**3GPP TSG-RAN WG4 Meeting # 97-e *R4-2014325***

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

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.886** | **CR** | **0004** | **rev** | **1** | **Current version:** | **16.1.0** |  |
|  | | | | | | | | |
| *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 update 5G V2X UE RF requirements in TR38.886 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***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 TR38.886. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This CR is to treat the UE-to-UE coexistence, additional ILs, MSD by 3rd harmonic from V2X\_20\_n38 and Switching position/ period for TDM operation between NR SL and LTE SL for 5G NR V2X UE.   * Update protected band list for V2X\_20A\_n38A and V2X\_n71\_47A * Remove switching period/position in RF session 🡪 It will be covered in RRM session. * Add delta Tib and remove [ ] in delta 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 poor MSD levels for V2X\_20\_38 UE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.1.7.3, 8.1.13, 10.1.1.4, 10.2.1.4, 10.2.1.13, 10.2.2.1, 10.2.2.1a | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS38.101-1, TS38.101-3... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## *<< Start of changes >>*

#### 8.1.7.3 Void

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

### 8.1.13 Spurious emission band UE co-existence for V2X UE

This clause specifies the spurious emission requirements for the specified NR V2X band, for coexistence with protected bands

Table 8.1.13-1: Requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Spurious emission | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| … |  |  |  |  |  |  |  |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 4,5,6 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 4,5 |
| n47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n71, n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 5925 | - | 5950 | -30 EIRP | 1 | 1,2,3 |
| Frequency range | 5815 | - | 5855 | -30 EIRP | 1 | 1,3,7 |
| NOTE 1:Applicable when NS\_33 or NS\_34 is configured by the pre-configured radio parameters.  NOTE 2: 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.  NOTE 3: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I.  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 in TS36.101 from the edge of the channel bandwidth.  NOTE 5: This requirement is applicable for power class 3 UE for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 6: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 7: Resolution BW is 10% of the measurement BW and the result should be integrated to achieve the measurement bandwidth. The sweep time shall be set larger than (symbol length)\*(number of points in sweep) to improve the measurement accuracy. | | | | | | | |

In Note 2, the frequency range with -30dBm/MHz will be further discussed.

When "NS\_33" is configured from pre-configured radio parameters or the cell and the indication from upper layers has indicated that the UE is within the protection zone of CEN DSRC devices or HDR DSRC devices, the power of any V2X UE emission shall fulfil either one of the two set of conditions.

|  |  |  |
| --- | --- | --- |
|  | Maximum Transmission Power (dBm EIRP) | Emission Limit in Frequency Range 5795-5815 (dBm/MHz EIRP) |
| Condition 1 | 10 | -65 |
| Condition 2 | 10 | -45 |

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

# 10 Tx/Rx characteristics of concurrent operation

## 10.1 NR V2X SL operation in 5.9GHz or other potential ITS spectrum and LTE/NR Uu operation in licensed band for FR1

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



#### Spurious emission band UE co-existence

This clause specifies the spurious emission requirements of the inter-band con-current V2X operation, for UE-to-UE coexistence to protect legacy protected bands

Table 10.1.1.13-1: Requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR V2X con-current operating band cofiguration | Spurious emission | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X\_n71A-n47A | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 2 |
| E-UTRA Band 2, 5, 41, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| 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 >>*

#### 10.2.1.4 Configured transmitted power

For the inter-band con-current V2X operation, the configured transmitted power requirements for V2X UE shall be applied per each component carrier. The legacy LTE or NR configured transmitted power for inter-band EN DC shall be decided by MPR*c* and A-MPR*c* of each CC*.*

If the total transmitted power is over the power class of the V2X UE or given PEMAX,*c* for NR V2X service, the UE shall compare the priority between the legacy LTE service on licensed band and NR SL V2X service at licensed band. Based on the priority, the configured transmitted power will be decided which transmission will be applied on power scale down or dropping between the legacy LTE Uu transmission and NR V2X SL transmission at licensed band.

The ΔTIB,V2X of PCMAX,*c*,Uu is considered to determine maximum output power for corresponding V2X con-current operating bands

Table 10.2.1.4-1: 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 that is considered harmonic trap filter to reduce 3rd harmonic impact from Band 20. | | |

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



#### Spurious emission band UE co-existence

This clause specifies the spurious emission requirements of the inter-band con-current V2X operation, for UE-to-UE coexistence to protect legacy protected bands

Table 10.2.1.13-1: Requirements

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| V2X con-current operating band cofiguration | Spurious emission | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X\_20A\_n38A | 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 20 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 42, 52  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 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 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 3: This requirement is applicable for power class 3 UE for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 2 UE for any channel bandwidths within the range 2570 - 2615 MHz, NS\_44 shall apply. For power class 2 or 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 4 For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | | |

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



### Rx requirements for inter-band con-current NR V2X operation

#### REFSENS

For the V2X UE RF receiver requirements, RAN4 can refer the 2DL inter-band CA to define general UE RF Rx requirements for inter-band con-current V2X UE.

The legacy REFSENS requirement will be applied on each CC of NR licensed bands if there was no self-interference problems in own receiver frequency band by own uplink and sidelink transmission.

Table 10.2.2.1-1 and Table 10.2.2.1-2 propose the uplink test configurations for inter-band con-current V2X REFSENS requirements. For the uplink configuration, RAN4 consider 10MHz Channel bandwidth.

Table 10.2.2.1-1: Uplink configuration for reference sensitivity of V2X UE (PC5)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inter-band V2X con-current band configuration | | LTE or NR UL band / Channel BW / NRB / Duplex mode | | | | |
| V2X band (PC5) | LTE or NR band (Uu) | LTE or NR UL band | Channel Bandwidth (MHz) | SCS  (kHz) | NRB | Duplex Mode |
| n38 | B20 | B20 | 10 | 15 | 50 | FDD |

Table 10.2.2.1-2: SL Tx configuration for reference sensitivity of V2X UE (Uu)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inter-band V2X con-current band configuration | | LTE or NR UL band / Channel BW / NRB / Duplex mode | | | | |
| V2X band (PC5) | LTE or NR band (Uu) | NR V2X band (PC5) | Channel Bandwidth (MHz) | SCS  (kHz) | NRB | Duplex Mode |
| n38 | B20 | n38 | 10 | 15 | 50 | HD |
| 30 | 24 |
| 60 | 10 |

Table 10.2.2.1-3 is proposed the REFSENS requirements with inter-band con-current V2X UE reception without any self-interference problem.

Table 10.2.2.1-3: Reference sensitivity for V2X QPSK PREFSENS

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Inter-band V2X reception | | Channel bandwidth | | | | | | | | |
| V2X Band | LTE or NR V2X band (Uu) | LTE 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 | B20 | B20 | 15 | -97 | -94 | -91.2 | -90 |  |  | FDD |
| n38 | 15 |  | -96.5 |  | -93.2 | -91.4 | -90.1 | HD |
| 30 |  | -96.1 |  | -93.4 | -91.7 | -90.2 |
| 60 |  | -96.9 |  | -93.1 | -91.9 | -90.4 |

Table 10.1.2.2-4 is proposed additional Rx insertion loss according to harmonic trap filter to reduce the harmonic problem based on specific self desense analysis according to specific NR V2X inter-band con-current operation.

Table 10.2.2.1-4: ΔRIB,V2X (two bands)

|  |  |  |  |
| --- | --- | --- | --- |
| V2X inter-band con-current band Combination | V2X operating Band | ΔRIB,V2X [dB] | Note |
| V2X\_20\_n38 | 20 | 0.01 | 3rd harmonic from B20 impact into n38 |
| 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. | | | |

#### 10.2.2.1a 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 10.2.2.1a-1 with uplink configuration of the aggressor band (low) specified in Table 10.2.2.1a-2.

Table 10.2.2.1a-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 10.2.2.1a-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 >>*