-DC/NE-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, powerClass-v1610***  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 that are applicable as specified in TS 38.101-1 [2] and TS 38.101-3 [4]. This capability is not applicable to IAB-MT. | BC | No | N/A | FR1 only |
| ***powerClassNRPart-r16***  Indicates NR part power class the UE supports when operating according to this band combination.  This field only applies for MR-DC BCs containing only single CC or intra-band CA in NR side in this release. | BC | No | N/A | FR1 only |
| ***scalingFactorTxSidelink-r16, scalingFactorRxSidelink-r16***  Indicates, for a particular Uu band combination, the scaling factor for the PC5 band combination(s) on which the UE supports transmission/reception of PC5 simultaneous with Uu uplink/downlink respectively (as indicated by *supportedTxBandCombListPerBC-Sidelink-r16* / *supportedRxBandCombListPerBC-Sidelink-r16*). The leading / leftmost value corresponds to the first band combination included in *BandCombinationListSidelinkEUTRA-NR* which is indicated with value 1 by *supportedTxBandCombListPerBC-Sidelink-r16* / *supportedRxBandCombListPerBC-Sidelink-r16*, the next value corresponds to the second band combination included in *BandCombinationListSidelinkEUTRA-NR* which is indicated with value 1 by *supportedTxBandCombListPerBC-Sidelink-r16* / *supportedRxBandCombListPerBC-Sidelink-r16* and so on. For each value of *ScalingFactorSidelink-r16*, value f0p4 indicates the scaling factor 0.4, f0p75 indicates 0.75, and so on. | BC | No | N/A | N/A |
| ***srs-SwitchingAffectedBandsListNR-r17***  Indicates which other bands in the band combination are affected by the SRS switch and the dropping rules / timelines apply to the indicated bands when SRS carrier switching on target CC and other UL on source CC are overlapped in the same symbol. UE indicating support of this feature shall indicate support of *srs-CarrierSwitch*.  NOTE: For each "source-target" pair (as indicated by *srs-SwitchingTimesListNR*), the UE can indicate which other bands in the band combination are affected by the SRS switch. | BC | No | N/A | N/A |
| ***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, srs-TxSwitch-v1610***  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, which is mandatory with capability signalling. 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. *supportedSRS-TxPortSwitch-v1610*, which is optional to report, indicates downgrading configuration of SRS Tx port switching pattern. If the UE indicates the support of downgrading configuration of SRS Tx port switching pattern using *supportedSRS-TxPortSwitch-v1610*, the UE shall report the values for this as below, based on what is reported in *supportedSRS-TxPortSwitch*.   |  |  | | --- | --- | | *supportedSRS-TxPortSwitch* | *supportedSRS-TxPortSwitch-v1610* | | *t1r2* | *t1r1-t1r2* | | *t1r4* | *t1r1-t1r2-t1r4* | | *t2r4* | *t1r1-t1r2-t2r2-t2r4* | | *t2r2* | *t1r1-t2r2* | | *t4r4* | *t1r1-t2r2-t4r4* | | *t1r4-t2r4* | *t1r1-t1r2-t2r2-t1r4-t2r4* |   - *txSwitchImpactToRx* indicates the lowest band entry number of the UL group (see *txSwitchWithAnotherBand*) that impacts the DL of this band entry;  - *txSwitchWithAnotherBand* indicates the lowest band entry of the UL group, which is defined as band entries with UL (see NOTE) that impact each other's UL (i.e. SRS TX port switching on any of the cells in the group will impact UL on all the cells in the group). This parameter is absent if an UL group contains only one band entry.  For *txSwitchImpactToRx* and *txSwitchWithAnotherBand*, value 1 means first entry, value 2 means second entry and so on. The UE may include *txSwitchImpactToRx* and *txSwitchWithAnotherBand* for a band entry even if *supportedSRS-TxPortSwitch* is set to 'notSupported' for that band entry. All DL and UL that switch together indicate the same entry number.  The entry number is the band entry number in a band combination. The UE is restricted not to include fallback band combinations for the purpose of indicating different SRS antenna switching capabilities.  NOTE: The band with UL includes a band associated with *FeatureSetUplinkId* set to 0 corresponding to the support of SRS-SwitchingTimeNR. | BC | FD | N/A | N/A |
| ***srs-AntennaSwitchingBeyond4RX-r17***  Indicates whether the UE supports SRS Antenna switching for more than 4 Rx. The capability signalling comprises the following parameters:  *-* *supportedSRS-TxPortSwitchBeyond4Rx-r17* indicates a combination of supported xTyRs. It includes 11-bit bitmap, where starting from the leading / leftmost bit (bit 0), each bit corresponds to {t1r1, t2r2, t1r2, t4r4, t2r4, t1r4, t2r6, t1r6, t4r8, t2r8, t1r8}. For any indicated value, x shall be equal to or smaller than the one associated with the largest y.  *-* *entryNumberAffectBeyond4Rx-r17* indicates the entry number of the first-listed band with UL in the band combination that affects this DL.  *-* *entryNumberSwitchBeyond4Rx-r17* indicates the entry number of the first-listed band with UL in the band combination that switches together with this UL.  The UE indicating support of this shall indicate support of *srs-TxSwitch.*  NOTE: If reported for the same values of xTyR in *supportedSRS-TxPortSwitchBeyond4Rx-r17* as reported with *supportedSRS-TxPortSwitch*/*supportedSRS-TxPortSwitch-v1610*, the reported values for *entryNumberAffectBeyond4Rx-r17* and *entryNumberSwitchBeyond4Rx-r17* are not valid. | BC | No | N/A | N/A |
| ***supportedBandwidthCombinationSet***  Defines the supported bandwidth combination set for a band combination as defined in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]. For NR SA CA, NR-DC, inter-band (NG)EN-DC without intra-band (NG)EN-DC component, inter-band NE-DC without intra-band NE-DC component and intra-band (NG)EN-DC/NE-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 (NG)EN-DC/NE-DC without additional inter-band NR and LTE CA component, the field indicates the supported bandwidth combination set applicable to intra-band (NG)EN-DC/NE-DC band combination. This field is not applicable to source and target cells in intra-frequency DAPS handover.  Field encoded as a bit map, where bit N is set to "1" if UE supports 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 (NG)EN-DC/NE-DC combination without additional inter-band NR and LTE CA component;  - or both.  The corresponding bits of Bandwidth Combination Set 4 and Bandwidth Combination Set 5 shall not both be set to "1" for the same band combination. | BC | CY | N/A | N/A |
| ***supportedBandwidthCombinationSetIntraENDC***  Defines the supported bandwidth combination set for a band combination that allows configuration of at least one EUTRA serving cell and at least one NR serving cell in the same band, as defined in the TS 38.101-3 [4], table 5.3B.1.2-1 and table 5.3B.1.3-1.  - For intra-band (NG)EN-DC with additional inter-band CA component(s) of LTE and/or NR, the field defines the bandwidth combinations for the intra-band (NG)EN-DC component.  - For intra-band NE-DC with additional inter-band CA component(s) of LTE and/or NR, the field defines the bandwidth combinations for the intra-band NE-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 (NG)EN-DC/NE-DC combination supporting both UL and DL intra-band (NG)EN-DC/NE-DC parts with additional inter-band NR/LTE CA component.  - It is optional if the band combination is an intra-band (NG)EN-DC/NE-DC combination without supporting UL in both the bands of the intra-band (NG)EN-DC/NE-DC UL part. If not included, the network assumes the UE supports BCS0 as defined in TS 38.101-3 [4], table 5.3B.1.2-1 and table 5.3B.1.3-1 for the intra-band (NG)EN-DC/NE-DC. | BC | CY | N/A | N/A |
| ***supportedTxBandCombListPerBC-Sidelink-r16, supportedRxBandCombListPerBC-Sidelink-r16***  Indicates, for a particular Uu band combination, the PC5 band combination(s) on which the UE supports transmission/reception of PC5 simultaneously with Uu uplink/downlink respectively. The leading / leftmost bit (bit 0) corresponds to the first band combination included in *BandCombinationListSidelinkEUTRA-NR*, the next bit corresponds to the second band combination included in *BandCombinationListSidelinkEUTRA-NR* and so on. with value 1 indicating simultaneous transmission/reception is supported. | BC | No | N/A | N/A |
| ***supportedBandCombListPerBC-SL-RelayDiscovery-r17, supportedBandCombListPerBC-SL-NonRelayDiscovery-r17***  Indicates, for a particular Uu band combination, the PC5 Relay discovery and non-Relay discovery band combination(s) on which the UE supports simultaneous transmission/reception of PC5 data (Relay discovery or non-Relay discovery) and Uu uplink/downlink respectively.  The leading / leftmost bit (bit 0) corresponds to the first band combination included in *supportedBandCombinationListSL-RelayDiscovery-r17/supportedBandCombinationListSL-NonRelayDiscovery-r17*, the next bit corresponds to the second band combination included in *supportedBandCombinationListSL-RelayDiscovery-r17/supportedBandCombinationListSL-NonRelayDiscovery-r17* and so on. with value 1 indicating simultaneous transmission/reception is supported. | BC | No | N/A | N/A |
| ***supportedBandCombListPerBC-SL-U2U-RelayDiscovery-r18***  Indicates, for a particular Uu band combination, the PC5 U2U relay discovery band combination(s) on which the UE supports simultaneous transmission/reception of PC5 data (U2U relay discovery) and Uu uplink/downlink respectively.  The leading / leftmost bit (bit 0) corresponds to the first band combination included in *supportedBandCombinationListSL-U2U-RelayDiscovery-r18*, the next bit corresponds to the second band combination included in *supportedBandCombinationListSL-U2U-RelayDiscovery-r18* and so on with value 1 indicating simultaneous transmission/reception is supported. | BC | No | N/A | N/A |
| ***switchingPeriodRestriction-r18***  Indicates whether the same value of switching period is applicable to the fallback band combinations for a given band combination supporting UL Tx switching across up to 4 bands.  When the field is included for a band combination, it represents the largest value, i.e. 210us is supported for each band pair in all fallback band combinations.  When the field is absent, it represents the same switching period reported for each band pair in this BC is also supported in all the fallback band combinations. | BC | FD | N/A | FR1 only |
| ***ULTxSwitchingBandPair-r16, ULTxSwitchingBandPair-v1700***  Indicates UE supports dynamic UL 1Tx-2Tx switching in case of inter-band CA, SUL, and (NG)EN-DC, and UL 2Tx-2Tx switching in case of inter-band CA and SUL as defined in TS 38.214 [12], TS 38.101-1 [2] and TS 38.101-3 [4]. The capability signalling comprises of the following parameters:  - *bandIndexUL1-r16* and *bandIndexUL2-r16* indicate the band pair on which UE supports dynamic UL Tx switching. *bandindexUL1*/*bandindexUL2* xx refers to the xxth band entry in the band combination. UE shall indicate support for 2-layer UL MIMO capabilities on one of the indicated two bands in each FeatureSet entry supporting UL 1Tx-2Tx switching and indicate support for 2-layer UL MIMO capabilities on both bands in each FeatureSet entry supporting UL 2T-2Tx switching, and only the band where UE supports 2-layer UL MIMO capability can work as carrier2 as defined in TS 38.101-1 [2] and TS 38.101-3 [4].  - *uplinkTxSwitchingPeriod-r16* indicates the length of UL Tx switching period of 1Tx-2Tx switching per pair of UL bands per band combination when dynamic UL Tx switching is configured, as specified in TS 38.101-1 [2] and TS 38.101-3 [4]. UE shall not report the value n210us for EN-DC band combinations. n35us represents 35 us, n140us represents 140us, and so on, as specified in TS 38.101-1 [2] and TS 38.101-3 [4].  - *uplinkTxSwitchingPeriod2T2T-r17* indicates the length of UL Tx switching period of 2Tx-2Tx switching per pair of UL bands per band combination when dynamic UL Tx switching is configured, as specified in TS 38.101-1 [2] and TS 38.101-3 [4]. n35us represents 35 us, n140us represents 140us, and so on, as specified in TS 38.101-1 [2] and TS 38.101-3 [4].  - *uplinkTxSwitching-DL-Interruption-r16* indicates that DL interruption on the band will occur during UL Tx switching, as specified in TS 38.133 [5] and in TS 36.133 [27]. UE is not allowed to set this field for the band combination of SUL band+TDD band, for which no DL interruption is allowed.  Field encoded as a bit map, where bit N is set to "1" if DL interruption on band N will occur during uplink Tx switching as specified in TS 38.133 [5] and in TS 36.133 [27]. The leading / leftmost bit (bit 0) corresponds to the first band of this band combination, the next bit corresponds to the second band of this band combination and so on. The capability is not applicable to the following band combinations, in which DL reception interruption is not allowed:  - TDD+TDD CA with the same UL-DL pattern  - TDD+TDD EN-DC with the same UL-DL pattern | BC | FD | N/A | FR1 only |
| ***uplinkTxSwitching-OptionSupport-r16***  Indicates which option is supported for dynamic UL 1Tx-2Tx switching for inter-band UL CA and (NG)EN-DC. *switchedUL* represents option 1 as specified in TS 38.214 [12], *dualUL* represents option 2 as specified in TS 38.214 [12], *both* represents both option 1 and option2 as specified in TS 38.214 [12]. UE shall not report the value *both* for (NG)EN-DC case. The field is mandatory for inter-band UL CA and (NG)EN-DC case where UE supports dynamic UL 1Tx-2Tx switching. | BC | CY | N/A | FR1 only |
| ***uplinkTxSwitching-OptionSupport2T2T-r17***  Indicates which option is supported for dynamic UL 2Tx-2Tx switching for inter-band UL CA. *switchedUL* represents option 1 as specified in TS 38.214 [12], *dualUL* represents option 2 as specified in TS 38.214 [12], *both* represents both option 1 and option2 as specified in TS 38.214 [12]. The field is mandatory for inter-band UL CA cases where UE supports dynamic UL 2Tx-2Tx switching. The UE indicating support of this feature shall indicate support of at least one common switching option between *uplinkTxSwitching-OptionSupport2T2T-r17* and *uplinkTxSwitching-OptionSupport-r16*. | BC | CY | N/A | FR1 only |
| ***uplinkTxSwitching-PowerBoosting-r16***  Indicates the support of 3dB boosting on the maximum output power for UE transmission under the operation state in which 2-port transmission can be supported on carrier2 in case of inter-band UL CA case where UE supports dynamic UL Tx switching. A UE shall only indicate this capability in case the UE supports power class 3 for inter-band UL CA for the band combination as defined in TS 38.101-1 [2]. | BC | No | N/A | FR1 only |
| ***UplinkTxSwitchingAdditionalPeriodDualUL-r18***  Indicates the UL Tx switching period for switching between a band pair and another band pair or another band, when Rel-18 UL Tx switching is configured by *uplinkTxSwitchingMoreBands-r18*. If the capability is not reported, the switching period reported in *switchingPeriodFor2T-r18* or *switchingPeriodFor1T-r18* applies, as specified in TS 38.214 [12] and TS 38.101-1 [2].  - *bandPairIndex1-r18*/*bandPairIndex2-r18* xx refers to the xxth band pair entry in the band pair list indicated by *ULTxSwitchingBandPair-r18*. The two band pairs consist of mutually exclusive bands.  - *bandIndex-r18* xx refers to the xxth band entry in this band combination, which indicates a different band from those indicated by *bandPairIndex1-r18*.  - *switchingAdditionalPeriodDualUL-r18* indicateds the length of switching period for switching between one band pair indicated by *bandPairIndex1-r18* and another band pair indicated by *bandPairIndex2-r18* or another band indicated by *bandIndex-r18*.  - *n35us* represents 35 us, *n140us* represents 140us, and so on, as specified in TS 38.101-1 [2].  A UE supporting this feature shall also indicate the support of dualUL switching option for the band pair(s) indicated in bandPairIndex1-r18/bandPairIndex2-r18. | BC | No | N/A | FR1 only |
| ***ULTxSwitchingBandPair-r18***  Indicates UE supports R18 dynamic UL Tx switching across up to 4 bands in case of inter-band CA, SUL as defined in TS 38.214 [12] and TS 38.101-1 [2]. The capability signalling comprises of the following parameters:  - *bandIndexUL1-r18* and *bandIndexUL2-r18* indicate the band pair on which UE supports dynamic UL Tx switching. *bandindexUL1*/*bandindexUL2* xx refers to the xxth UL band entry in the band combination. UE shall indicate support of 2-layer UL MIMO in *FeatureSet* on both bands for 2Tx-2Tx switching, or indicate support of 2-layer UL MIMO on one band and 1-layer MIMO on the other band for 1Tx-2Tx switching, or indicate support of 1-layer UL MIMO on both bands for 1Tx-1Tx switching.  - *uplinkTxSwitchingOptionForBandPair-r18* indicates whether switchedUL or dualUL or both switching options is supported for a given band pair as specified in TS 38.214 [12].  - *switchingPeriodFor2T-r18* indicates the length of 2Tx-2Tx switching period. *switchingPeriodFor1T-r18* indicates the length of 1Tx-2Tx switching and/or 1Tx-1Tx switching period, as specified in TS 38.101-1 [2]. n35us represents 35 us, n140us represents 140us, and so on, as specified in TS 38.101-1 [2].  - *uplinkTxSwitching-DL-Interruption-r18* indicates that DL interruption on the band will occur during UL Tx switching, as specified in TS 38.133 [5]. UE is not allowed to set this field for the band combination of SUL band+TDD band, for which no DL interruption is allowed.  Field encoded as a bit map, where bit N is set to "1" if DL interruption on band N will occur during uplink Tx switching as specified in TS 38.133 [5]. The leading / leftmost bit (bit 0) corresponds to the first band of this band combination, the next bit corresponds to the second band of this band combination and so on. The capability is not applicable to the following band combinations, in which DL reception interruption is not allowed:  - TDD+TDD CA with the same UL-DL pattern  - *SwitchingPeriodUnaffectedBandDualUL-r18* indicates for a given band pair {band X and band Y}, whether/how the switching period is to be applied on band Z (as well as band X and Y), when a UL Tx switching is triggered from band pair {band X and band Z} to band pair {band Y and band Z}, as defined in 38.101-1 [2]. If absent for band Z, the UE is not required to transmit on any UL bands during the switching period reported for the band pair of band X and band Y, as defined in 38.101-1 [2].  - *bandIndexUnaffected-r18* xx indicates the band index of band Z and refers to the xxth UL band entry in the band combination.  - *maintainedUL-Trans-r18* indicates that the UE is capable of uplink transmission on band Z and is not required to transmit on band X and Y during the switching period reported for the band pair of band X and band Y, as specified in 38.101-1 [2].  - *periodOnULBands-r18* indicates the switching period to be applied on any UL bands as specified in 38.101-1 [2]. n35us represents 35 us, n140us represents 140us, and so on. | BC | FD | N/A | FR1 only |
| ***UplinkTxSwitchingBandParameters-v1700***  Contains the UL Tx switching specific band parameters for a given band combination.  The capability signalling comprises of the following parameters:  - *bandIndex-r17* indicates a band on which UE supports dynamic UL Tx switching with another band in the band combination. *bandIndex* xx refers to the xxth band entry in the band combination.  - *uplinkTxSwitching2T2T-PUSCH-TransCoherence-r17* indicates support of the uplink codebook subset for the carrier(s) on a band capable of two antenna connectors on which UE supports dynamic UL 2Tx-2Tx switching with another band in the band combination. UE indicating support of full coherent codebook subset shall also support non-coherent codebook subset. If this field is absent,  - When 2Tx-2Tx switching between two bands is configured by *uplinkTxSwitching-2T-Mode-r17*, the per BC UE capability reported in *uplinkTxSwitching-PUSCH-TransCoherence-r16* is applied, and if this field and *uplinkTxSwitching-PUSCH-TransCoherence-r16* are both absent, the UE capability reported in *pusch-TransCoherence* is applied when uplink Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2].  - When R18 dynamic UL Tx switching is configured by *uplinkTxSwitchingMoreBands-r18*, the UE capability reported in *pusch-TransCoherence* is applied when uplink Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2].  NOTE: If *UplinkTxSwitchingBandParameters-v1700* is absent for one or more bands of a band combination, the per BC UE capability reported in *uplinkTxSwitching-PUSCH-TransCoherence-r16* is applied for corresponding band(s), and if *uplinkTxSwitching-PUSCH-TransCoherence-r16* is also absent, the UE capability reported in *pusch-TransCoherence* is applied for corresponding band(s) when uplink Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2]. | BC | No | N/A | FR1 only |
| ***uplinkTxSwitchingMinimumSeparationTime-r18***  Indicates the minimum separation time for two uplink switching on more than 2 bands within any two consecutive reference slots as specified in TS 38.214 [12]. The field is mandatory when UE supports dynamic UL Tx switching across more than two bands. | BC | CY | N/A | FR1 only |
| ***uplinkTxSwitching-PUSCH-TransCoherence-r16***  Indicates support of the uplink codebook subset when uplink 1Tx-2Tx switching is triggered between last transmitted SRS and scheduled PUSCH transmission, as specified in TS 38.101-1 [2].  UE indicating support of full coherent codebook subset shall also support non-coherent codebook subset.  If the field is absent, the supported uplink codebook subset indicated by *pusch-TransCoherence* applies when the uplink switching is triggered between last transmitted SRS and scheduled transmission. | BC | No | N/A | FR1 only |