**3GPP TSG-RAN WG4 Meeting #90 R4-1900642**

**Athens, GR, 25 Feb - 1 March 2019**

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| *CR-Form-v11.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | Draft | **rev** | **-** | **Current version:** | **16.0.0** |  |
|  | | | | | | | | |
| *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:*** | Introduction of completed SUL band combinations into Rel-16 TS 38.101-1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_SUL\_combos\_R16-Core | | | | |  | | ***Date:*** | | 2018-03-05 |
|  |  | | | |  | | |  | |  |
| ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Corrections on some SUL band combinations are captured based on the apporved TP R4-1900653.  ΔRIB,c for SUL bands are removed. | | | | | | | | |
| ***Summary of change:*** | | Corretions on some SUL band combinations are captured based on the apporved TP R4-1900653.  ΔRIB,c for SUL bands are removed. | | | | | | | | |
| ***Consequences if not approved:*** | | There are still errors in the spec for SUL band combinations. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.3C | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | |  | | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | TS/TR ... CR ... | | | |
| ***affected:*** | | **x** |  | Test specifications | | | TS/TR ... CR ... 38.521 | | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | TS/TR ... CR ... | | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

## **<Start of Changes>**

## 7.3C Reference sensitivity for SUL

### 7.3C.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

### 7.3C.2 Reference sensitivity power level for SUL

For SUL operation, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in Table 7.3.2-1 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.2-3 or supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.2-1 with uplink transmission using QPSK DFT-s-OFDM waveforms.

Table 7.3C.2-1: Supplementary Uplink configuration for reference sensitivity



|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DL band/ UL band / SCS / Channel bandwidth of the affected DL band / NRB | | | | | | | | | | | | | | |
| DL band | UL band | SCS of UL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n41 | n80 | 15 |  | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n41 | n81 | 15 |  | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n78 | n80 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n78 | n81 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n78 | n82 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n78 | n83 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n78 | n84 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n78 | n86 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n79 | n80 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n79 | n81 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |
| n79 | n84 | 15 |  |  |  |  |  |  | 100 | 100 | 100 | 100 |  | 100 |

For the UE that supports any of the SUL operation given in Table 7.3C.2-2, exceptions to the requirements specified in Table 7.3.2-1are allowed when the uplink is active in a lower frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3C.2-2. For these exceptions, the UE shall meet the requirements specified in Table 7.3C.2-2 and Table 7.3C.2-3.

Table 7.3C.2-2: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / Channel bandwidth of the high band | | | | | | | | | | | | | |
| UL band | DL band | **5 MHz** | **10 MHz** | **15 MHz** | **20 MHz** | **25 MHz** | 30 MHz | **40 MHz** | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| n80 | n781,2 |  | 23.9 | 22.1 | 20.9 |  |  | 17.9 |  |  |  |  |  |
| n783 |  | 1.1 | 0.8 | 0.3 |  |  |  |  |  |  |  |  |
| n82 | n784,5 |  | 10.8 | 9.1 | 8 |  |  | 6 |  |  |  |  |  |
| n81 | n781,2 |  | 10.8 | 9.1 | 8 |  |  | 5.1 | 4.2 | 3.5 | 2.3 |  | 1.4 |
| n81 | n786,7 |  | 10.4 | 8.9 | 7.8 |  |  | 4.7 | 3.7 | 3 | 1.7 | 1.2 | 0.7 |
| n86 | n781,2 |  | 23.9 | 22.1 | 20.9 |  |  | 17.9 |  |  |  |  |  |
| n783 |  | 1.1 | 0.8 | 0.3 |  |  |  |  |  |  |  |  |
| n81 | n796,7 |  |  |  |  |  |  | [6.8] | 6.2 | [5.6] | 4.9 |  | 4.4 |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.  NOTE 2: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 3: The requirements are only applicable to channel bandwidths with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  NOTE 4: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.  NOTE 5: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 6: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 7: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band. | | | | | | | | | | | | | |

Table 7.3C.2-3: Supplementary Uplink configuration (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / Channel bandwidth of the high band | | | | | | | | | | | | | |
| UL band | DL band | 5 MHz (NRB) | 10 MHz (NRB) | 15 MHz (NRB) | 20 MHz (NRB) | 25 MHz (NRB) | 30 MHz (NRB) | 40 MHz (NRB) | 50 MHz (NRB) | 60 MHz (NRB) | 80 MHz (NRB) | 90 MHz (NRB) | 100 MHz (NRB) |
| n80 | n78 |  | 25 | 36 | 50 |  |  | 100 |  |  |  |  |  |
| n81 | n78 |  | 16 | 25 | 25 |  |  | 25 | 25 | 25 | 25 | 25 | 25 |
| n81 | n79 |  |  |  |  |  |  | 25 | 25 | 25 | 25 | 25 | 25 |
| n83 | n78 |  | 10 | 15 | 20 |  |  | 25 | 25 | 25 | 25 | 25 | 25 |
| n86 | n78 |  | 26 | 39 | 53 |  |  | 100 |  |  |  |  |  |
| NOTE 1: 15 kHz SCS is assumed for UL band.  NOTE 2: The UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.2-3 for the uplink bandwidth in which case the allocation according to Table 7.3.2-3 applies. | | | | | | | | | | | | | |

Sensitivity degradation is allowed for a band if it is impacted by UL of another band part of the same SUL configuration due to cross band isolation issues. Reference sensitivity exceptions are specified in Table 7.3C.2-4 with uplink configuration specified in Table 7.3C.2-5.

Table 7.3C.2-4: Reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | 25 MHz  (dBm) | 40 MHz  (dBm) | 50 MHz  (dBm) | 60 MHz  (dBm) | 80 MHz  (dBm) | 90 MHz  (dBm) | 100 MHz  (dBm) |
| n80 | n41 |  | [-90.3] | [-88.8] | [-87.7] |  | [-84.5] | [-83.5] |  |  |  |  |
| NOTE 1: The B41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2515 - 2690 MHz. | | | | | | | | | | | | |

Table 7.3C.2-5: Uplink configuration for reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | 25 MHz  (dBm) | 40 MHz  (dBm) | 50 MHz  (dBm) | 60 MHz  (dBm) | 80 MHz  (dBm) | 90 MHz  (dBm) | 100 MHz  (dBm) |
| n80 | n41 | 25 | 50 | 50 | 50 | 50 | 50 | N/A | N/A | N/A | N/A | N/A |

### 7.3C.3 ΔRIB,c for SUL

#### 7.3C.3.1 General

For a UE supporting a SUL configuration, the ΔRIB,c applies for both SC and SUL operation.

#### 7.3C.3.2 SUL band combination

For the UE which supports SUL band combiantion, the minimum requirement for reference sensitivity in Table 7.3C.2-1 shall be increased by the amount given in ΔRIB,c defined in subclause 7.3C.3.2 for the applicable operating bands.

##### 7.3C.3.2.1 ΔRIB,c for two bands

Table 7.3C.3.2.1-1: ΔRIB,c due to SUL (two bands)

|  |  |  |
| --- | --- | --- |
| Band combination for SUL | NR Band | ΔRIB,c (dB) |
| SUL\_n41-n80 | n41 | 0.51 |
| SUL\_n78-n80 | n78 | 0.5 |
|  |  |
| SUL\_n78-n81 | n78 | 0.2 |
|  |  |
| SUL\_n78-n82 | n78 | 0.5 |
| SUL\_n78-n83 | n78 | 0.5 |
|  |  |
| SUL\_n78-n84 | n78 | 0.5 |
| SUL\_n78-n86 | n78 | 0.5 |
|  |  |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2496 - 2515 MHz. | | |

## **<End of Changes>**