**3GPP TSG-****RAN WG2 Meeting #121 R2-230XXXX**

**Incheon, KR, May 22- May 26, 2023**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.300** | **CR** | **Draft CR** | **rev** | **-** | **Current version:** | **17.3.0** |  |
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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:***  | Introduction of In-Device Co-existence (IDC) enhancements for NR |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_IDC\_enh-Core |  | ***Date:*** | 2023-04-05 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | This CR introduces the support of Rel-18 In-Device Co-existence (IDC) enhancements for NR. |
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| ***Summary of change:*** | Introduction of general description of Rel-18 In-Device Co-existence (IDC) enhancements for NR. |
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| ***Consequences if not approved:*** | Rel-18 In-Device Co-existence (IDC) enhancements are not supported in NR. |
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| ***Clauses affected:*** | 7.9,10.x |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*Start of 1st change*

## 7.9 UE Assistance Information

When configured to do so, the UE can signal the network through *UEAssistanceInformation*:

- If it prefers an adjustment in the connected mode DRX cycle length, for the purpose of delay budget reporting;

- If it is experiencing internal overheating;

- If it prefers certain DRX parameter values, and/or a reduced maximum number of secondary component carriers, and/or a reduced maximum aggregated bandwidth and/or a reduced maximum number of MIMO layers and/or minimum scheduling offsets K0 and K2 for power saving purpose;

- If it expects not to send or receive any more data in the near future, and in this case, it can provide its preference to transition out of RRC\_CONNECTED where this indication may express its preferred RRC state, or alternately, it may cancel an earlier indicated preference to transition out of RRC\_CONNECTED;

- If it prefers (not) to be provisioned with reference time information;

- If it prefers to transition out of RRC\_CONNECTED state for MUSIM operation and its preferred RRC state after transition;

- If it wants to include assistance information for setup or release of gaps for MUSIM operation;

- When affected by IDC problems that it cannot solve by itself:

- The list of frequencies affected by IDC problems (see clause 23.4 of TS 36.300 [2]); or

- The list of frequency ranges/frequency ranges combination affected by the IDC problems, where a frequency range is characterised by a center frequency and bandwidth in KHz/MHz; and

- optionally TDM assistance information including the cycle, start offset and active duration to enable appropriate TDM configuration on the serving NR carriers;

- Its RRM measurement relaxation status indicating whether RRM measurement relaxation criteria are met or not;

- Its RLM measurement relaxation status indicating whether the UE is applying RLM measurements relaxation;

- Its BFD measurement relaxation status indicating whether the UE is applying BFD measurements relaxation.

NOTE: The requirements on RRM/RLM/CSI measurements in different phases of IDC interference defined in TS 36.300 [2] are applicable except that for NR serving cell, the requirements in TS 38.133 [13] and TS 38.101-1 [18], TS 38.101-2 [35], TS 38.101-3 [36] apply.

In the second case, the UE can express a preference for temporarily reducing the number of maximum secondary component carriers, the maximum aggregated bandwidth and the number of maximum MIMO layers. In all cases, it is up to the gNB whether to accommodate the request.

For sidelink, the UE can report SL traffic pattern(s) to NG-RAN, for periodic traffic.

*End of 1st change*

*Start of 2nd change*

## 10 Scheduling

## 10. x Autonomous Denial for IDC

The network may configure a long-term denial rate by dedicated RRC signalling to limit the amount of NR UL autonomous denials in order to protect other RAT(s) from IDC problem. The autonomous denial configuration provided by the network can be on per CG basis. Once configured by the network, the UE can autonomously deny NR UL transmission. Otherwise, the UE shall not perform any NR UL autonomous denials.

Once configured by the network, the UE can autonomously deny NR UL transmission to protect ISM in rare cases if other solutions cannot be used. Conversely, it is assumed that the UE also autonomously denies ISM transmission in order to ensure connectivity with the eNB to perform necessary NR procedures, e.g., paging reception, etc. The network may configure a long-term denial rate by dedicated RRC signalling to limit the amount of NR UL autonomous denials. Otherwise, the UE shall not perform any NR UL autonomous denials.

*End of 2nd change*

# Annex - RAN2 agreements

Green highlight – agreement captured in stage-2 specifications

Blue highlight – agreement captured as editor’s notes

No highlight – agreement with no direct impact on specifications

The RAN2 agreements related to the IDC enhancements are quoted as follows:

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| **RAN2#119 meeting agreements:*** The Adjacent channel interference between NR Stand Alone (SA) or MN of NR-DC and non-3GPP should be considered for the FDM enhancement in Rel.18.
* The Adjacent channel interference between SN (NR) of MR-DC and non-3GPP should be considered for the FDM enhancement in Rel.18.
* NE-DC is not considered; We will work on NR freq as SA NR case.
* We will not consider the enhancements on E-UTRA freq for EN-DC scenario.
* FFS, on signalling details;
* The IMD interference from simultaneous Tx in EN-DC to non-3GPP should be considered for the FDM enhancement in Rel.18.
* The IMD interference from simultaneous Tx in NR-DC to non-3GPP should be considered for the FDM enhancement in Rel.18.
* Note: the solution (on freq granularity) for adjacent can be reused for IMD, we will not invent new solution on freq granularity for IMD. FFS on signalling details.
* Granular indications of the affected NR frequency reported for IDC issue needs to consider both serving and non-serving frequency as in the legacy FDM solution.
* The use cases (e.g. BT voice, BT eSCO and WLAN beacon) as described in 3GPP TR 36.816 for LTE TDM solutions are considered for developing the Rel-18 IDC TDM solution in RAN2.
* Rel-18 IDC TDM solution(s) targets at resolving the adjacent channel interference issue and the intermodulation distortion interference issue, as LTE.
* As the baseline, the UE reports the TDM assistance information for IDC affected frequency list , as LTE.

Note, this does not exclude MUSIM gap like solution. |
| **RAN2#120 meeting agreements:*** Reconfirm, The Rel-18 IDC solution should allow for more granular IDC indications both on serving and on non-serving frequencies.
* Only one single new finer granularity report is introduced, that applies for both serving and non-serving frequencies.
* For LTE, problematic frequencies of E-UTRA are indicated by indicating measurement object IDs (same as existing LTE, no specification impact is foreseen.)
* RAN2 down select one of solution 1, 2 or 2a based on ASN.1 details. FFS on the signalling details, how to configure, how to report.
* MN can configure IDC, FFS whether SN can configure IDC for SN
* Periodic pattern is supported; FFS on the values;
* Option 3 (i.e. UL and/or DL transmission occasion(s) solution) is not supported in Rel-18.
* The periodic pattern reported by the UE includes cycle, start offset and active duration. FFS, whether multiple patterns are supported. FFS on per CG pattern.
* RAN2 confirms the understanding that in Rel-17 NR RRC, the values from periodic pattern in MUSIM-gap is a subset of the DRX parameters.
* NR DRX values can be treated as a starting point for assistance information reported by UE. FFS, on exact values.
* RAN2 reconfirms the previous RAN2 agreement that the aperiodic traffics as described in 3GPP TR 36.816 are considered for developing the Rel-18 IDC TDM solution in RAN2.
* Autonomous denial solution is supported in Rel-18 IDC, RAN2 will not introduce other solution on aperiodic use case (i.e. no report from UE on this aperiodic issue).
* Not agreed: the aperiodic gap in the MUSIM-gap solution is supported in Rel-18 IDC.
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| **RAN2#121 meeting agreements:*** Adopt Option 1 based frequency range reporting to the network i.e Center frequency + bandwidth in KHz/MHz for the actual affected frequencies is reported by the UE to the network for addressing IDC problem in R18.
* Take the ASN.1 framework for option 1 as a starting point in the Text proposal section and work on the following enhancements
	+ - 1. Add granular values for band width (including BW in KHz/Mhz) to cover all the scenarios involving Wi-Fi, GNSS, BT
		- 2. Add the other IEs such as direction of interference.
		- 3. Add combination of frequencies’ range for addressing IMD scenarios.
		- 4. Check whether to reuse maxFreqIDC-r16, or define maxFreqIDC-r18
* In MR-DC scenarios, SN can also configure the UE for IDC reporting in SN, including both FDM and TDM solution.
* no additional co-ordination is needed for IDC configuration, apart from the existing mechanism between MN and SN (i.e. candidateServingFreqListNR in CG-Config for EN-DC).
* The gNB configures the candidate frequency ranges using (centre frequency + bandwidth) for which the UE should report IDC issues. Network may indicate the whole bandwidth of the freq.
* The frequency range (centre frequency + bandwidth) reported by the UE shall at least overlap with the frequency range (centre frequency + bandwidth) configured by the network.
* The centre frequency reported by the UE is within the frequency range (centre frequency + bandwidth indicated by network in the configuration) configured by the network.
* If the UE detects interference in both directions for one candidate frequency range indicated by the gNB, the UE can report two affected frequency ranges with the respective interference direction, as legacy. No extra specification change is required.
* LTE MN does not configure the UE with R18 NR IDC configuration.
* The NR values of long/short DRX cycle and start offset are used for periodic pattern. RAN2 will not introduce new DRX value for network configuration for IDC purpose.
* The slot offset with 1/32ms granularity is included in UEAssistanceInformation-v18xy-IEs for start offset.
* Multiple periodic patterns for IDC are not supported in R18.
* Per CG pattern is supported for MR-DC. SN can configure the UE to report the TDM assistance information directly to SN, either through SRB 1 (if SRB3 is not configured) or SRB 3.
* FFS whether any additional coordination is needed for network to resolve the problem when network receives the reporting from UE.
* Slot as time unit for autonomous denial
* Agree to send LS to RAN4, indicate the progress in RAN2
* For NR-DC, per CG idc-AssistanceConfigTDM-r18 is introduced to indicate whether TDM assistant information needs to be reported.
* For NR-DC, per CG idc-AssistanceConfigFDM-r18 is introduced to indicate whether FDM assistant information needs to be reported. FFS on dependency between FDM and TDM configuration.
* The values of drx-onDurationTimer in NR is used as the baseline for active Duration in UE assistant information. FFS on other values.
* The same values of validity period and number of denial slots as in LTE is reused. FFS on other values.
* The autonomous denial configuration is per CG.
* Rel-18 IDC UE capability(ies) defined in NR side is/are per UE, not FDD-TDD DIFF, not FR1-FR2 DIFF.
* In NR side, 3 capability bit is introduced for FDM, periodic pattern and autonomous denial separately.
* The pre-requisite of autonomous denial is FDM solution (R16 or R18) or periodic pattern.
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