**3GPP TSG-RAN WG4 Meeting # 97-e *revision of R4-2014324***

**Electronic Meeting, 2 - 13 November, 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-3** | **CR** | **0363** | **rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *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:*** | Correction on 5G V2X inter-band con-current UE RF requirements in TS38.101-3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | LG Electronics, Huawei, CATT | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_V2X\_NRSL-Core | | | | |  | ***Date:*** | | | 2020-10-17 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR is to update Tx/Rx RF requirmeents for 5G V2X UE in TS38.101-3. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This CR is to treat the UE-to-UE coexistence, additional ILs and MSD by 3rd harmonic from V2X\_20\_n38 UE for 5G NR V2X UE.   * Update protected band list for V2X\_20A\_n38A and V2X\_n71\_47A * Remove [ ] and 0.0dB in delta Tib/Rib of V2X\_20\_n38 * Update MSD level and test configuration for V2X\_20\_n38 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | NR V2X UE do not protect some adjacent UE with the additional NR operating band list. Still exist [ ] and not aligned MSD levels for V2X\_20\_38 UE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2E.4.2, 6.5C.3.2.2, 6.5E.3.3, 7.3C.2.3, 7.3C.2.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS38.521-1 | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## *<< Start of changes >>*

#### 6.2E.4.2 UE configured output power for Inter-band V2X

When a UE is configured for simultaneous NR V2X sidelink and NR uplink transmissions for inter-band con-current operation, the UE is allowed to set its configured maximum output power PCMAX,*c*,*Uu*and PCMAX,*c*,*V2X*for the configured E-UTRA or NR uplink carrier and the configured NR V2X SL or E-UTRA V2X SL carrier, respectively, and its total configured maximum output power PCMAX,c. The TIB,V2X of PCMAX,*c*,Uuis specified in Table 6.2E.4.2-1.

The configured maximum output power PCMAX *c*,*Uu(p)* in subframe *p* for the configured E-UTRA or NR uplink carrier shall be set within the bounds:

PCMAX\_L,*c, Uu* (*p*) ≤ PCMAX,*c, Uu* (*p*) ≤ PCMAX\_H,*c, Uu* (*p*)

where PCMAX\_L,*c,Uu* andPCMAX\_H,*c, Uu* are the limits for a serving cell c as specified in subclause 6.2.5 TS 36.101 [4] or 6.2.4 TS 38.101-1 [2].

The configured maximum output power PCMAX *c*,*V2X (q)* in slot *q* for the configured NR or E-UTRA V2X SL carrier shall be set within the bounds:

PCMAX,*c,V2X* (*q*) ≤ PCMAX\_H,*c,V2X* (*q*)

where PCMAX\_H,*c,V2X* is the limit as specified in subclause 6.2C.4 of TS 38.101-1 [2] or 6.2.5G or TS 36.101 [5].

The total UE configured maximum output power PCMAX (*p,q*) in a subframe *p* of E-UTRA uplink carrier and a slot *q* of NR V2X sidelink that overlap in time shall be set within the following bounds for synchronous and asynchronous operation unless stated otherwise:

PCMAX\_L (*p,q*) ≤ PCMAX (*p,q*) ≤ PCMAX\_H (*p,q*)

with

PCMAX\_L (*p,q*) = PCMAX\_L,*c,Uu* (*p*)

PCMAX\_H (*p,q*) = 10 log10 [pCMAX\_H,*c, Uu*(*p*) + pCMAX\_H,*c,V2X*(*q*)]

where pCMAX\_H*,c,V2X* and pCMAX\_H,*c,Uu*are the limits PCMAX\_H,*c,V2X* (*q*) and PCMAX\_H,*c,Uu* (*p*) expressed in linear scale.

The measured total maximum output power PUMAX over both the E-UTRA uplink and NR V2X carriers is

PUMAX = 10 log10 [pUMAX,*c,Uu* + pUMAX,*c,V2X*],

where pUMAX,*c,Uu*  denotes the measured output power of serving cell *c* for the configured E-UTRA uplink carrier or NR uplink carrier, and pUMAX,*c,V2X* denotes the measured output power for the configured NR V2X SL carrier or E-UTRA V2X SLcarrier expressed in linear scale.

When a UE is configured for synchronous V2X sidelink and uplink transmissions,

PCMAX\_L(*p, q*)  – TLOW (PCMAX\_L(*p, q*)) ≤ PUMAX  ≤ PCMAX\_H(*p, q*) + THIGH (PCMAX\_H(*p, q*))

where PCMAX\_L (*p,q*) and PCMAX\_H (*p,q*) are the limits for the pair (*p,q*) and with the tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX specified in Table 6.2C.4-1. PCMAX\_L may be modified for any overlapping portion of slots *(p, q)* and *(p +1, q+1).*

Table 6.2E.4.2-1: ΔTIB,V2X for inter-band con-current V2X operation (two bands)

|  |  |  |
| --- | --- | --- |
| V2X con-current operating band Configuration | Operating Band | ΔTIB,V2X [dB] |
| V2X\_20\_n38 | 20 | 0.01 |
| Note 1: The ΔTIB,V2X is applied on top of ΔTIB,c of DC\_20A\_n38A UE thatis considered harmonic trap filter to reduce 3rd harmonic impact from Band 20. | | |

## *<< Unchanged sections are omitted >>*

#### 6.5E.3.2 Inter-band V2X con-current operation

##### 6.5E.3.2.1 General spurious emissions

For inter-band V2X, the general spurious emissions requirements specified in clause 6.6.3.1 of TS 36.101 [4] and clause 6.5E.3.1 of TS 38.101-1 [2] apply for each frequency range respectively.

##### 6.5E.3.2.2 Spurious emission band UE co-existence

For the inter-band con-current NR V2X operation, the UE-coexistence requirements in Table 6.5E.3.2.2-1 apply for the corresponding inter-band con-current operation with transmission assigned to both E-UTRA uplink in licensed band and sidelink in NR Band n47.

Table 6.5E.3.2.2-1: Requirements for inter-band con-current V2X operation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| V2X con-current operating band cofiguration | Spurious emission | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X\_20\_n38 | E-UTRA Band 1, 3, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 42, 52 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| V2X\_n71\_47 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25, 41, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 2 |
| NR Band n71 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
| Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| NOTE 1: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x LCRB x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 2: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.  NOTE 3: Applicable when NS\_33 is configured by the pre-configured radio parameters for power class 3 V2X UE.  NOTE 4: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency. | | | | | | | |

## *<< Unchanged sections are omitted >>*

## 7.3E Reference sensitivity for V2X operation in FR1

### 7.3E.1 General

For V2X operation, REFSENS requirements defined in TS 38.101-1 [2] and TS 36.101 [4] apply to all downlink bands of V2X configurations listed in clause 5.5E, unless sensitivity degradation exception is allowed in this clause of this specification, clause 7.3E in TS 38.101-1 [2] or clause 7.3.1G in TS 36.101 [4].

### 7.3E.2 Reference sensitivity for V2X

#### 7.3E.2.1 Intra-band contiguous V2X

For intra-band contiguous V2X listed in Table 5.5E.2-1, the each REFSENS requirements specified in clause 7.3.1G of TS 36.101 [4] and clause 7.3E.2 of TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

#### 7.3E.2.2 Intra-band non-contiguous V2X

For intra-band non-contiguous V2X listed in Table 5.5E.3-1, the each REFSENS requirements specified in clause 7.3.1G of TS 36.101 [4] and clause 7.3E.2 of TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

#### 7.3E.2.3 Inter-band V2X con-current operation

When UE is configured for NR V2X reception on V2X carrier con-current with E-UTRA uplink and downlink, NR V2X sidelink throughput for the carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2. Also the E-UTRA downlink throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.3.

Table 7.3E.2.3-1 is proposed the reference sensitivity requirements for inter-band con-current V2X UE reception without any self-interference problem.

Table 7.3E.2.3-1: Reference sensitivity for V2X QPSK PREFSENS

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Inter-band V2X reception | | Channel bandwidth | | | | | | | | | |
| V2X Band | E-UTRA or NR V2X band (Uu) | E-UTRA or NR Band | SCS (kHz) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | | 20 MHz (dBm) | 30 MHz (dBm) | 40 MHz (dBm) | Duplex Mode |
| n38 | 20 | 20 | 15 | -97 | -94 | -91.2 | | -90 |  |  | FDD |
| n38 | 15 |  | -96.5 |  | | -93.2 | -91.4 | -90.1 | HD |
| 30 |  | -96.6 |  | | -93.4 | -91.7 | -90.2 |
| 60 |  | -97.4 |  | | -93.6 | -91.9 | -90.4 |
| n71 | 47 | 47 | 15 |  | -90.4 | |  | -87.5 |  |  | FDD | |
| n71 | 15 | -97.2 | -94.0 | | -91.6 | -86.0 |  |  | HD | |
| 30 |  | -94.3 | | -91.9 | -87.4 |  |  |
| 60 |  |  | |  |  |  |  |

Table 7.3E.2.3-2 is specified the additional Rx insertion loss according to different RF architecture with DC/CA UE with same band combinations to reduce the self interference problem based on specific self desense analysis according to specific NR V2X inter-band con-current operation.

Table 7.3E.2.3-2: ΔRIB,V2X (two bands)

|  |  |  |
| --- | --- | --- |
| V2X inter-band con-current band Combination | V2X operating Band | ΔRIB,V2X [dB] |
| V2X\_20\_n38 | 20 | 0.01 |
| Note 1: The ΔRIB,V2X is applied on top of ΔRIB,c of DC\_20\_n38 UE that is considered harmonic trap filter to reduce 3rd harmonic impact from Band 20. | | |

The reference sensitivity is defined to be met with Uu uplink assigned to one band (that differs from the V2X operating band) and all E-UTRA downlink carriers active. The Uu uplink resource blocks as defined in Table 7.3E.2.3-3 and Table 7.3E.2.3-4 shall be located as close as possible to V2X operating band but confined within the transmission bandwidth configuration for the channel.

Table 7.3E.2.3-3: Uplink configuration for reference sensitivity of V2X UE (PC5)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Inter-band V2X con-current band configuration** | | **E-UTRA or NR UL band / Channel BW / NRB / Duplex mode** | | | | |
| **V2X band (PC5)** | **Uu band (Uu)** | **UL band** | **Channel Bandwidth (MHz)** | **SCS**  **(kHz)** | **NRB** | **Duplex Mode** |
| n38 | 20 | 20 | 10 | 15 | 50 | FDD |
| 47 | n71 | n71 | 10 | 15 | 52 | FDD |
| 30 | 24 |

Table 7.3E.2.3-4: SL Tx configuration for reference sensitivity of V2X UE (Uu)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Inter-band V2X con-current band configuration** | | **E-UTRA or NR UL band / Channel BW / NRB / Duplex mode** | | | | |
| **V2X band (PC5)** | **Uu band (Uu)** | **V2X band (PC5)** | **Channel Bandwidth (MHz)** | **SCS**  **(kHz)** | **NRB** | **Duplex Mode** |
| n38 | 20 | n38 | 10 | 15 | 50 | HD |
| 30 | 24 |
| 60 | 10 |
| 47 | n71 | 47 | 10 | 15 | 50 | HD |

#### 7.3E.2.3.1 Reference sensitivity exception due to UL harmonic problem

Sensitivity degradation is allowed for a band if it is impacted by UL harmonic interference from another band part of the inter-band con-current V2X UE. Reference sensitivity exceptions (MSD) for the victim band (high) are specified in Table 7.3E.2.3.1-1 with uplink configuration of the aggressor band (low) specified in Table 7.3E.2.3.1-2.

Table 7.3E.2.3.1-1: Reference sensitivity exceptions (MSD) due to UL harmonic for inter-band con-current operation

| V2X inter-band con-current band combinations | Operating Bands / Channel bandwidth of the affected DL band / MSD | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| V2X\_20\_n38 | UL band | SL operation | 10 MHz  (dB) | 20 MHz  (dB) | 30 MHz (dB) | 40 MHz  (dB) |
| 20 | n38 | 10.7 | 7.7 | 5.8 | 4.7 |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) for which the 3rd transmitter harmonic is within the sidelink 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 the carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the low band.  NOTE 3: The MSD level applied to all supported SCSs in victim band. | | | | | | |

Table 7.3E.2.3.1-2: Uplink configuration for reference sensitivity exceptions due to UL harmonic interference for inter-band con-current V2X in NR FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | |
| UL band | SL operation | 10  MHz  (LCRB) | 20 MHz  (LCRB) | 30 MHz  (LCRB) | 40 MHz  (LCRB) |
| 20 | n38 | 25 | 50 | 50 | 50 |
| NOTE 1: The UL configuration applies regardless of the channel bandwidth of the UL band unless the UL resource blocks exceed that specified in Table 7.3.1-2 in TS 36.101 [4] or Table 7.3.2-3 in TS 38.101-1 [2] for the uplink bandwidth in which case the allocation according to Table 7.3.1-2 in TS 36.101 [4] or Table 7.3.2-3 in TS 38.101-1 [2] applies | | | | | |

## *<< End of Changes >>*