**3GPP TSG-RAN WG4 Meeting#112 *REV\_R4-2411678***

**Maastricht, Netherlands, 19 – 23 August 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **38.101-1** | **CR** | **2395** | **rev** | **1** | **Current version:** | **17.14.0** |  |
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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 |  | Core Network |  |

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| ***Title:***  | HPUE maximum transmit power in downlink CA with a single configured UL |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | Power\_Limit\_CA\_DC |  | ***Date:*** | 2024-08-19 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)Rel-20 (Release 20)* |
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| ***Reason for change:*** | The power class supported by a HPUE UE is sometimes reduced when the UE is configured with DL CA only (a DL SCell added) even though minimum transmitter requirements for HPUE are specified in sub-clause 6.2.1 for the UL band.Not only is the Pcell coverage reduced, the CA configuration is delayed if measurements to reconfirm the Pcell coverage must be configured first. This reduces the benefits of CA for shorter sessions that are common. |
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| ***Summary of change:*** | New clause 6.2A.0:  Support of DL-only CA with HPUE is faciliated by the following: for HPUE the reference sensitivity requirements for DL-only CA shall at least be met for the default power class as specified in clause 7.3, power reductions due to missing CA requirements for HPUE can thus be avoided. The CA REFSENS requirements are specified for UL CA configurations with one UL carrier active, i.e. DL-only CA (only IMD for UL inter-band CA is verified at specific test points with one active UL carrier in each of two bands along with one exceptional case for harmonics).Clause 7.3A.2.1 (intra-band contiguous CA): Requirements (DRIBC) for a specified CA configuration apply for the default power class unless specified for a supported higher power class (not applicable for FDD in Rel-17). Clause 7.3A.2.2 (intra-band NC CA): Changes analogous to those for 7.3A.2.1.Clause 7.3A.2.3 (inter-band CA): Exceptions to CA REFSENS requirements clauses 7.3A.4 and 7.3A.6 only apply for inter-band CA configurations with one component carrier per operating band and the UL assigned to one NR band that include at least one combination of UL and DL configurations listed in any one of these two clauses for the band combination of the CA configuration.For an exceptional UL band the CA REFSENS degradation is only specified for a specific UL/DL configuration. For other UL bands the standard requirement in clause 7.3A.2.3 applies.Clause 7.3A.4 (exceptions for harmonics):In case an exception is specified for at least one power class: a UE indicating a per-band capability higher than PC3 for the NR UL band shall meet the requirements in this clause for applicable UL/DL configurations with the uplink power limited to the nominal maximum output power for PC3 unless otherwise specified for the supported power class.Clause 7.3A.6 (exceptions for cross-band isolation): Changes analogous to those for 7.3A.4.Isolated impact analysis: UEs not implemented in accordance with this CR would not be impacted by the changes of this CR. |
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| ***Consequences if not approved:*** | Scell configuration delayed if the network has to reconfirm Pcell UL coverage before adding a DL Scell. The benefits of CA for shorter sessions reduced. |
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| ***Clauses affected:*** | 6.2A.1.0 (new), 7.3.A.2.1, 7 .3.A.2.2, 7.3.A.2.3, 7.3.A.4, 7.3.A.6 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications | .  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
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| ***Other comments:*** |   |
|  |  |
| ***This CR's revision history:*** |  |

*< start of changes >*

## 6.2A Transmitter power for CA

### 6.2A.0 General

The following sub-clauses define the transmitter power for CA configurations.

NOTE: For a band combination with a single uplink component carrier configured in one NR band, the reference sensitivity requirements for CA shall at least be met for the default power class as specified in clause 7.3.

### 6.2A.1 UE maximum output power for CA

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#### 7.3A.2.1 Reference sensitivity power level for Intra-band contiguous CA

For intra-band contiguous carrier aggregation, the throughput of each component carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.2-1a, Table 7.3.2-1b, Table 7.3.2-2, and Table 7.3.2-3.

For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.2-3 and the downlink PCC carrier center frequency shall be configured closer to uplink operating band than any of the downlink SCC center frequency.

For aggregation of two or more downlink FDD carriers with two uplink carriers, the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.2.1-1 and the reference sensitivity power level increased by ΔRIBC. The requirements apply with all downlink carriers active. Unless given by Table 7.3.2-4, the reference sensitivity requirements shall be verified with the network signaling value NS\_01 (Table 6.2.3.1-1) configured.

A UE indicating a supported UE power class in *BandNR* higher than the default power class for the band shall at least meet the requirements specified in Table 7.3A.2.1-1 with the uplink power limited to the nominal maximum output power for the default power class unless otherwise specified for the said supported UE power class.

Table 7.3A.2.1-1: Intra-band contiguous CA uplink configuration for reference sensitivity

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#### 7.3A.2.2 Reference sensitivity power level for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) and parameters specified in Table 7.3.2-1a, Table 7.3.2-1b, Table 7.3.2-2, and Table 7.3A.2.2-1 with the reference sensitivity power level increased by ΔRIBNC given in Table 7.3A.2.2-1 for the SCC(s).

For aggregation of two or more downlink FDD carriers with one uplink carrier the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.2.2-1. The requirements apply with all downlink carriers active. Unless given by Table 7.3.2-4, the reference sensitivity requirements shall be verified with the network signaling value NS\_01 (Table 6.2.3.1-1) configured.

A UE indicating a supported UE power class in *BandNR* higher than the default power class for the band shall meet the requirements specified in Table 7.3A.2.2-1 with the uplink power limited to the nominal maximum output power for the default power class unless otherwise specified for the said supported UE power class.

Table 7.3A.2.2-1: Intra-band non-contiguous CA with one uplink configuration for reference sensitivity in FDD bands.

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#### 7.3A.2.3 Reference sensitivity power level for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 with parameters specified in Table 7.3.2-1a, Table 7.3.2-1b, Table 7.3.2-1c, Table 7.3.2-1d, Table 7.3.2-2, Table 7.3.2-3, and in Table 7.3F.2-1, Table 7.3F.2-2, Table 7.3F.2-3 for inter-band CA with one shared spectrum channel access band, modified in accordance with clause 7.3A.3.2. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active. Exceptions to reference sensitivity are allowed in accordance with clause 7.3A.4, 7.3A.5 and 7.3A.6.

The exceptions specified in clauses 7.3A.4 and 7.3A.6 only apply for inter-band CA configurations with one component carrier per operating band and the uplink assigned to one NR band that include at least one combination of UL and DL configurations listed in any one of these two clauses for the band combination of the CA configuration. For these CA configurations the parameters in Table 7.3.2-1a, Table 7.3.2-1b, Table 7.3.2-1c, Table 7.3.2-1d, Table 7.3.2-2, Table 7.3.2-3, Table 7.3F.2-1, Table 7.3F.2-2 and Table 7.3F.2-3 are replaced by those of the specific test configurations in the respective clauses 7.3A.4 and 7.3A.6.

For the combination of intra-band and inter-band carrier aggregation, the intra-band CA relaxation, ΔRIBC and ΔRIBNC, are also applied according to the clause 7.3A.2.1 and 7.3A.2.2.

#### 7.3A.2.4 Void

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### 7.3A.4 Reference sensitivity exceptions due to UL harmonic interference for CA

Sensitivity degradation is allowed for different combinations of UL configurations and DL channel bandwidths if a band in frequency range 1 is impacted by UL harmonic interference from another band which belongs to NR band in frequency range 1 of the same downlink CA configuration. Reference sensitivity exceptions and uplink/downlink configurations due to UL harmonic from a PC3 aggressor NR UL band for either single band uplink or PC3 or PC2 CA are specified in Table 7.3A.4-1. For these exceptions, only the listed test points in Table 7.3A.4-1 are needed to be tested.

A UE indicating a supported UE power class in *BandNR* higher than the default power class for the NR UL band shall meet the requirements for applicable UL/DL configurations as specified in Table 7.3A.4-1 and Table 7.3A.4-4 with the uplink power limited to the nominal maximum output power for the default power class unless otherwise specified for the said supported UE power class in Table 7.3A.4-4a, Table 7.3A.4-4b or Table 7.3A.4-4d.

Table 7.3A.4-1: Reference sensitivity exceptions and uplink/downlink configurations due to UL harmonic from a PC3 aggressor NR UL band for NR DL CA FR1

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### 7.3A.6 Reference sensitivity exceptions due to cross band isolation for CA

Sensitivity degradation is allowed for a band if it is impacted by UL of another band part which belongs to NR band of the same NR CA configuration due to cross band isolation issues. The reference sensitivity degradation for the victim band due to cross band isolation is specified only for the specific uplink and downlink test points specified in Table 7.3A.6-1 for either PC3 and PC2 NR CA from a PC3 aggressor NR UL band, and for PC2 NR CA, in Table 7.3A.6-1afrom a PC2 aggressor NR UL band, and in Table 7.3A.6-1b from a PC1.5 aggressor NR single band uplink

In Tables 7.3A.6-1, 7.3A.6-1a and 7.3A.6-1b the following terminology is used to define the source of cross-band isolation interference:

* “ACLR1” indicates that the first adjacent channel of the aggressor UL band falls into the Rx channel of victim band.
* “ACLR2” indicates that the second adjacent channel of the aggressor UL band falls into the Rx channel of victim band.
* “>ACLR2” indicates that neither the first, nor the second adjacent channel of the aggressor UL band falls into the Rx channel of victim band.

A UE indicating a supported UE power class in *BandNR* higher than Power Class 3 for the NR UL band shall meet the requirements for applicable UL/DL configurations as specified in Table 7.3A.6-1 and Table 7.3A.6-1c with the uplink power limited to the nominal maximum output power for default power class for the bands unless otherwise specified for the said supported UE power class in Table 7.3A.6-1b or Table 7.3A.6-1c.

Table 7.3A.6-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC3 aggressor NR UL band for NR CA FR1

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