**3GPP TSG-RAN2 Meeting #118 electronic** ***R2-220xxxx***

**Online, May 9 – 20, 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.306** | **CR** | **0706** | **rev** | **-** | **Current version:** | **17.0.0** |  |
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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 to TS 38.306 on UE capability for Rel-17 CRS interference mitigation |
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| ***Source to WG:*** | China Telecom, Huawei, HiSilicon |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | NR\_demod\_enh2-Core |  | ***Date:*** | 2022-05-16 |
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| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | In RAN4#102-e meeting, RAN4 discussed UE capability and network assistant signalling for CRS interference mitigation(CRS-IM) in scenarios with overlapping spectrum for LTE and NR. Based on that, RAN4 sent an LS (R2-2200489\_R4-2207238) and asked RAN2 to take the related agreements into account and design the corresponding UE capability and network assistance signalling. The following new NR UE capabilities are agreed to be defined for CRS-IM.

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| * Capability #1: NR UE capable of performing CRS-IM in scenario 1 with 15 kHz SCS, UE can support Capability #1 on the CC(s) in a band only if the UE indicates support of *rateMatchingLTE-CRS* on that band.
* Capability #2: NR UE capable of performing CRS-IM in scenario 2 with 15 kHz SCS without Rel-17 new network assistant signalling on LTE channel bandwidth.
* Capability #3: NR UE capable of performing CRS-IM in scenario 2 with 15 kHz SCS with Rel-17 new network assistant signalling on LTE channel bandwidth.
* The granularity of the above capabilities is Per Feature Set per CC.
* The above capabilities are applicable for FR1 only without FDD/TDD difference.
* The above capabilities are optional for UE to report.
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In RAN4#103-e meeting, RAN4 send an LS (R2-2206439\_R4-2210435) to inform RAN2 that the following new NR UE capabilities are agreed to be defined for CRS-IM.

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| * Capability #4: NR UE capable of performing CRS-IM in scenario 2 with 30kHz SCS without Rel-17 new network assistant signalling on LTE channel bandwidth.
* Capability #5: NR UE capable of performing CRS-IM in scenario 2 with 30kHz SCS with Rel-17 new network assistant signalling on LTE channel bandwidth.
* The granularity of the above capabilities is Per Feature Set per CC.
* The above capabilities are applicable for FR1 only without FDD/TDD difference.
* The above capabilities are optional for UE to report.
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| ***Summary of change:*** | * Add *CRS-InterfMitigation-r17* to indicate whether the UE supports CRS interference mitigation (CRS-IM) in both DSS and non-DSS scenarios. The capability signalling comprises of the following parameters:
	+ *CRS-IM-DSS-15kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in DSS scenario with NR 15 kHz SCS. *CRS-IM-nonDSS-15kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth.
	+ *CRS-IM-nonDSS-NWA-15kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth.
	+ *CRS-IM-nonDSS-30kHzSCS-r17* is introduced in *CRS-InterfMitigation-r17* to indicate whether the UE is capable of performing CRS-IM in non-DSS scenario with 30 kHz SCS without Rel-17 new network assistant signalling on LTE channel bandwidth.
	+ *CRS-IM-nonDSS-NWA-30kHzSCS-r17* is introduced in *CRS-InterfMitigation-r17* to indicate whether the UE is capable of performing CRS-IM in non-DSS scenario with 30 kHz SCS with Rel-17 new network assistant signalling on LTE channel bandwidth.
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| ***Consequences if not approved:*** | R17 CRS interference mitigation (CRS-IM) in scenarios with overlapping spectrum for LTE and NR is not supported by the standard. |
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| ***Clauses affected:*** | 4.2.7.1 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.331 CR 3020  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** |  |

*START OF CHANGE*

#### 4.2.7.6 *FeatureSetDownlinkPerCC* parameters

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD****DIFF** | **FR1-FR2****DIFF** |
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| ***broadcast-SCell-r17***Indicates whether the UE supports MBS reception via broadcast in RRC\_CONNECTED, on one frequency indicated in an *MBSInterestIndication* message, when an SCell is configured and activated on that frequency, as specified in TS 38.331 [9].NOTE: The UE is not required to receive MBS via broadcast on PCell and SCell simultaneously | FSPC | No | No | No |
| ***channelBW-90mhz***Indicates whether the UE supports the channel bandwidth of 90 MHz.For FR1, the UE shall indicate support according to TS 38.101-1 [2], Table 5.3.5-1. | FSPC | CY | N/A | FR1 only |
| ***CRS-InterfMitigation-r17***Indicates whether the UE supports CRS interference mitigation (CRS-IM) in both DSS and non-DSS scenarios with overlapping spectrum for LTE and NR, which is defined in TS 38.101-4 [18]. The capability signalling contains the following:- *CRS-IM-DSS-15kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in DSS scenario with NR 15 kHz SCS. UE can indicate support of this capability on the CC(s) in a band only if the UE indicates support of *rateMatchingLTE-CRS* on that band.- *CRS-IM-nonDSS-15kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth.- *CRS-IM-nonDSS-NWA-15kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in non-DSS and 15 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth.- *CRS-IM-nonDSS-30kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in non-DSS and 30 kHz NR SCS scenario, without the assistance of network signaling on LTE channel bandwidth.- *CRS-IM-nonDSSwithNWAssist-30kHzSCS-r17* indicates whether the UE supports neighboring LTE cell CRS-IM in non-DSS and 30 kHz NR SCS scenario, with the assistance of network signaling on LTE channel bandwidth.For the UE supporting the capability of *CRS-IM-DSS-15kHzSCS-r17*, the UE can perform CRS-IM without the assistant configuration information of neighbour LTE cells when *RateMatchPatternLTE-CRS* is configured for the serving cell. When *RateMatchPatternLTE-CRS* is not configured for the serving cell, for UE supporting the capability of *CRS-IM-nonDSS-15kHzSCS-r17*, the UE can perform CRS-IM without the assistant configuration information of neighbour LTE cells with 15 kHz SCS if *MeasObjectEUTRA* is configured and the configured measurement gaps overlap with neighbour LTE cell PBCH position, and for UE supporting the capabilities of *CRS-IM-nonDSS-30kHzSCS-r17*, the UE can perform CRS-IM without the assistant configuration information of neighbour LTE cells with 30 kHz SCS if *MeasObjectEUTRA* is configured and the configured measurement gaps overlap with neighbour LTE cell PBCH position.NOTE 1: In the DSS scenario, serving and neighboring cells are both operating with dynamic spectrum sharing (DSS) of NR and LTE.NOTE 2: In the non-DSS scenario, serving cell is operating in NR, and neighboring cells are operating in LTE. | FSPC | No | No | 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 |
| ***multiDCI-MultiTRP-r16***Indicates whether the UE supports multi-DCI based multi-TRP and support of fully/partially overlapping PDSCHs in time and non-overlapping in frequency. This capability applies only to BWPs where two values of *coresetPoolIndex* are configured. The capability signalling contains the following:- *maxNumberCORESET-r16* indicates maximum number of CORESETs configured per BWP per cell in addition to CORESET 0.- *maxNumberCORESETPerPoolIndex-r16* indicates maximum number of CORESETs configured per *coresetPoolIndex* per BWP per cell in addition to CORESET 0.- *maxNumberUnicastPDSCH-PerPool-r16* indicates maximum number of unicast PDSCHs per *coresetPoolIndex* per slot.NOTE 1: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a Cyclic Prefix.NOTE 2: Processing capability 2 is not supported in any CC if at least one CC is configured with two values of *coresetPoolIndex*.NOTE 3: If UE reports value N1 for *maxNumberCORESET-r16*, that means UE supports up to min (N1+1, 5) CORESETs in total (including CORESET#0) if there is CORESET#0, and supports maximal N1 CORESETs if there is no CORESET#0.NOTE 4: If UE reports value N2 for *maxNumberCORESETPerPoolIndex-r16*, that means UE supports up to min (N2+1, 3) CORESETs in total (including CORESET#0) for a TRP if there is CORESET#0, and supports maximal N2 CORESETs for another TRP if there is no CORESET#0. | FSPC | No | N/A | N/A |
| ***supportedBandwidthDL***Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of DAPS handover for the source or target cell), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] 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].The UE may report a *supportedBandwidthDL* wider than the *channelBWs-DL*; this *supportedBandwidthDL* may not be included in the Table 5.3.5-1 of TS 38.101-1[2]/TS 38.101-2[3] for the case that the UE is unable to report the actual supported bandwidth according to the Table 5.3.5-1 of TS 38.101-1[2]/TS 38.101-2[3]. For each band, RedCap UEs shall indicate its maximum channel bandwidth, which is the maximum of those channel bandwidths that are less than or equal to 20 MHz for FR1 and less than or equal to 100 Mhz for FR2, taking restrictions in TS 38.101-1 [2] and TS 38.101-2 [3] into consideration.NOTE: To determine whether the UE supports a channel bandwidth of 90 MHz, the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet* and the *supportedBandwidthCombinationSetIntraENDC*. For serving cell(s) with other channel bandwidths the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]), *supportedBandwidthDL* and *supportedMinBandwidthDL*. | FSPC | CY | N/A | N/A |
| ***supportedMinBandwidthDL-r17***Indicates minimum DL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2. This parameter is only applicable to the Bandwidth Combination Set 5. This field does not restrict the bandwidths configured for a single CC (i.e. non-CA case). | 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 |
| ***supportFDM-SchemeB-r16***Indicates whether UE supports single DCI based FDMSchemeB. | FSPC | No | N/A | N/A |

END OF CHANG