**3GPP TSG-RAN2 Meeting #109e *R2-200xxxx***

**24 Feb – 6 Mar 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.331** | **CR** | **1433** | **rev** | **2** | **Current version:** | **15.8.0** |  |
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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:*** | Introduction of downgraded configuration for SRS antenna switching | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | OPPO, Intel (?) | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI16 | | | | |  | ***Date:*** | | | 2020-2-8 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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:*** | | In LS from RAN1, R1-1913580, RAN1 indicate the following agreement:  RAN1 discussed on a TEI proposal regarding downgrading configuration of SRS for antenna switching, and RAN1 made following agreements.  *Agreement:*  *Regarding TEI “Enable gNB to configure downgrading configuration of SRS for antenna switching”*  *• Rel-16 UE capability design for SRS antenna switching in conjunction with the existing Rel-15 UE capability should allow UE to indicate support of one of the following combinations*  *o {t1r1, t1r2}*  *o {t1r1, t1r2, t1r4}*  *o {t1r1, t1r2, t2r2, t2r4}*  *o {t1r1, t2r2}*  *o {t1r1, t2r2, t4r4}*  *o {t1r1, t1r2, t2r2, t1r4, t2r4}*  *o Note: Detailed signaling design is up to RAN2*  *• The TP in R1-1913445 is endorsed in principle*  *o Note: RAN1 spec can be further updated depending on the final RAN2 signalling design*  Such agreement has been captured in RAN1 spec in R1-1913677. In order to capture the capability design agreed in RAN2, related capabilty bits have to be added into RRC signaling. | | | | | | | | |
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| ***Summary of change:*** | | In 6.3.3, the additional code-points which are agreed by RAN1 are added as per-BC capabiity (following the existing format of SRS-TxSwitch). | | | | | | | | |
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| ***Consequences if not approved:*** | | The agreed downgrading configuration of SRS for antenna switching is not supported in 38.331. | | | | | | | | |
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| ***Clauses affected:*** | | 6.3.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS/TR 38.306 CR 0258 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| CHANGE START |

### 6.3.3 UE capability information elements

<Text Removed>

– *RF-Parameters*

The IE *RF-Parameters* is used to convey RF-related capabilities for NR operation.

***RF-Parameters* information element**

-- ASN1START

-- TAG-RF-PARAMETERS-START

RF-Parameters ::= SEQUENCE {

supportedBandListNR SEQUENCE (SIZE (1..maxBands)) OF BandNR,

supportedBandCombinationList BandCombinationList OPTIONAL,

appliedFreqBandListFilter FreqBandList OPTIONAL,

...,

[[

supportedBandCombinationList-v1540 BandCombinationList-v1540 OPTIONAL,

srs-SwitchingTimeRequested ENUMERATED {true} OPTIONAL

]],

[[

supportedBandCombinationList-v1550 BandCombinationList-v1550 OPTIONAL

]],

[[

supportedBandCombinationList-v1560 BandCombinationList-v1560 OPTIONAL

]],

[[

supportedBandCombinationList-r16 BandCombinationList-r16 OPTIONAL

]]

}

BandNR ::= SEQUENCE {

bandNR FreqBandIndicatorNR,

modifiedMPR-Behaviour BIT STRING (SIZE (8)) OPTIONAL,

mimo-ParametersPerBand MIMO-ParametersPerBand OPTIONAL,

extendedCP ENUMERATED {supported} OPTIONAL,

multipleTCI ENUMERATED {supported} OPTIONAL,

bwp-WithoutRestriction ENUMERATED {supported} OPTIONAL,

bwp-SameNumerology ENUMERATED {upto2, upto4} OPTIONAL,

bwp-DiffNumerology ENUMERATED {upto4} OPTIONAL,

crossCarrierScheduling-SameSCS ENUMERATED {supported} OPTIONAL,

pdsch-256QAM-FR2 ENUMERATED {supported} OPTIONAL,

pusch-256QAM ENUMERATED {supported} OPTIONAL,

ue-PowerClass ENUMERATED {pc1, pc2, pc3, pc4} OPTIONAL,

rateMatchingLTE-CRS ENUMERATED {supported} OPTIONAL,

channelBWs-DL CHOICE {

fr1 SEQUENCE {

scs-15kHz BIT STRING (SIZE (10)) OPTIONAL,

scs-30kHz BIT STRING (SIZE (10)) OPTIONAL,

scs-60kHz BIT STRING (SIZE (10)) OPTIONAL

},

fr2 SEQUENCE {

scs-60kHz BIT STRING (SIZE (3)) OPTIONAL,

scs-120kHz BIT STRING (SIZE (3)) OPTIONAL

}

} OPTIONAL,

channelBWs-UL CHOICE {

fr1 SEQUENCE {

scs-15kHz BIT STRING (SIZE (10)) OPTIONAL,

scs-30kHz BIT STRING (SIZE (10)) OPTIONAL,

scs-60kHz BIT STRING (SIZE (10)) OPTIONAL

},

fr2 SEQUENCE {

scs-60kHz BIT STRING (SIZE (3)) OPTIONAL,

scs-120kHz BIT STRING (SIZE (3)) OPTIONAL

}

} OPTIONAL,

...,

[[

maxUplinkDutyCycle-PC2-FR1 ENUMERATED {n60, n70, n80, n90, n100} OPTIONAL

]],

[[

pucch-SpatialRelInfoMAC-CE ENUMERATED {supported} OPTIONAL,

powerBoosting-pi2BPSK ENUMERATED {supported} OPTIONAL

]],

[[

maxUplinkDutyCycle-FR2 ENUMERATED {n15, n20, n25, n30, n40, n50, n60, n70, n80, n90, n100} OPTIONAL

]]

}

-- TAG-RF-PARAMETERS-STOP

-- ASN1STOP

|  |
| --- |
| ***RF-Parameters* field descriptions** |
| ***appliedFreqBandListFilter***  In this field the UE 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*. The UE does not include this field if the UE capability is requested by E-UTRAN and the network request includes the field *eutra-nr-only* [10]. |
| ***supportedBandCombinationList***  A list of band combinations that the UE supports for NR (and NR-DC, if requested). The *FeatureSetCombinationId*:s in this list refer to the *FeatureSetCombination* entries in the *featureSetCombinations* list in the *UE-NR-Capability* IE. The UE does not include this field if the UE capability is requested by E-UTRAN and the network request includes the field *eutra-nr-only* [10]. |

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| NEXT CHANGE |

– *RF-ParametersMRDC*

The IE *RF-ParametersMRDC* is used to convey RF related capabilities for MR-DC.

***RF-ParametersMRDC* information element**

-- ASN1START

-- TAG-RF-PARAMETERSMRDC-START

RF-ParametersMRDC ::= SEQUENCE {

supportedBandCombinationList BandCombinationList OPTIONAL,

appliedFreqBandListFilter FreqBandList OPTIONAL,

...,

[[

srs-SwitchingTimeRequested ENUMERATED {true} OPTIONAL,

supportedBandCombinationList-v1540 BandCombinationList-v1540 OPTIONAL

]],

[[

supportedBandCombinationList-v1550 BandCombinationList-v1550 OPTIONAL

]],

[[

supportedBandCombinationList-v1560 BandCombinationList-v1560 OPTIONAL,

supportedBandCombinationListNEDC-Only BandCombinationList OPTIONAL

]],

[[

supportedBandCombinationList-v1570 BandCombinationList-v1570 OPTIONAL

]],

[[

supportedBandCombinationList-v1580 BandCombinationList-v1580 OPTIONAL

]],

[[

supportedBandCombinationList-r16 BandCombinationList-r16 OPTIONAL

]]

}

-- TAG-RF-PARAMETERSMRDC-STOP

-- ASN1STOP

|  |
| --- |
| ***RF-ParametersMRDC* field descriptions** |
| ***appliedFreqBandListFilter***  In this field the UE 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*. |
| ***supportedBandCombinationList***  A list of band combinations that the UE supports for (NG)EN-DC and/or NE-DC. The *FeatureSetCombinationId*:s in this list refer to the *FeatureSetCombination* entries in the *featureSetCombinations* list in the *UE-MRDC-Capability* IE. |
| ***supportedBandCombinationListNEDC-Only***  A list of band combinations that the UE supports only for NE-DC. The *FeatureSetCombinationId*:s in this list refer to the *FeatureSetCombination* entries in the *featureSetCombinations* list in the *UE-MRDC-Capability* IE. |

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| NEXT CHANGE |

– *BandCombinationList*

The IE *BandCombinationList* contains a list of NR CA and/or MR-DC band combinations (also including DL only or UL only band).

***BandCombinationList* information element**

-- ASN1START

-- TAG-BANDCOMBINATIONLIST-START

BandCombinationList ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination

BandCombinationList-v1540 ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination-v1540

BandCombinationList-v1550 ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination-v1550

BandCombinationList-v1560 ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination-v1560

BandCombinationList-v1570 ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination-v1570

BandCombinationList-v1580 ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination-v1580

BandCombinationList-r16 ::= SEQUENCE (SIZE (1..maxBandComb)) OF BandCombination-r16

BandCombination ::= SEQUENCE {

bandList SEQUENCE (SIZE (1..maxSimultaneousBands)) OF BandParameters,

featureSetCombination FeatureSetCombinationId,

ca-ParametersEUTRA CA-ParametersEUTRA OPTIONAL,

ca-ParametersNR CA-ParametersNR OPTIONAL,

mrdc-Parameters MRDC-Parameters OPTIONAL,

supportedBandwidthCombinationSet BIT STRING (SIZE (1..32)) OPTIONAL,

powerClass-v1530 ENUMERATED {pc2} OPTIONAL

}

BandCombination-v1540::= SEQUENCE {

bandList-v1540 SEQUENCE (SIZE (1..maxSimultaneousBands)) OF BandParameters-v1540,

ca-ParametersNR-v1540 CA-ParametersNR-v1540 OPTIONAL

}

BandCombination-r16 ::= SEQUENCE {

bandList-r16 SEQUENCE (SIZE (1..maxSimultaneousBands)) OF BandParameters-r16

}

BandCombination-v1550 ::= SEQUENCE {

ca-ParametersNR-v1550 CA-ParametersNR-v1550

}

BandCombination-v1560::= SEQUENCE {

ne-DC-BC ENUMERATED {supported} OPTIONAL,

ca-ParametersNRDC CA-ParametersNRDC OPTIONAL,

ca-ParametersEUTRA-v1560 CA-ParametersEUTRA-v1560 OPTIONAL,

ca-ParametersNR-v1560 CA-ParametersNR-v1560 OPTIONAL

}

BandCombination-v1570 ::= SEQUENCE {

ca-ParametersEUTRA-v1570 CA-ParametersEUTRA-v1570

}

BandCombination-v1580 ::= SEQUENCE {

mrdc-Parameters-v1580 MRDC-Parameters-v1580

}

BandParameters ::= CHOICE {

eutra SEQUENCE {

bandEUTRA FreqBandIndicatorEUTRA,

ca-BandwidthClassDL-EUTRA CA-BandwidthClassEUTRA OPTIONAL,

ca-BandwidthClassUL-EUTRA CA-BandwidthClassEUTRA OPTIONAL

},

nr SEQUENCE {

bandNR FreqBandIndicatorNR,

ca-BandwidthClassDL-NR CA-BandwidthClassNR OPTIONAL,

ca-BandwidthClassUL-NR CA-BandwidthClassNR OPTIONAL

}

}

BandParameters-v1540 ::= SEQUENCE {

srs-CarrierSwitch CHOICE {

nr SEQUENCE {

srs-SwitchingTimesListNR SEQUENCE (SIZE (1..maxSimultaneousBands)) OF SRS-SwitchingTimeNR

},

eutra SEQUENCE {

srs-SwitchingTimesListEUTRA SEQUENCE (SIZE (1..maxSimultaneousBands)) OF SRS-SwitchingTimeEUTRA

}

} OPTIONAL,

srs-TxSwitch SEQUENCE {

supportedSRS-TxPortSwitch ENUMERATED {t1r2, t1r4, t2r4, t1r4-t2r4, t1r1, t2r2, t4r4, notSupported},

txSwitchImpactToRx INTEGER (1..32) OPTIONAL,

txSwitchWithAnotherBand INTEGER (1..32) OPTIONAL

} OPTIONAL

}

BandParameters-r16 ::= SEQUENCE {

srs-TxSwitch SEQUENCE {

supportedSRS-TxPortSwitch-r16 ENUMERATED {t1r1-t1r2, t1r1-t1r2-t1r4, t1r1-t1r2-t2r2-t2r4, t1r1-t1r2-t2r2-t1r4-t2r4,

t1r1-t2r2, t1r1-t2r2-t4r4}

} OPTIONAL

}

-- TAG-BANDCOMBINATIONLIST-STOP

-- ASN1STOP

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| ***BandCombination* field descriptions** |
| ***BandCombinationList-v1540, BandCombinationList-v1550, BandCombinationList-v1560, BandCombinationList-v1570, BandCombinationList-v1580, BandCombinationList-r16***  The UE shall include the same number of entries, and listed in the same order, as in *BandCombinationList* (without suffix). |
| ***ca-ParametersNRDC***  If the field is included for a band combination in the NR capability container, the field indicates support of NR-DC. Otherwise, the field is absent. |
| ***ne-DC-BC***  If the field is included for a band combination in the MR-DC capability container, the field indicates support of NE-DC. Otherwise, the field is absent. |
| ***srs-SwitchingTimesListNR***  Indicates, for a particular pair of NR bands, the RF retuning time when switching between a NR carrier corresponding to this band entry and another (PUSCH-less) NR carrier corresponding to the band entry in the order indicated below:  - For the first NR band, the UE shall include the same number of entries for NR bands as in *bandList*, i.e. first entry corresponds to first NR band in *bandList* and so on,  - For the second NR band, the UE shall include one entry less, i.e. first entry corresponds to the second NR band in *bandList* and so on  - And so on |
| ***srs-SwitchingTimesListEUTRA***  Indicates, for a particular pair of E-UTRA bands, the RF retuning time when switching between an E-UTRA carrier corresponding to this band entry and another (PUSCH-less) E-UTRA carrier corresponding to the band entry in the order indicated below:  - For the first E-UTRA band, the UE shall include the same number of entries for E-UTRA bands as in *bandList,* i.e. first entry corresponds to first E-UTRA band in *bandList* and so on,  - For the second E-UTRA band, the UE shall include one entry less, i.e. first entry corresponds to the second E-UTRA band in *bandList* and so on  - And so on |

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| CHANGE END |