**3GPP TSG-RAN WG4 Meeting # 97-e R4-2016952**

**Electronic Meeting, 02nd – 13th November, 2020**

**Agenda item:** 7.3.1, 7.3.3

**Source:** Moderator (LG Electronics)

**Title:** Email discussion summary for [97e][108] 5G\_V2X\_NRSL\_UE\_RF

**Document for:** Information

# Introduction

In this paper, RAN4 treat the maintenance for 5G V2X UE transmitter/Receiver requirements and rapporteur inputs.

The provided technical docs list of email discussion are shown in Reference in the end of the paper.

Candidate target of email discussion for 1st round are listed as following

* 1st round: UE Tx/Rx requirements for single carrier for NR V2X Service in rel-16
  + Topic #1: V2X UE RF requirements for single carrier
  + Sub-Topic #1-1: UE-to-UE coexistence
  + Sub-Topic #1-2: Update FRC tables
  + Sub-Topic #1-3: Others
    - CR contents from vivo and OPPO
* 2nd round: RAN4 will treat revised CRs based on 1st round discussion summary
  + R4-2016803 (revised from R4-2014323): CR on TS38.101-1 UE-to-UE coexistence
  + R4-2016804 (revised from R4-2014325): CR on TR38.886 for V2X UE Tx and Rx requirements
  + R4-2016805 (revised from R4-2015333): CR on V2X bands reference table (only need to check the cover sheet)
  + R4-2016474 : CR for TS 38.101-1: Update of NR V2X FRC
  + R4-2017811: LS onRel-16 RAN4 Clarification for UE Antenna Connector Interpretation

# Topic #1: Maintenance of V2X UE requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014321 | LG Electronics | Updated UE-to-UE coexistence requirements for single carrier V2X operation and V2X\_n71\_n47 UE.  - Switching period and Position will be treated in [109] e-mail thread for V2X con-current operation.  - Additional ILs and MSD for V2X\_20\_n38 UE will be treated in [109] e-mail thread for V2X con-current operation. |
| R4-2014323 | LG Electronics | Corresponding CR to update UE-to-UE coexistence for n38/n47 and V2X\_20\_n38 UE   * Add n77/ n78 in the protect band list for n38 V2X UE * Add n47 in the protect band list for n71 V2X UE * Remove n5 and add n77 in the protect band list for V2X\_n71\_n47 UE |
| R4-2014325 | LG Electronics | 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 [109] e-mail thread  - Add delta Tib and remove [ ] in delta Rib of V2X\_20\_n38 🡪 It will be covered in [109] e-mail thread |
| R4-2014972 | vivo | Correction CR on TS38.101-1 for NR V2X  Add definition of con-current operation in TS38.101-1  **Con-current operation**: The simultaneous transmission and reception of sidelink and Uu interfaces while operation is agnostic of the service used on each interface.  Remove PC2 UE sentence for SL-MIMO in 6.2E.1.  Propose other minor corrections in TS38.101-1 |
| R4-2015333 | OPPO | CR on V2X bands reference table  OPPO update the reference table number from 5.2E-1 to 5.2E.1-1 in several sections. |
| R4-2016446 | Qualcomm | Revised V2X FRC tables  QC propose revised CR to update FRC table since current FRC table are not reflected the update RAN1 agreements. Also, the current FRC configuration in 38.101-1 is limited to a 2-symbol DMRS pattern for subchannel sizes of 12 and 15 PRBs which could lead to performance degradation in moderate and high Doppler scenarios. This CR proposes a new FRC configuration which does not have this limitation allowing more DMRS symbols per slot leading to better doppler performance. |
| R4-2016447 | Qualcomm | Propose to update the protected band lists in UE-to-UE coexistence requirements  QC captured the protected band list for V2X\_n71-n47 UE from V2X\_n71\_47 UE in TS38.101-3. |
| R4-2016474 | Huawei | CR for TS 38.101-1: Update of NR V2X FRC  Only update the sub-channel size of PSSCH. And keep 10RBs for PSCCH. |

## 1.2 Open issues summary

*Based on provided contributions, RAN4 mainly treat the protect band lists for UE-to-UE coexistence requirements for single carrier V2X operation and con-current V2X\_n71-n47 UE in TS38.101-1. Also need to update FRC tables for REFSENS and other Rx requirements*

* Sub-Topic #1-1: UE-to-UE coexistence
* Sub-Topic #1-2: Update FRC tables
* Sub-Topic #1-3: Others
  + CR contents from vivo and OPPO

### 1.2.1 Sub-topic #1-1

*Sub-topic description:* **UE-to-UE coexistence**

*Open issues and candidate options before e-meeting:*

**Issue 1-1-1: *Protect band lists for UE-to-UE coexistence for single carrier V2X UE***

* Proposals
  + Option 1: Follow LGE proposal in R4-2014323.
  + Option 2: Other proposal are not precluded
* Recommended WF
  + RAN4 will decide one option in 1st round.

**Issue 1-1-2: *Protect band lists for UE-to-UE coexistence for V2X\_n71-n47 UE***

* Proposals
  + Option 1: Follow LGE proposal in R4-2014323.
  + Option 2: Follow Qualcomm proposal in R4-2016447.
  + Option 3: Other proposal are not precluded.
* Recommended WF
  + RAN4 will decide one option in 1st round.

### 1.2.2 Sub-topic #1-2

*Sub-topic description:* **Update FRC tables**

*There are two candidate options based on proposed CRs*

**Issue 1-2-1: *FRC Tables***

* Proposals
  + Option 1: Follow Qualcomm proposal in R4-2016446 with same PSSCH and PSCCH RB size for Doppler scenarios
  + Option 2: Follow Huawei proposal in R4-2016474 with fixed PSCCH RB size (10 RBs)
* Recommended WF
  + RAN4 will decide one option in 1st round.

### 1.2.3 Sub-topic #1-3

*Sub-topic description:* **Others**

*There are two CRs with minor correction to update V2X specification*

**Issue 1-3-1: vivo CR R4-2014972**

* Proposals
  + Option 1: Agree to all contents in the CR.
  + Option 2: Need to update to add more correction
* Recommended WF
  + RAN4 will treat each CR to maintain 5G V2X UE RF requirements. And Option1 can be acceptable

**Issue 1-3-2: OPPO CR R4-2015333**

* Proposals
  + Option 1: Agree to all contents in the CR.
  + Option 2: Need to update to add more correction
* Recommended WF
  + RAN4 will treat each CR to maintain 5G V2X UE RF requirements. And Option1 can be acceptable.

## 1.3 Companies views’ collection for 1st round

### 1.3.1 Open issues

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| **Company** | **Comments** |
| LGE | Sub topic 1-1: UE-to-UE coexistence requirements  **Issue 1-1-1: *Protect band lists for UE-to-UE coexistence for single carrier V2X UE***  LGE prefer option 1  **Issue 1-1-2: *Protect band lists for UE-to-UE coexistence for V2X\_n71-n47 UE***  LGE prefer option 1  Sub topic 1-2: Update FRC tables  **Issue 1-2-1: *FRC Tables***  LGE: two options are available for FRC table. However, RAN4 consider fixed PSCCH RB size for REFSENS requirements. So we prefer option 2 for FRC table.  Sub topic 1-3: Others  **Issue 1-3-1: vivo CR R4-2014972**  LGE prefer option 1. The CR is agreeable  **Issue 1-3-2: OPPO CR R4-2015333**  LGE prefer option 1. The CR contents are agreeable. You just check the RAN4 secretary comment that your CR cover is missing the check in proposed change affects in draft\_skeleton report in chairman note folder.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |   So, your CR will be revised. |
| CATT | **Issue 1-1-1: *Protect band lists for UE-to-UE coexistence for single carrier V2X UE***  Prefer option 1.  **Issue 1-1-2: *Protect band lists for UE-to-UE coexistence for V2X\_n71-n47 UE***  Prefer option 1.  **Issue 1-3-1: vivo CR R4-2014972**  The CR is OK with us.  **Issue 1-3-2: OPPO CR R4-2015333**  The CR is OK with us. |
| Xiaomi | Sub topic 1-1: UE-to-UE coexistence requirements  **Issue 1-1-1: *Protect band lists for UE-to-UE coexistence for single carrier V2X UE***  Option1.  **Issue 1-1-2: *Protect band lists for UE-to-UE coexistence for V2X\_n71-n47 UE***  These two CRs (LGE and QC) might need to be merged since QC’s correction is according to the up-to-date TS 38.101-3.  Sub topic 1-2: Update FRC tables  **Issue 1-2-1: *FRC Tables***  QC’s CR can be an implementation in the UE for avoiding few DMRS pattern, however, as the CR is for reference measurement channel, there is no need to set this specific PRB number to finish the test. We prefer option 2.  Sub topic 1-3: Others  **Issue 1-3-1: vivo CR R4-2014972**  Agree with the CR content.  **Issue 1-3-2: OPPO CR R4-2015333**  Agree with the CR content.. |
| Huawei, HiSilicon | Sub topic 1-1: UE-to-UE coexistence requirements  **Issue 1-1-1: *Protect band lists for UE-to-UE coexistence for single carrier V2X UE***  Option1.  **Issue 1-1-2: *Protect band lists for UE-to-UE coexistence for V2X\_n71-n47 UE***  Since n71 is used in the US, if n47 is confirmed to be used in US as well, some additional US bands should be considered. Which bands should be considered can be further checked. Format of QC’s CR is not correct.  Sub topic 1-2: Update FRC tables  **Issue 1-2-1: *FRC Tables***  Option 2. The FRC table is based on two DMRS symbols pattern per current RAN4 spec. Not all DMRS pattern configurations are tested. For the case where two DMRS symbols are configured, DMRS symbol is starting from the symbols after PSCCH, which is not relevant to the bandwidth of PSCCH.  Sub topic 1-3: Others  **Issue 1-3-1: vivo CR R4-2014972**  OK with the CR content.  **Issue 1-3-2: OPPO CR R4-2015333**  OK with the CR content. |
| Qualcomm | Sub-topic #1-1 UE-UE coexisitence  Issue 1-1-1  Option 2: Do not think that in CR R4-2014323 for V2X\_n71A-n47A that n47 should be in the protected bands list. As n47 is a TDD band then FDL is the same as FUL. Protection of the transmit band was never in the past requirements. Do not believe that this requirement was there in LTE.  Issue1-1-2  Option 2: Follow Qualcomm proposal in R4-2016447. We believe that n47 will be used in the US so the list of bands that have to be protected should include NAR bands. The list of protected bands should resemble those presented in 38.101-3 v16.5.0 as indicated in R4-2016447. If companies cannot agree on the protected band list given in 38.101-3 v16.5.0 then each interested company should come up with a proposed list and the final set of protected bands should be agreed based on these lists.  Sub-topic #1-2  Issue 1-2-1 FRC tables  Option 1: Follow Qualcomm proposal in R4-2016446 with same PSSCH and PSCCH RB size for Doppler scenarios. We believe that the current FRC tables in the RAN4 spec are restrictive and so we propose a more general configuration which will perform better in moderate and high doppler scenarios.  Sub-topic #1-3  Issue 1-3-1 : Vivo CR R4-2014972  Option 1 : Agreed to all contents in the CR  Issue 1-3-2  Option 1: Agree to all contents of CR |

### 1.3.2 CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| **R4-2014323** | **Revised CR based on interested companies comments for both single band and NR-NR con-current operation Band combinations** |
| **YYY** |
| **ZZZ** |
| **R4-2016474** | **Most companies agree with contents except one companies. Maybe we can further discuss on FRC table between R4-2016474 and R4-2016446. Baseline is the R4-2016474 and it can be revised if RAN4 agree with some update the parameters in FRC table.** |
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| **R4-2016446** | **One companies agree with this revision. Maybe we can further discuss on FRC table between R4-2016474 and R4-2016446. Baseline is the R4-2016474 to update the parameters in FRC table. It can be noted.** |
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| **R4-2016447** | **For update UE-to-UE coexistence requirements, RAN4 treat the CR R4-2014323 as baseline to update the protect band lists for both single carrier and con-current band combos. It can be noted.** |
| **R4-2014972** | **All companies agree with the correction CR. It will be agreed** |
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| **R4-2015333** | **All companies agree with the correction CR. But CR did not check the proposed change affects in coversheet. So it will be revised.** |
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## 1.4 Summary for 1st round

### 1.4.1 Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary** |
| **Sub-topic#1-1**  UE-to-UE coexistence | ***Issue #1-1-1: Protect band lists for UE-to-UE coexistence for single carrier V2X UE***  *Recommendations for 2nd round:*   * Based on 1st round comment, the CR R4-2014323 will be revised and further discussed in 2nd round for the protect band list for n47 SL UE |
| ***Issue #1-1-2: Protect band lists for UE-to-UE coexistence for V2X\_n71-n47 UE***  *Recommendations for 2nd round:*   * Based on 1st round comment, the CR R4-2014323 will be revised and further discussed in 2nd round for the protect band list for V2X\_n71-n47 UE. |
| **Sub-Topic#1-2**  Update FRC tables | **Issue 1-2-1: *FRC Tables***  *Recommendations for 2nd round:*   * Based on 1st round comment, the original CR R4-2016474 contents will be further discussed and if RAN4 agree to update some parameters in FRC tables, then it could be revised. Otherwise, the original version will be agreed at 2nd round. |
| **Sub-Topic#1-3**  Others | **Issue 1-3-1: vivo CR R4-2014972**  Agreement: The original CR is agreed in 1st round |
| **Issue 1-3-2: OPPO CR R4-2015333**  *Recommendations for 2nd round:*   * Based on 1st round comment, the CR R4-2015333 will be revised and automatically agreed when the CR cover sheet is correct. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
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### 1.4.2 CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2014323 | It will be revised and further discussed at 2nd round |
| [R4-2014325](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014325.zip) | It will be revised and further discussed at 2nd round |
| R4-2016474 | It can be revised if RAN4 agree with some update the parameters in FRC table. Otherwise, the original CR will be agreed. |
| R4-2015333 | It will be revised to update cover sheet. Contents are OK to all interested companies |

## 1.5 Discussion on 2nd round (if applicable)

RAN4 will further discuss based on the revised TPs/CRs in 2nd round.

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| **T-doc number** | **Company** | **Comments** |
| **R4-2016803 CR on TS38.101-1 UE-to-UE coexistence** | **LGE** | **Support CR** |
| **YYY** |  |
|  |  |
| **R4-2016804 CR on TR38.886 for V2X UE Tx and Rx requirements** | **LGE** | **Support CR** |
| **YYY** |  |
|  |  |
| **R4-2016474**  **FRC table in TS38.101-1** | **Qualcomm** | **Issue 1-2-1: *FRC Tables***  **We believe that table A.7.1-1 in R4-2016474 is missing information on the redundancy version and the sl-PSSCH-DMRS\_TimePattern that was used to generate these tables. We would like this information to be included in this table.**  **As a compromise it is acceptable for us to adopt the FRC tables presented in R4-2016474.**  **Also, we request that the following note be captured in the WF so the usage of these tables are clear:**  **“Note: The following configuration is only for the FRC testing of the V2X receiver’s RF characteristics”**  **To LGE: We do not mind this note being captured in the Chairman’s notes or as a sentence in the body of the CR.** |
| **LGE** | **To QC, Do you want to capture the Note in FRC Tables in CR? Currently, we do not have WF on FRC table. Huawei will request revised Tdoc number for CR to add information on the redundancy version and the sl-PSSCH-DMRS\_TimePattern and capture QC’s proposed Note in CR.** |
| **Huawei** | **We are fine to capture in the chairman notes, but in the CR, may not be appropriate. The FRC is referred in clause 7 for Rx requirements in the spec, which is identical to the meaning of the note.** |
| **R4-2016805**  **(OPPO) check cover sheet** | **LGE** | **Need to check cover sheet error. Currently the revised version is not available.** |
| **YYY** |  |
|  |  |
| **R4-2017811**  **LS to 5GAA**  **(contents are same with the agreed LS R4-2011710)** | **LGE** | **Support LS. Just changed the next meeting information in revision.** |
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## 1.6 Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
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# Reference Tdoc lists

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **# of Tdoc** | **TDoc** | **Title** | **Source** | **Type** | **Agenda item** |
| 1 | [**R4-2014321**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014321.zip) | UE-to-UE coexistence and other remaining issues for V2X operation | LG Electronics France | Others | 7.3.3.1 🡪 Sub-Topic #1-1 |
| 2 | [**R4-2014323**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014323.zip) **🡪 R4-2016803** | Correction on NR V2X UE RF requirements in TS38.101-1 | LG Electronics France | [CR](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014323.zip) | 7.3.3 🡪 Sub-Topic #1-1 |
| 3 | [**R4-2014325**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014325.zip) **🡪 R4-2016804** | Correction on TR38.886 for V2X UE Tx and Rx requirements | LG Electronics France | CR | 7.3.3 🡪 Sub-Topic #1-1 |
| 4 | [**R4-2014972**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014972.zip) | CR on TS 38.101-1 for NR V2X | vivo | CR | 7.3.1 🡪 Sub-Topic #1-3 |
| 5 | [**R4-2015333**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015333.zip) **🡪 R4-2016805** | CR on V2X bands reference table | OPPO | CR | 7.3.3.1 🡪 Sub-Topic #1-3 |
| 6 | [**R4-2016446**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016446.zip) | Revised V2X FRC tables | Qualcomm Incorporated | CR | 7.3.3.2 🡪 Sub-Topic #1-2 |
| 7 | [**R4-2016447**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016447.zip) | Revision of inter-band V2X con-currency table for V2X\_n71A-n47A | Qualcomm Incorporated | CR | 7.3.3.1 🡪 Topic #1-1 |
| 8 | [**R4-2016474**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016474.zip) **🡪 R4-201xxxx** | CR for TS 38.101-1: Update of NR V2X FRC | Huawei, HiSilicon | CR | 7.3.1 🡪 Topic #1-2 |