**3GPP TSG-RAN4 Meeting # 103-e *R4-2211270***

**Electronic Meeting, 9th May – 20th May 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **1123** | **rev** | - | **Current version:** | **17.5.0** |  |
|  | | | | | | | | |
| *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 |  | Core Network |  |

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| ***Title:*** | Draft CR on RedCap FR1 RF | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_redcap-Core | | | | |  | ***Date:*** | | | 2022-05-24 |
|  |  | | | |  | |  | | |  |
| ***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 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | BigCR to capture the draftCR endorsed in RAN4#104e | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Including R4-2210791 Draft CR on RedCap FR1 RF | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | missing clarification in specification | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.2, 7.3.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS 38.521-1 | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## < start of changes #1>

## 7.2 Diversity characteristics

The UE is required to be equipped with a minimum of two Rx antenna ports in all operating bands except for the bands n7, n38, n41, n48, n77, n78, n79 where the UE is required to be equipped with a minimum of four Rx antenna ports. This requirement applies when the band is used as a standalone band or as part of a band combination.

For the single carrier REFSENS requirements in Clause 7, the UE shall be verified with two Rx antenna ports in all supported frequency bands, additional requirements for four Rx ports shall be verified in operating bands where the UE is equipped with four Rx antenna ports.

For Rx requirements other than single carrier REFSENS in Clause 7, the UE shall be verified with four Rx antenna ports and skip two Rx antenna ports requirements in operating bands where the UE is equipped with four Rx antenna ports, otherwise, the UE shall be verified with two Rx antenna ports.

The above rules apply for all clauses with the exception of clause 7.9.

A Redcap UE is required to be equipped with a minimum of single Rx antenna port and maximum of two Rx antenna ports. Clause 7 requirements for four Rx antenna ports do not apply to a RedCap UE.

## < end of changes #1>

## < start of changes #2>

### 7.3.2 Reference sensitivity power level

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A3.2 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 and Table 7.3.2-2.

Table 7.3.2-1a: Two antenna port reference sensitivity QPSK PREFSENS for FDD bands

| Operating band / SCS / Channel bandwidth | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 35 MHz (dBm) | 40  MHz (dBm) | 45 MHz (dBm) | 50  MHz (dBm) |
| n1 | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 | -91.9 |  | -90.6 | -90.1 | -89.6 |
| 30 |  | -97.1 | -95.1 | -94.0 | -92.8 | -92.0 |  | -90.7 | -90.2 | -89.7 |
| 60 |  | -97.5 | -95.4 | -94.2 | -93.0 | -92.1 |  | -90.9 | -90.3 | -89.7 |
| n2 | 15 | -98 | -94.8 | -93 | -91.8 | -90.7 | -84.1 | -83.6 | -81.5 |  |  |
| 30 |  | -95.1 | -93.1 | -92 | -90.8 | -84.2 | -83.7 | -81.6 |  |  |
| 60 |  | -95.5 | -93.4 | -92.2 | -90.9 | -84.3 | -83.8 | -81.7 |  |  |
| n3 | 15 | -97.0 | -93.8 | -92.0 | -90.8 | -89.7 | -88.9 | -86.2 | -82.3 | -81.3 | -79.7 |
| 30 |  | -94.1 | -92.1 | -91.0 | -89.8 | -89.0 | -86.3 | -82.4 | -81.4 | -79.8 |
| 60 |  | -94.5 | -92.4 | -91.2 | -90.0 | -89.1 | -86.4 | -82.6 | -81.5 | -79.9 |
| n5 | 15 | -98.0 | -94.8 | -93.0 | -86.8 | -84.8 |  |  |  |  |  |
| 30 |  | -95.1 | -93.1 | -88.6 | -84.9 |  |  |  |  |  |
| n71 | 15 | -98.0 | -94.8 | -93.0 | -91.8 | -90.7 | -89.9 | -89.2 | -88.6 |  | -81.5 |
| 30 |  | -95.1 | -93.1 | -92.0 | -90.8 | -90.0 | -89.3 | -88.7 |  | -81.5 |
| 60 |  | -95.5 | -93.4 | -92.2 | -91.0 | -90.1 | -89.4 | -88.9 |  | -81.5 |
| n8 | 15 | -97.0 | -93.8 | -91.4 | -85.8 |  |  | -78.4 |  |  |  |
| 30 |  | -94.1 | -91.7 | -87.2 |  |  | -78.5 |  |  |  |
| n12 | 15 | -97.0 | -93.8 | -84.0 |  |  |  |  |  |  |  |
| 30 |  | -94.1 | -84.1 |  |  |  |  |  |  |  |
| n13 | 15 | -97.0 | -93.8 |  |  |  |  |  |  |  |  |
| 30 |  | -94.1 |  |  |  |  |  |  |  |  |
| n14 | 15 | -97.0 | -93.8 |  |  |  |  |  |  |  |  |
| 30 |  | -94.1 |  |  |  |  |  |  |  |  |
| n18 | 15 | -100.0 | -96.8 | -95.0 |  |  |  |  |  |  |  |
| 30 |  | -97.1 | -95.1 |  |  |  |  |  |  |  |
| n20 | 15 | -97.0 | -93.8 | -91.0 | -89.8 |  |  |  |  |  |  |
| 30 |  | -94.1 | -91.1 | -90.0 |  |  |  |  |  |  |
| n24 | 15 | -100.0 | -96.8 |  |  |  |  |  |  |  |  |
| 30 |  | -97.1 |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 |  |  |  |  |  |  |  |  |
| n25 | 15 | -96.5 | -93.3 | -91.5 | -90.3 | -89.3 | -82.2 | -81.7 | -79.5 | -77.6 |  |
| 30 |  | -93.6 | -91.6 | -90.5 | -89.4 | -82.3 | -81.8 | -79.6 | -77.7 |  |
| 60 |  | -94.0 | -91.9 | -90.7 | -89.6 | -82.4 | -81.9 | -79.7 | -77.8 |  |
| n26 | 15 | -97.56 | -94.56 | -92.76 | -87.6 |  |  |  |  |  |  |
| 30 |  | -94.86 | -92.76 | -87.7 |  |  |  |  |  |  |
| n28 | 15 | -98.5 | -95.5 | -93.5 | -90.8 |  | -78.5 |  |  |  |  |
| 30 |  | -95.6 | -93.6 | -91.0 |  | -78.6 |  |  |  |  |
| n30 | 15 | -99.0 | -95.8 |  |  |  |  |  |  |  |  |
| 30 |  | -96.1 |  |  |  |  |  |  |  |  |
| n65 | 15 | -99.5 | -96.3 | -94.5 | -93.3 |  |  |  |  |  | -89.2 |
| 30 |  | -96.6 | -94.6 | -93.5 |  |  |  |  |  | -89.3 |
| 60 |  | -97.0 | -94.9 | -93.7 |  |  |  |  |  | -89.4 |
| n66 | 15 | -99.5 | -96.3 | -94.5 | -93.3 | -92.2 | -91.4 | -90.7 | -90.1 | -89.6 |  |
| 30 |  | -96.6 | -94.6 | -93.5 | -92.3 | -91.5 | -90.8 | -90.2 | -89.7 |  |
| 60 |  | -97.0 | -94.9 | -93.7 | -92.5 | -91.6 | -90.9 | -90.4 | -89.8 |  |
|  | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 |  |  |  |  |  |
| n70 | 30 |  | -97.1 | -95.1 | -94.0 | -92.8 |  |  |  |  |  |
|  | 60 |  | -97.5 | -95.4 | -94.2 | -93.0 |  |  |  |  |  |
| n71 | 15 | -97.2 | -94.0 | -91.6 | -86.0 | -84.1 | -82.5 | -80.7 |  |  |  |
| 30 |  | -94.3 | -91.9 | -87.4 | -84.2 | -82.6 | -80.8 |  |  |  |
| n74 | 15 | -99.53 | -96.33 | -94.53 | -89.33 |  |  |  |  |  |  |
| 30 |  | -96.63 | -94.63 | -89.53 |  |  |  |  |  |  |
| 60 |  | -97.03 | -94.93 | -89.63 |  |  |  |  |  |  |
| n85 | 15 | -97.0 | -93.8 | -84.0 |  |  |  |  |  |  |  |
|  | 30 |  | -94.1 | -84.1 |  |  |  |  |  |  |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4  NOTE 3: The requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9 - 1510.9 MHz.  NOTE 4: Void  NOTE 5: Void  NOTE 6: Values are modified by -0.5dB when carrier channel BW is between 865MHz and 894MHz.  NOTE 7: Void. | | | | | | | | | | | |

**Table 7.3.2-1b: Two antenna port reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Operating band / SCS / Channel bandwidth / REFSENS** | | | | |
| **Operating band** | **SCS**  **kHz** | **Channel bandwidth (MHz)** | **REFSENS (dBm)8** | **Duplex Mode** |
| n297 | 15 | 5,10 | -97 + 10log10(NRB/25) | SDL |
| 30 | 10 | -94.1 + 10log10(NRB/24) |
| n34 | 15 | 5, 10, 15 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15 | -97.5 + 10log10(NRB/11) |
| n381 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11) |
| n39 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11) |
| n40 | 15 | 5, 10, 15, 20, 25, 30, 40, 50 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -97.5 + 10log10(NRB/11) |
| n411 | 15 | 10, 15, 20, 30, 40, 50 | -94.8 + 10log10(NRB/52) | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.5 + 10log10(NRB/11) |
| n481 | 15 | 5, 10, 15, 20, 30, 40, 505 | -99 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 30, 40, 505, 605, 705, 805, 905, 1005 | -96.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 30, 40, 505, 605, 705, 805, 905, 1005 | -96.5 + 10log10(NRB/11) |
| n50 | 15 | 5, 10, 15, 20, 30, 40, 50 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 80 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 30, 40, 50, 60, 80 | -97.5 + 10log10(NRB/11) |
| n51 | 15 | 5 | -100 | TDD |
| n53 | 15 | 5, 10 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10 | -97.1 |
| 60 | 10 | -97.5 |
| n677 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) | SDL |
|  | 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) |  |
| n757 | 15 | 5,10,15,20,25,30,40,50 | -100 + 10log10(NRB/25) | SDL |
| 30 | 10,15,20,25,30,40,50 | -97.1 + 10log10(NRB/24) |
| 60 | 10,15,20,25,30,40,50 | -97.5 + 10log10(NRB/11) |
| n767 | 15 | 5 | -95.3 + 10log10(NRB/52) | SDL |
| n771,4 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.3 + 10log10(NRB/52) | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -95.6 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.0 + 10log10(NRB/11) |
| n781 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.8 + 10log10(NRB/52) | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.5 + 10log10(NRB/11) |
| n791 | 15 | 10, 20, 30, 40, 50 | -95.8 + 10log10(NRB/52) | TDD |
| 30 | 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -96.1 + 10log10(NRB/24) |
| 60 | 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -96.5 + 10log10(NRB/11) |
| n91 | 15 | 5 | -100 | FDD |
| n92 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25) | FDD |
| 30 | 10,15,20 | -97.1 + 10log10(NRB/24) |
| n93 | 15 | 5 | -100 | FDD |
| n94 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25) | FDD |
|  | 30 | 10,15,20 | -97.1 + 10log10(NRB/24) |
| n101 | 15 | 5, 10 | -100 + 10log10(NRB/25) | TDD |
|  | 30 | 10 | -97.1 + 10log10(NRB/24) |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 3: Void  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 6: Void  NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.  NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. “NRB” in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1. | | | | |

## < end of changes #2>