**3GPP TSG-RAN WG4 Meeting #94-e R4-20xxxxx**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 8.4.1, 8.4.4, 8.4.4.1

**Source:** Moderator (LG Electronics)

**Title:** Email discussion summary for RAN4#94e\_#11\_5G\_V2X\_NRSL\_UE\_TX

**Document for:** Information

# Introduction

*In this paper, RAN4 treat the 5G V2X UE transmitter requirements and rapporteur inputs.*

*The provided technical docs list of email discussion are shown in Reference in the end of the paper. Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

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

* 1st round: Focus on UE Tx requirements according to NR V2X operating scenarios and Others.
  + Topic #1: UE Tx requirements for single carrier operation
  + Max. power/MPR/A-MPR/Configured Tx power/Output power dynamic/Transmit signal quality/Output RF Spectrum emission
  + Topic #2: UE Tx requirements for intra-band operation at n47 with TDM operation between NR SL and LTE SL
  + Topic #3: UE Tx requirements for inter-band con-current operation
  + Topic #4: Conclusion of 5G V2X WI in TR38.886 and rapporteur input
  + Topic #5: Others
  + Sub-Topic #5-1: UL-SL prioritization for 5G V2X UE
  + Sub-Topic #5-2: Annex X on declare of post Antenna gain
  + Sub-Topic #5-3: UE Tx diversity
  + Sub-Topic #5-4: Power class 2 UE for 5G V2X service at n47
* 2nd round: TBA

# Topic #1: UE Tx requirements for single carrier operation

*In this section, RAN4 treat the UE TX requirements for single carrier operation at n47.*

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000702 | FUTUREWEI | **Proposal 1: A single common additional MPR requirements for simultaneous transmissions of PSSCH and PSFCH** |
| R4-2001080 & R4-2001083 | Huawei | **Proposal 1: to reuse inner\outer method for QPSK/16QAM to specify NR V2X MPR requirements.**  **Proposal 2: MPR requirements for power class 3 NR V2X UE can be derived from table 2.** |
| R4-2001082 | Huawei | **Reflect updated MPR simulation assumptions based on summary of e-mail discussion** |
| R4-2001085 | Huawei | **Proposal 1: The allowed MPR for the maximum output power for NR V2X S-SSB shall meet the NR Uplink MPR requirements specified in sub-clause 6.2.2 from TS 38.101-1 for the corresponding waveform, power class, modulation and transmission bandwidth.** |
| R4-2000472 | Qualcomm | **The proposal were different in the main contents. It was revised from QC in e-mail.**  **Proposal 1: Use MPR back-off values given in table4 for PSSCH /PSCCH operation**  **Proposal 2: Use AMPR back-off values given in table5 for ESTI 10M emissions when NS33 is signaled for PSSCH /PSCCH operation**  **Proposal 3: Use AMPR values given in table6 for 40M emissions when FCC requirements are signaled for PSSCH /PSCCH operation** |
| R4-2001218 | LG Electronics | **Proposal 1: Reflect updated MPR simulation assumptions based on summary of e-mail discussion**  **Proposal 2: Propose the general ON/OFF time mask, SSSS time mask and PSSS / SSSS / PSBCH time mask for 5G V2X UE** |
| R4-2001240 | LG Electronics | **Provide MPR simulation results for PSSCH/PSCCH transmission** |
| R4-2001217 | LG Electronics | **Draft CR to introduce 5G V2X UE Tx requirements** |
| R4-2001220 | LG Electronics | **A-MPR simulation assumptions and requirements to protect regional regulatory requirements** |
| R4-2002029 | Huawei | ***Proposal 1: It is proposed to remove the brackets for the minimum output power requirement.*** |
| R4-2000473 | Qualcomm | Proposal 1: Use MPR values given in table4 for multi-cluster PSFCH operation (up to 5dB for proposed RB allocation up to 5 users)  Proposal 2: Use AMPR values given in table5 for 10M emissions when NS33 is signaled for multi-cluster PSFCH operation  Proposal 3: Use AMPR values given in table6 for 40M emissions when FCC requirements are signaled for multi-cluster PSFCH operation |
| R4-2000703 | FUTUREWEI | RAN4 also listed some potential limitations to support N>1 transmissions and would study the issues.   * To support N>1 simultaneous transmissions, under the conditions of fixed UE power of 23dBm, the MPR is in range of [1.5 – XdB] depending on the PRB locations of those PSFCH transmissions. |
| R4-2000704 | FUTUREWEI | Observation 1: IBE could be an important factor from system and reception perspective. But the effect of IBE on UE could be minimal if IBE zone is relatively far from the UE transmitting multiple PSFCHs.  Proposal 1: RAN4 should discuss the question “how many PSFCH a UE can transmit simultaneously” jointly with the frequency separation between the PSFCH resources.  Proposal 2: In order to minimize the impact of IBE, RAN4 should consider the impact of transmit power of PSFCH when number of simultaneously transmitted PSFCH >1 |
| R4-2001079 | Huawei | Propose the MPR according to RB allocation for PSFCH transmission  Observation 1: The amount of gap RB between RBlowest and RBhighest has an impact on the MPR for Non-contiguous PSFCH RB allocation.  Observation 2: 2 RB Non-contiguous PSFCH allocation is the worst case in all N RB Non-contiguous PSFCH allocation, it they have the same RBlowest and RBhighest.   |  |  | | --- | --- | | PSFCH RB allocation | MRP（dB） | | [1;106] | 10.1 | | [1,53,106] | 5.8 | | [1,26,53,79,106] | 5.1 | | [1,53] | 3.3 | | [53,106] | 3.3 | | [1,2] | 1.1 | | [105,106] | 1.1 | | [1] | 0 | | [106] | 0 | |
| R4-2001719 | LG Electronics | Propose the minimum 5dB MPR is needed for PC3 UE with up to 5 PSFCH transmissions. |

## Open issues summary

*Based on provided contributions, RAN4 mainly treat the TPs/CRs contents to complete 5G V2X UE Tx requirements for single carrier.*

* Sub-topic #1-1: *MPR for PSSCH/PSCCH transmission*
* Sub-topic #1-2: *MPR for simultaneous PSFCH transmission*
* Sub-topic #1-3: *MPR for S-SSB transmission*
* Sub-topic #1-4: *A-MPR to protect regional regulatory requirements*
  + *A-MPR for PSSCH/PSCCH*
  + *A-MPR for PSFCH*
* Sub-topic #1-5: *Configured output power*
* Sub-topic #1-6: *ON/OFF Time mask for single carrier except TDM operation*
* Sub-topic #1-7: *Draft CR contents in R4-2001217*

### Sub-topic #1-1

*Sub-topic description:* ***MPR for PSSCH/PSCCH transmission***

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

**Issue 1-1: *MPR for PSSCH/PSCCH transmission***

* Proposals
  + Option 1: Define MPR requirements to reuse inner\outer method for QPSK/16QAM to specify NR V2X MPR requirements.
  + Option 2: Define MPR requirements as same LTE V2X MPR requirements without inner/outer method for all supporting modulation schemes
* Recommended WF
  + It could be determined based on 1st e-mail discussion status

### Sub-topic #1-2

*Sub-topic description:* ***MPR for simultaneous PSFCH transmission***

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

**Issue 1-2-1: *MPR for simultaneous PSFCH transmission***

**How to specify the MPR requirements for simultaneous PSFCH transmission**

* Proposals
  + Option 1: Specify the MPR/A-MPR requirements as table format according to number of cluster and channel BWs
  + Option 2: Specify MPR requirements as equation format as same as multi-cluster transmission in LTE/NR.
* Recommended WF
  + RAN4 should be make consensus for the detail simulation parameters and worst scenarios to derive MPR requirements.
  + RAN4 will further discuss how to specify the MPR for PSFCH transmission at 1st e-mail discussion.

**Issue 1-2-2: Reply LS contents for MPR requirements for simultaneous PSFCH transmission**

* Proposals
  + Option 1: Draft LS based on FUTUREWEI reply LS (R4-2000703) will be generated. Just focus on MPR value for simultaneous PSFCH transmission. And IBE impact will be further discussed in RAN4. The final number of user for simultaneous PSFCH transmission will be decided in RAN1.
  + Option 2: Do not send reply LS to RAN1. Just define MPR requirements for simultaneous PSFCH transmission.
* Recommended WF
  + Focus on the MPR simulation assumptions to find the reason that the proposed MPR values from interested companies’ results are different.
  + More detail parameters will be discussed and recommend to send LS based on RAN4 MPR requirements for PSFCH simultaneous transmission.

### Sub-topic #1-3

*Sub-topic description:* ***MPR for S-SSB transmission***

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

**Issue 1-3: *MPR for S-SSB transmission***

* Proposals
  + Option 1: The allowed MPR of NR V2X S-SSB follow the NR Uplink MPR requirements specified in sub-clause 6.2.2 from TS 38.101-1.
  + Option 2: The allowed MPR for NR V2X PSBCH/PSSS follow the NR uplink MPR requirements and [4] dB MPR for SSSS would be applied. This is based on CM/PAPR of gold-sequence compare to m-sequence of PSSS.
* Recommended WF
  + It could be determined based on 1st e-mail discussion status.

### Sub-topic #1-4

*Sub-topic description:* ***A-MPR to protect regional regulatory requirements***

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

**Issue 1-4: *A-MPR to protect regional regulatory requirements***

* Proposals
  + Option 1: Define NS\_33 to comply A-SEM requirements for EU regulatory requirements and define NS\_48 to comply A-SEM requirements for FCC regulatory requirements.
  + *A-MPR for PSSCH/PSCCH*
  + *A-MPR for PSFCH*
  + Option 2: define new NS\_XX for single common A-MPR requirements.
* Recommended WF
  + Apply the A-MPR requirements when UE received network signal such as NS\_33 and NS\_48 to protect regional regulatory requirements due to different regulation requirements.
  + *A-MPR for PSSCH/PSCCH*
  + *A-MPR for PSFCH*

### Sub-topic #1-5

*Sub-topic description:* ***Configured Output power requirements***

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

**Issue 1-5: *Configured Output power requirements***

* Proposals
  + Option 1: Define configured Tx power as similar with LTE V2X. Also add restriction of Max power to protect CEN DSRC tolling system.
* Recommended WF
  + Define configured Tx power as similar with LTE V2X
  + Apply the A-MPR requirements when UE received network signal such as NS\_33 and NS\_48 to protect regional regulatory requirements.

### Sub-topic #1-6

*Sub-topic description:* ***On/Off Time mask for 5G V2X UE***

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

**Issue 1-6:**

* Proposals
  + Option 1: Define the on/off time mask for single carrier V2X operation based on R4-2001218.
  + Option 2: Do not need to specify the time mask for 5G V2X UE. The On/Off time mask for NR uplink transmission will be reused.
* Recommended WF
  + It will be determined based on 1st e-mail discussion status.

### Sub-topic #1-7

*Sub-topic description:* ***Draft CR on introducing NR V2X UE Tx requirements in TS38.101-1***

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

**Issue 1-7: *Draft CR on introducing NR V2X UE Tx requirements in TS38.101-1***

* Proposals
  + Option 1: Interested company should careful check the proposed 5G V2X UE Tx requirements in R4-2001217
  + Option 2: Need further discussion the 5G V2X UE Tx requirements
* Recommended WF
  + The draft CR (R4-2001217) will be treated as baseline UE Tx requirements to complete 5G V2X UE remaining issues on Tx part.

## Companies views’ collection for 1st round

### Open issues for sub-topic #1-1

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| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic #1-1: LGE will provide revised MPR simulation results in this week. We also observe the inner/outer RB allocation pattern. Based on the MPR simulation results from interested companies, RAN4 will derive MPR requirements for PSSCH/PSCCH transmission.  Others: |
| Huawei | We support Option1. NR V2X use CP-OFDM waveform, instead of DFT-S-OFDM used by LTE. CP-OFDM waveform has higher PAPR. It’s beneficial to use inner/outer methods. |
| FUTUREWEI | Sub topic #1-1: We understand that for now single/shared carrier UL – SL discussion is in subtopic #5-1. There we made argument that since NR UL and NR SL both are CP-OFDM that simultaneous transmissions could have a comparable MPRs. We wonder single/share carrier UL -SL can be covered in this MPR derivation exercise? |
| QCOM | Sub topic #1-1:  QCOM is prefers option 2. It is simpler to implement.  Others: |

### Open issues for sub-topic #1-2

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| **Company** | **Comments** |
| LG Electronics | **Sub topic #1-2-1:** Huawei, LGE and QC provided MPR simulation results for simultaneous PSFCH transmission.  - LGE : Up to 5dB MPR for 2-5 user simultaneous PSFCH transmission with non-contiguous RB allocation.  - QC: Up to 5dB MPR according to RB allocation up to 5 users  - HW : Proposed equation for MPR requirements for simultaneous PSFCH transmission with non-contiguous RB allocation. Max. 10.1dB MPR for 2user simultaneous PSFCH transmission with non-contiguous RB allocation. Also they propose to discuss on IBE problems.  Based on this simulation results, we can discuss the detail simulation assumptions and parameters why the simulation results are different between two group.  **Sub topic #1-2-2:** Currently, RAN4 do not need to send LS to RAN1 for the required MPR levels. Just try to define MPR requirements for simultaneous PSFCH transmission with aligned simulation assumptions.  Others: |
| Huawei | Sub topic #1-2-1:  Our proposal is to specify MPR for PSFCH based on NGap / NRB. The main factor for PSFCH which has an impact on MPR is the frequency distance between RBlowest and RBhighest. Two RBs Non-contiguous PSFCH allocation is the worst case in all N RBs Non-contiguous PSFCH allocation under the same **RBlowest and RBhighest.** |
| FUTUREWEI | Sub topic #1-2-1:  For non-contiguous case, the RBs on two extremes have the largest MPR but the values seem to differ from companies. In the end, these ‘max’ values are the ones going to be listed in specification. It would be good to align these values.  Sub topic #1-2-2:  Defining MPR requirements is our first priority. If we are in a position where there is consensus to finalize MPR values then we do not see any reason why not let RAN1 know this information. The situation is that RAN1 asked for this information and RAN4 provided preliminary information and also mentioned we would let them know if we define. So, if we are in the final stages of defining MPR requirements and sharing this result to RAN1 is not a big problem. |
| QCOM | Sub topic #1-2-1:  QCOM prefers option1, a table format according to the number of clusters =1,2,3,4, and >=5.  Equation format (option 2) is a problem as the fraction of allocated RBs is very small.  Re: the recommended WF, Simulation parameters are already agreed by consensus in the Reno WF, so we can move ahead under that agreement.  Sub topic #1-2-2:  RAN4 should continue to work to finalize the requirements (option 2). We don’t see a reason for an LS to RAN1.  Others: |

### Open issues for sub-topic #1-3

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| **Company** | **Comments** |
| LG Electronics | **Sub topic #1-3**: The allowed MPR for NR V2X PSBCH/PSSS follow the NR uplink MPR requirements and [4] dB MPR for SSSS would be applied. This is based on CM/PAPR of gold-sequence compare to m-sequence of PSSS.  Others: |
| Huawei | Sub topic #1-3:  CP-OFDM is adopted by NR-V, which is different from that of LTE-V. The LTE-V requirements cannot be reused without simulation evaluation. |
| Intel | Sub topic #1-3:  We agree with Huawei that LTE requirements can not be reused due to different waveform for LTE V2X and NR V2X. Our preference is to have same MPR for whole S-SSB. Option 1 can be considered as one of candidates. |
| QCOM | Sub topic #1-3:  Before we can specify the MPR companies should do some simulation to determine the required value. Prior to that the group should consider whether simulation assumptions are needed.  Others: |

### Open issues for sub-topic #1-4

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| **Company** | **Comments** |
| LG Electronics | **Sub topic #1-4:** Define NS\_33 to comply A-SEM requirements for EU regulatory requirements and define NS\_48 to comply A-SEM requirements for FCC regulatory requirements based on follow V2X specific channel transmission.   * *A-MPR for PSSCH/PSCCH* * *A-MPR for PSFCH*   LGE will provide the revised A-MPR requirements for both 10MHz (ETSI) and 40MHz(FCC) for PSSCH/PSCCH. FFS on the A-MPR for PSFCH transmission.  One discussion point is that the A-SE will be removed in EN 302 571. However, currently official announcement is not ready.  Others: |
| Huawei | Sub topic #1-4:  1. For R4-2001220, shall we limit Start Resource Block as discrete in table 7\8\9? As far as I know, there is no limitation for Rbstart. Thus, we need to consider all of the cases when we specify the AMPR requirements. The LTE-V’s method may not be applicable.  2. We need to consider NS\_34, as well.  3. For R4-2000472, why is the MPR/AMPR same between QPSK and 256QAM? Transmit modulation quality should be considered when we simulate MPR/AMPR.  4. AMPR for PSFCH can be derived by using MPR’s method.  Others: |
| QCOM | Sub topic #1-4:  We prefer option1, separate AMPR for PSFCH and PSSCH/PSCCH, which can provide more optimal backoff.  A clarification on the EU requirement, the TR Table 8.1.10.1-1: Additional spectrum mask requirements for 10MHz channel bandwidth, should be the only requirement used.  Others: |

### Open issues for sub-topic #1-5

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| **Company** | **Comments** |
| LG Electronics | **Sub topic #1-5**: Define configured Tx power as similar with LTE V2X. Also add restriction of Max power to protect CEN DSRC tolling system.  Others: |
| Huawei | **Sub topic #1-5**: Configured Output power cannot reuse the LTE-V requirements, which should be carefully considered and discussed |
| QCOM | Sub topic #1-5:  We need clarification, are you referring to the configured power part of the CR R4-2001217?  If so we are OK with the configured power part.  We don’t agree with the entire CR.  Others: |

### Open issues for sub-topic #1-6

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| **Company** | **Comments** |
| LG Electronics | **Sub topic #1-6**: Define the on/off time mask for single carrier V2X operation based on R4-2001218  Others: |
| Intel | **Sub-topic #1-6:**  We have several comments about content of R4-2001218.  First comment is about terminology. Scheduling unit “sub-frame” is used for definition of time mask. Same time, in NR, sub-frame is fixed unit with duration 1 ms and slot in NR is used as scheduling unit.  Second comment is about time masks for PSBCH/SSSS/PSSS. Motivation to have dedicated on/off time masks for SSSS only and PSBCH/SSSS/PSSS is not clear. Based on our understanding, time mask for PSBCH/SSSS/PSSS is same as for PSSCH/PSCCH. Same time, SSSS is always transmitted as a part of S-SSB and on/off time mask for SSSS only is not required.  Taking into account above comments, we prefer Option 2 at current stage. |
| QCOM | Sub topic #1-6:  We do have some questions that will help us understand the proposal  In Figure 8.1.7.1-1  Does the gap mean the PSSCH transmission gap? Is there a reason to put the first transient period inside the slot?If we can get some clarification we can make a comment in the next round about the tdoc.  Others: |

### Open issues for sub-topic #1-7

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| **Company** | **Comments** |
| LG Electronics | **Sub topic #1-7:** The draft CR (R4-2001217) will be treated as baseline UE Tx requirements to complete 5G V2X UE remaining issues on Tx part.  Others: |
| Huawei | **Sub topic #1-7:** The draft CR (R4-2001217) together with those drafts on PC2 as well as 2Tx requirements should be considered |
| Intel | **Sub-topic #1-7:** The draft CR (R4-2001217) contains proposals which not yet agreed in this e-mail thread and RAN4#94e\_#13\_5G\_V2X\_NRSL\_SysParameters e-mail thread. Therefore, we suggest to come back to this CR later once agreements on all open issue will be completed. |
| QCOM | Sub topic #1-7:  We need to further discuss the UE TX requirements, so Option 2.  Some comments on R4-2001217  We have not settled on MPR or AMPR , 6.2E.2 and 6.2E.3.  For co-existence the n47 emissions levels from 5925-5950 and 5815-5855 are not needed and should be removed. ETSI has removed this requirement in their stable draft document.  Others: |

### 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** |
| R4-2001082 | LG Electronics: Duplicated with R4-2001218 |
| Huawei :further check other changes besides the simulation assumptions |
|  |
| R4-2001083 | LG Electronics: MPR requirements will be derived as RAN4 consensus. |
| QCOM:  Results should be presented in format similar to LTE |
|  |
| R4-2001085 | LG Electronics: We think that the allowed MPR for NR V2X PSBCH/PSSS follow the NR uplink MPR requirements. However, [4] dB MPR for SSSS would be applied since SSSS will be generated by gold-sequence compare to m-sequence of PSSS. So PAPR/CM will be larger than PSSS |
| Huawei: CP-OFDM is adopted by NR-V, which is different from that of LTE-V. The LTE-V requirements cannot be reused without simulation evaluation. |
| QCOM:  Need to determine whether agreement on simulation assumptions is required before doing MPR simulations |
| R4-2001218 | LG Electronics: The MPR requirements will be decided as RAN4 consensus. |
| Huawei: 1. For MPR, we have a different formular to calculate it. Our proposal is to specify inner and outer allocation for NR V2X. It can helo choose the RB allocation which cause smaller MPR.  2. And the architecture of MPR for NR V2X TR need to be improved. |
| QCOM:   * Figure 8.1.7.1-1-1 Does the gap mean the PSSCH transmission gap? Is there a reason to put the first transient period inside the slot? |
| R4-2001220 | LG Electronics: The A-MPR requirements for 40MHz will be updated in this paper. Based on the revised A-MPR results, RAN4 can further discuss the A-MPR req. for both 10MHz(ETSI) and 40MHz(FCC) |
| Huawei: We need to make some consensus for AMPR firstly, then we can review or revise it. |
| QCOM:   * A-MPR numbers in Tables 8.1.3-5, 8.1.3-6, 8.1.3-7 have not been agreed   Table 8.1.13-1 -30dBm/MHz spec should be removed |
| R4-2001217 | Huawei: Should be revised based on the email discussion |
| QCOM :   * MPR and A-MPR numbers in 6.2E2 and 6.2E3 have not been agreed * Tables 6.5.3.2-1, 6.5E.3.2-1 For co-existence the n47 emissions levels from 5925-5950 and 5815-5855 are not needed and should be removed. ETSI has removed this requirement in their stable draft document. * Figure 6.3E3.1-1 Does the gap mean the PSSCH transmission gap? Is there a reason to put the first transient period inside the slot? * In Table 6.5E2.2.2-1 the last emissions limit is missing |
|  |
| R4-2001079 | LG Electronics: The MPR for PSFCH simulation results are different between two groups. RAN4 need to discuss the detail simulation assumptions and parameters why the simulation results are different. |
| Huawei: can further check the simulation assumptions and simulation cases |
| QCOM:  MPR simulations should cover more RB placement scenarios |
| R4-2000703 | LG Electronics: Currently, RAN4 do not need to send LS to RAN1 for the required MPR levels for simultaneous PSFCH transmission. Just try to define MPR requirements for simultaneous PSFCH transmission with aligned simulation assumptions. |
| QCOM  Not clear how MPR in the range of [1.5-X] was derived |
|  |

## Summary for 1st round

### 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** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company, WF or LS lead** |
| #1 |  |  |

### 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** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## 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** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: UE Tx requirements for intra-band operation at n47 with TDM operation between NR SL and LTE SL

*In this section, RAN4 treat the UE TX requirements for intra-band V2X operation at n47 with TDM operation between NR SL and LTE SL.*

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001216 | LG Electronics | **Proposal 1: define additional time mask for TDM operation between NR SL and LTE SL at n47.**  When a NR V2X UE is operated with TDM between NR SL and LTE SL at n47 without dual PA capability, the maximum UL switching time is defined as [120] us and SL reception interruption is allowed during UL switching time masks in Figure 8.1.7.4-1 and Figure 8.1.7.4-2 shall apply. |
| R4-2000701 | FUTUREWEI | **Include UE architecture without dual PA capability for in-device coexistence in section 6. Need to define switching period of about 140us is applicable between the NR SL and LTE SL for TDM operation** |
| R4-2000702 | FUTUREWEI | **Proposal 2: In addition to the general ON / OFF time masks, the additional switching period of about 140us is applicable between the NR SL and LTE SL for TDM operation.** |
| R4-2001224 | LG Electronics | **Propose Draft CR to introduce intra-band NR V2X TDM operation between NR SL and LTE SL at n47** |
| R4-2000471 | Qualcomm Incorporated | **Observation: If the switching time exceeds the duration of 1 symbol then and extra slot must be inserted between the LTE SL and NR SL slots.**  **Proposal 1: Define the switching time between NR SL and LTE SL for TDM operation in band n47 to be 210us for both contiguous and non-contiguous spectral allocations.**  **Proposal 2: Interruption requirement for Tx switch between LTE SL and NR SL is one slot for NR and one subframe for LTE** |

## Open issues summary

*Based on provided contributions, RAN4 will treat the TP contents to complete 5G V2X UE Tx requirements for TDM operation between NR SL and LTE SL at ITS spectrum.*

### Sub-topic #2-1

*Sub-topic description:* ***Additional switching Time mask between NR SL and LTE SL without dual PA capability***

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

**Issue 2-1: *Additional switching Time mask between NR SL and LTE SL without dual PA capability***

**How to specify the switching time at 5855~5925MHz**

* Proposals
  + Option 1: propose 20+120+ 10 =150us when V2X UE switched from LTE SL to NR SL or vice versa
  + Option 2: propose 140us for the additional switching period which is applicable between the NR SL and LTE SL for TDM operation.
  + Option 3: propose 210us for the additional switching period for both contiguous and non-contiguous spectral allocations.
* Recommended WF
  + It could be determined based on 1st e-mail discussion status.

### Sub-topic #2-2

*Sub-topic description:* ***Draft CR on introducing intra-band NR V2X UE Tx requirements with TDM operation between NR SL and LTE SL in TS38.101-3***

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

**Issue 2-2: *Draft CR on introducing intra-band NR V2X UE Tx requirements with TDM operation***

* Proposals
  + Option 1: The final switching time will be decided by majority rule. Interested company should careful check the proposed NR V2X UE Tx requirements with TDM operation between NR SL and LTE SL in R4-2001224
  + Option 2: The switching period between Case 1 and Case 2 in NR Uplink transmission will be refered to specify the switched period at n47
* Recommended WF
  + The draft CR (R4-2001224) will be treated as baseline UE Tx requirements to support 5G V2X UE TDM operation at n47 on Tx/Rx part.

## Companies views’ collection for 1st round

### Open issues for sub-topic #2-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | **Sub topic #2-1**: propose 20+120+ 10 =150us will be specified as switched period when V2X UE switched from LTE SL to NR SL or vice versa. The switched period allowed in NR slot.  Others: |
| Huawei | **Sub topic #2-1**: Whether the switching period is totally considered as OFF power period should be further discussed |
| FUTUREWEI | **Sub topic #2-1: In previous meetings we discussed about the switching period value. This excludes the OFF time on LTE subframe and NR slot side. We did not fully discuss where this switching period will be. The agreement we should reach here is regarding the switching period only. The OFF periods 20us and 10us are fixed and in the specification, the open point is about the switching period. For this our preferred option is option 2 (140us).**  **Qualcomm paper (0471) include 50us for the RF chain reconfiguration, on top of 140us switching period. So far, we do not have any discussion on this.** |
| QCOM | Sub topic #2-1:  We prefer option 3 for the reasons described in our tdoc.  Neither option 1 or option 2 provide sufficient time for reconfiguration.  Others: |

### Open issues for sub-topic #2-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Sub topic #2-2:** The draft CR (R4-2001224) will be treated as baseline UE Tx requirements to support 5G V2X UE TDM operation between LTE SL and NR SL at n47 on Tx part.  Others: |
| Huawei | **Sub topic #2-2:** The switching position should be discussed further, which may not be always placed at the NR-V side. |
| FUTUREWEI | **Sub topic #2-2:** So far we have not discussed or decided the position of such switching period.  We should discuss this. Once this is clear then below 2.3.3 CR drafting can be quicker. |
| QCOM | Sub topic #2-2:  Could you please clarify option 1 and option 2? For option 1 what part of the CR are you referring to? For option 2 can you describe what you mean by case 1 and case, and what is meant by ‘referred to specify the switched period at n47’.  Once we understand what is being proposed we can comment.  Others: |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001216 | LG Electronics: The figure will be revised to remove OFF power requirements and switched period will be defined as [140 or 150 or 210]us for TDM operation between LTE SL and NR SL at ITS spectrum |
| Huawei: besides the switching period, the switching position should be further discussed |
| QCOM  Our calculations indicate that at least 210us is required for switching between NR SL and LTE SL |
| R4-2001224 | LG Electronics: The UL switched time mask figure will be revised to remove OFF power requirements and switched period will be defined as [140 or 150 or 210] us for TDM operation between LTE SL and NR SL at ITS spectrum |
| Huawei: besides the switching period, the switching position should be further discussed |
| QCOM:  Our calculations indicate that at least 210us is required for switching between NR SL and LTE SL |
| R4-2000701 | LG Electronics: Need further discuss to define switching period. Candidate options are below  Option1: 150us  Option2: 140us  Option3: 210us |
| Huawei: Option 2 without transient period |
| QCOM:  Our calculations indicate that at least 210us is required for switching between NR SL and LTE SL |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: UE Tx requirements for inter-band con-current operation

*In this section, RAN4 treat the UE TX requirements for inter-band V2X operation.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001218 | LG Electronics | Define UE Tx/Rx requirements for inter-band con-current V2X operation with n38 |
| R4-2002030 | Huawei | **Propose Draft CR in TS38.101-1 with NR licensed band + NR n47 con-current operation** |
| R4-2002031 | Huawei | **Propose Draft CR in TS38.101-3 with LTE licensed band + NR n47 con-current operation** |

## Open issues summary

*Based on provided contributions, RAN4 will treat the TP/CRs contents to complete inter-band con-current V2X UE Tx requirements.*

### Sub-topic #3-1

*Sub-topic description:* ***Inter-band con-current operation with n38***

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

**Issue 3-1: UE Tx/Rx requirements for inter-band con-current operation with n38**

* Proposals
  + Option 1: The propose TP on UE Tx/Rx requirements for NR V2X\_nX-n38 UE will be approved. This is 2nd priority for inter-band con-current V2X operating scenarios
  + Option 2: Defer to the inter-band con-current operation since there was no inter-band con-current band combinations with n38 in this meeting.
* Recommended WF
  + The inter-band con-current band combination with n38 SL transmission will be determined by operator request in this meeting. If there is no request the band combinations with n38 from operator, then the related contents in draft CR will not be included in this meeting.

### Sub-topic #3-2

*Sub-topic description:* ***Draft CR on introducing inter-band NR V2X UE Tx requirements for NR uplink (at licensed band) + NR SL ( at n47 or n38) con-current operation in TS38.101-1***

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

**Issue 3-2:**

* Proposals
  + Option 1: Draft CR from Huawei is baseline to introduce inter-band NR V2X Tx requirements for NR uplink (at licensed band) + NR SL (at n47 or n38) con-current operation.
  + Option 2: Need further discussion the inter-band NR V2X UE Tx requirements for NR uplink (at licensed band) + NR SL (at n47 or n38) con-current operation
* Recommended WF
  + The draft CR (R4-2002030) will be treated as baseline UE Tx requirements to support inter-band NR V2X UE requirements for NR uplink (at licensed band) + NR SL (at n47 or n38) con-current operation.

### Sub-topic #3-3

*Sub-topic description:* ***Draft CR on introducing inter-band NR V2X UE Tx requirements for LTE uplink (at licensed band) + NR SL (at n47 or n38) con-current operation in TS38.101-3***

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

**Issue 3-3:**

* Proposals
  + Option 1: Draft CR from Huawei is baseline to introduce inter-band V2X Tx requirements for LTE uplink (at licensed band) + NR SL (at n47 or n38) con-current operation.
  + Option 2: Need further discussion the inter-band V2X UE Tx requirements for LTE uplink (at licensed band) + NR SL (at n47 or n38) con-current operation
* Recommended WF
  + The draft CR (R4-2002031) will be treated as baseline UE Tx requirements to support inter-band NR V2X UE requirements for LTE uplink (at licensed band) + NR SL (at n47 or n38) con-current operation.

## Companies views’ collection for 1st round

### Open issues for sub-topic #3-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 3-1: Whether we need to consider the con-current operation for n38 should be based on the operator’s scenario  Others: |
| QCOM | Sub topic 3-1:  We are not sure we understand the proposals. Option 1 seems to be approval of the TP, we don’t understand the second priority meaning. Option 2 seems to be rejecting the CR, because no operator has brought inter-band n38 proposal to the meeting. Do we understand the options correctly?  If we understand correctly, we prefer option 2.  Others: |

### Open issues for sub-topic #3-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Dish Network | Sub topic 3-2: How about case when NR Uu controls LTE SL? That is part of the WID as well.  Others: |
| LG Electronics | Sub topic 3-2: RAN4 will be further discussed based on the draft CR (R4-2002030). The additional requirements will be captured to support inter-band con-current operation between n38 SL and NR uplink transmission.  For the Dish comment, RAN4 will treat the NR uplink (at licensed bad) control the LTE SL (at Band 47) based on operator request. |
| Dish Network | Understood that NR Uu (licensed band) controlling LTE SL at B47 is based on operator request, but my question is when/in which specification are the generic requirements specified? |
| Huawei | Make it clear in the spec that con-current operation only considers the combinations with configuration relationship between Uu and SL for mode 1. |
| Dish Network | Could Huawei clarify why mode 1? The WID (RP-191723) has:  Specify support for NR Uu to provide control for LTE sidelink   * Sidelink mode 4 as per the study outcome [RAN2, RAN1]; and * Sidelink mode 3-like RRC-configured SPS scheduling with DCI-based activation/deactivation as per the agreement in RAN1#97 [RAN1, RAN2]. |
| LG Electronics | LGE think that mode 3 and mode 4 can be support based on the RAN1/RAN2 specification completion in rel-16. In Mode 3, NW schedule the resource pool & SPS scheduling to the LTE SL operation. In Mode 4, NW schedule the resource pool and LTE UE determine the resource. Therefore, In RAN4 perspective, do not have any restriction of Uu and SL mode.  The TS38.101-3 will cover the con-current operation of NR Uu + LTE SL like as EN-DC operation. |
| QCOM | Sub topic 3-2:  We need further discussion in RAN4, so option 2.  For spurious emissions the protection in the 5815-5855 and 5925-5950 are not applicable. ETSI has removed these requirements in their stable draft.  Others: |

### Open issues for sub-topic #3-3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic 3-3: This is also can be treat based on operator request. However, Currently, we do not any request the LTE uplink + NR sidelink (n47 or n38). So RAN4 can specify the con-current operation bands in enhanced sidelink WI or new con-current V2X band combination WI in rel-17.  Others: |
| Huawei | Make it clear in the spec that con-current operation only considers the combinations with configuration relationship between Uu and SL for mode 1. |
| LG Electronics | This is depend on operator request for inter-band con-current operation. RAN4 do not restricted of band configuration between Uu and SL. However, one check point is that other WG progress about related band configuration modes. |
| QCOM | Sub topic 3-3:  We need further discussion in RAN4, so option 2.  On comment on the CR content. For spurious emissions the protection in the 5815-5855 and 5925-5950 are not applicable. ETSI has removed these requirements in their stable draft.  Others: |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001218 | Company A |
| Company B |
|  |
| R4-2002030 | Company A |
| Company B |
|  |
| R4-2002031 | Company A |
| Company B |
|  |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: Conclusion and Rapporteur inputs for 5G V2X WI

*In this section, RAN4 treat the revised TR, conclusion of 5G V2X WI and others for NR V2X Service.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001214 | LG Electronics | Update TR based on agreements in previous RAN4 meeting |
| R4-2001215 | LG Electronics | Provided summary of RAN4 e-mail discussion results   * Updated MPR simulation assumptions for PSSCH/PSCCH * Updated MPR simulation assumptions for PSFCH * Baseline RF architecture for NR V2X UE * UE capability for NR UE RF characteristics * Work split for CR works |
| R4-2001221 | LG Electronics | Propose the conclusion part in TR38.886  Based on coexistence evaluation results and the NR V2X operating scenarios, 5G V2X service will be supported in contents of TR38.886. |

## Open issues summary

*All required contents in TR38.886 were filled to support NR V2X service based on agreed V2X operating scenarios. So RAN4 need to specify the NR V2X UE RF requirements in TS38.101-1 and TS38.101-3.*

### Sub-topic #4-1

*Sub-topic description:* ***Updated TR38.886***

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

**Issue 4-1: Updated TR38.886.**

* Proposals
  + RAN4 can approved the updated TR38.886 v0.5.0
* Recommended WF
  + It will be approved if there is no comment to update.

### Sub-topic #4-2

*Sub-topic description:* ***Summary on E-mail discussion for NR V2X***

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

**Issue 4-2: Summary on E-mail discussion for NR V2X.**

* Proposals
  + RAN4 can approved the provided summary paper.
* Recommended WF
  + It will be approved if there is no comment to update.

### Sub-topic #4-3

*Sub-topic description:* ***Conclusion part in TR38.886 for NR V2X WI***

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

**Issue 4-3: Conclusion part for NR V2X WI.**

* Proposals
  + Based on the NR V2X operating scenarios, RAN4 studied and specified the NR V2X UE RF requirements to support the following scenarios to comply the regional regulatory requirements in FR1.
* Specify operating NR V2X bands and system parameters (Section 7)
* Specify RF core requirements in the ITS spectrum (Section 8 and 9)
  + Specify additional-SEM requirements to comply regional regulation
  + Specify the restricted max. power to protect CEN DSRC tolling system
* Specify RF core requirements for NR SL (at n47) and LTE SL (at B47) as TDM for Tx transmission and simultaneous receptions (Section 8 and 9)
* Specify RF core requirements for licensed bands (Section 8 and 9)
* Specify RF core requirements for inter-band con-current operation (Section 10)
* Recommended WF
  + RAN4 can approved the conclusion part if there is no comment to update the contents.

.

## Companies views’ collection for 1st round

### Open issues for sub-topic #4-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| QCOM | Sub topic 4-1:  We can’t approve the CR.  In tables 8.1.13-1 and Table 10.1.1.13-1 the n47 spurious requirements for the 5815-5855 and 5925-5950 are not required and should be removed.  Others: |

### Open issues for sub-topic #4-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| QCOM | Sub topic 4-2:  We are OK with this  Others: |

### Open issues for sub-topic #4-3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| QCOM | Sub topic 4-3:  We are OK with this  Others: |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001214 | Company A |
| Company B |
|  |
| R4-2001221 | Company A |
| Company B |
|  |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #5: Other issues

*In this section, RAN4 treat additional other issues for 5G V2X UE such as following issues.*

* Sub-Topic #5-1: UL-SL prioritization for 5G V2X UE
* Sub-Topic #5-2: Annex X on declare of post Antenna gain
* Sub-Topic #5-3: UE Tx diversity
* Sub-Topic #5-4: Power class 2 UE for 5G V2X service at n47

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000705 | FUTUREWEI | Proposal 1: For Q1, for the Case 1 single / shared carrier, RAN4 can indicate to RAN2 that both the scenarios are valid |
| R4-2000706 | FUTUREWEI | RAN4 discussed the case 1 of Q1 NR-UL/NR-SL prioritization in shared/same carrier frequency.  RAN4 can confirm that scenario described in Q1 about NR-UL/NR-SL prioritization in shared/same carrier frequency is VALID. |
| R4-2000690 | Qualcomm | Propose the equation for conversation between PEIRP and Pconducted power is added in TS38.101-1.  Add Annex I to declare of post Antenna gain |
| R4-2000688 | Qualcomm | Draft CR for the inclusion of TX diversity in NR V2X was added to the relevant sections.  Use suffix G from LTE contents |
| R4-2002033 | Huawei | Draft CR to introduce UL-MIMO for NR V2X  Use suffix E in new NR contents |
| R4-2001081 | Huawei | MPR simulation results  **Proposal 1: MPR requirements for power class 2 NR V2X UE can be derived from table 2.**  Table 2 Maximum power reduction (MPR) for power class 2 NR V2X UE   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Modulation | | MPR (dB) | | | | Edge RB allocations | Outer RB allocations | Inner RB allocations | | CP-OFDM | QPSK | ≤ 3.5 | | ≤ 1.5 | | 16 QAM | ≤ 3.5 | | ≤ 2 | | 64 QAM | ≤ 4 | | | | 256 QAM | FFS | | | |  | | | | | |
| R4-2001084 | Huawei | TP on NR V2X PC2 UE RF requirements for NR V2X  Provide MPR and ACLR requirements for PC2 NR V2X UE |
| R4-2002032 | Huawei | Draft CR on PC2 RF requirements for NR V2X  MPR requirements based on R4-2001081, ACLR is 31dB for PC2 and A-MPR is TBD |

## Open issues summary

*Based on provided contributions, RAN4 will discuss the remaining open issues in this sections*

### Sub-topic #5-1:

*Sub-topic description:* ***UL-SL prioritization for 5G V2X UE***

*Open issues and candidate options before e-meeting:* RAN2 request for the feedback from RAN4.

**Q1**: For the two scenarios agreed by RAN2 for NR-UL/NR-SL prioritization (i.e., 1) when UL TX overlaps in time domain with SL TX in the shared/same carrier frequency, and 2) when UL TX and SL TX (in different carrier frequency) share TX chains and power budget), are they valid scenarios for prioritization from RAN1/4 perspective?

Case1: UL-Tx and SL-Tx in shared/same carrier frequency in licensed bands

**Issue 5-1: *UL-SL prioritization for 5G V2X UE***

**How to reply the answer for Case1 in Q1.**

* Proposals
  + Option 1: Based on Futurewei proposal, RAN4 send LS to RAN2 the Case 1 is VALID scenario in RAN4 perspective
  + Option 2: For single or shared carrier in licensed band, the UL-TX and SL-TX will be operated with TDM manner as same as Prose. So this is not valid to decide UL-SL transmission priority.
* Recommended WF
  + It will be determined based on 1st e-mail discussion status.

### Sub-topic #5-2:

*Sub-topic description:* ***Equation for conversation between PEIRP and Pconducted power and Annex X***

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

**Issue 5-2: *Equation for conversation between PEIRP and Pconducted power and Annex X***

**How to define NR V2X Tx power related EIRP.**

* Proposals
  + Option 1: RAN4 reuse the conversation equation between EIRP and conducted power for NR V2X UE
* Recommended WF
  + The draft CR contents will be merged in big CR to cover the EIRP conversion

### Sub-topic #5-3:

*Sub-topic description:* ***Required Tx requirements for******UL-MIMO***

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

**Issue 5-3: *Required Tx requirements for******UL-MIMO***

**How to specify the MPR/A-MPR requirements.**

* Proposals
  + Option 1: Draft CR from Huawei is baseline to support NR V2X UL-MIMO schemes as 2nd priority (optional feature)
  + Option 2: The UL-MIMO scheme will be specified in Rel-17. UL-MIMO scheme for NR V2X will be supported from rel-16 as release independent manner
* Recommended WF
  + It could be decided by 1st e-mail discussion status.

### Sub-topic #5-4:

*Sub-topic description:* ***Required MPR/A-MPR requirements for******PC2 NR V2X UE***

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

**Issue 5-4: *MPR/A-MPR requirements for******PC2 NR V2X UE***

* Proposals
  + Option 1: The PC3 MPR level was diverse the simulation results from interested companies. RAN4 just focus how to specify the PC3 MPR/A-MPR requirements. Then RAN4 further discuss the PC2 MPR/A-MPR requirements. There are two option as follow
    - Sub-option1: Follow NR Uplink MPR/A-MPR requirement to reuse inner\outer method for all supported modulation and channel BWs to specify NR V2X MPR requirements for PC2 based on Huawei proposal in R4-2001081. But need more simulations inputs.
    - Sub-option2: Follow LTE V2X MPR/A-MPR requirement regardless of inner/outer RB allocation for all supported modulation and channel BWs to specify NR V2X MPR requirements for PC2 UE. Need more simulation inputs.
  + Option 2: In next RAN4 meeting, RAN4 will provide MPR/A-MPR requirements for PC2 UE. The simulation assumption should be decided in RAN4 94-e-meeting.
  + Option 3: The PC2 UE requirements will be specified in Rel-17. PC2 UE for NR V2X will be supported from rel-16 as release independent manner.
* Recommended WF
  + It will be decided by 1st e-mail discussion status.

## Companies views’ collection for 1st round

### Open issues for sub-topic #5-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic #5-1: LGE already shared LGE view in R4-1913952. For single or shared carrier in licensed band, the UL-TX and SL-TX will be operated with TDM manner as same as Prose. So this is not valid to decide UL-SL transmission priority. Priority should be considered with the dual transmission possible scenarios.  Others: |
| FUTUREWEI | Sub topic #5-1: It is NR V2X, both NR UL and NR SL transmissions are CP-OFDM, so this should be taken into account. We need not follow Prose procedures as it is.  Last meeting, we discussed two cases: in a single/shared carrier when UL-TX and SL-TX are adjacent and non-contiguous. Adjacent cases are not a problem. Even for non-contiguous cases, the transmission would work the same way as already defined NR CA/ EN-DC cases. This is no different than already defined requirements. |
| QCOM | Sub topic #5-1:  We are still studying the aspects of the tdoc and the associated LS. We need more time for internal discussion.  Others: |

### Open issues for sub-topic #5-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic #5-2: RAN4 reuse the conversation equation between EIRP and conducted power for NR V2X UE  Others: |
| QCOM | Sub topic #5-2:  We support option 1 per our tdoc R4-2000690.  Others: |

### Open issues for sub-topic #5-3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic #5-3: LGE do not block to specify the tx diversity scheme in rel-16. However, the first priority is to specify the agreed NR V2X scenarios in 4.3.1 in TR38.886  Others: |
| Huawei | Sub topic #5-3: We need to have a merged CR version to facilitate further discussion as the clauses could be overlapped in different CRs |
| LG Electronics | Sub topic #5-3: LGE think that do not merge CR to introduce a feature such as UL-MIMO, Power class 2 NR V2X UE. The dedicate CR will be proposed to support NR V2X in single carrier and NR V2X con-current operation, NR V2X TDM operation. RAN4 treat one by one for the progress of each feature or items. |
| QCOM | Sub topic #5-3:  We prefer option 2.  If , however, the group consensus is for option 1, we would need more time to study all aspects of the CR internally. This is a big CR and the first time it has been presented.  Others: |

### Open issues for sub-topic #5-4

|  |  |
| --- | --- |
| **Company** | **Comments** |
| LG Electronics | Sub topic #5-4: RAN4 still ongoing discussion the MPR/A-MPR for PC3 UE. This is quite burden to specify in rel-16. So we prefer the PC2 UE RF requirements will be specified in rel-17. PC2 UE for NR V2X will be supported from rel-16 as release independent manner.  Others: |
| Huawei | Sub topic #5-4: MPR simulation results were provide in this meeting for PC2, companies can further check the values |
| QCOM | Sub topic #5-4:  There is significant work to complete the PC3 requirements in the WI and rel16 timeframe. Our view is that PC3 should be the focus of the rel16 work.  We still have to agree on core PC3 specs and form, and we have the disadvantage of the eMeeting format compared to face to face discussion, and uncertainty about meetings in the next few months. Further the January email agreement focused the work on exclusively on 23 dBm (PC3).  We don’t have any comment on rel16 independence for PC2 or further work on PC2 in the rel17 timeframe, after rel16 closes.  Others: |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2000688 | LG Electronics: the draft CR is not consider the current RAN4 TS38.101-1. So the content will be treated in Huawei draft CR for UL-MIMO. |
| Company B |
|  |
| R4-2002033 | LG Electronics: the draft CR is baseline to specify the UL-MIMO for NR V2X UE. |
| Company B |
|  |
| R4-2001084 | LG Electronics: we prefer the PC2 UE RF requirements will be specified in rel-17. PC2 UE for NR V2X will be supported from rel-16 as release independent manner. |
| Huawei: preference is to finish 2Tx requirements in Rel-16 |
|  |
| R4-2002032 | LG Electronics: we prefer the PC2 UE RF requirements will be specified in rel-17. PC2 UE for NR V2X will be supported from rel-16 as release independent manner. |
| Huawei: preference is to finish PC2 requirements in Rel-16 |
|  |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Reference Tdoc list

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **# of Tdoc** | **Topic #** | **TDoc** | **Title** | **Source** | **Type** | **Agenda item** |
| 1 | 2 | [**R4-2000471**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000471.zip) | Switching time between NR SL and LTE SL | Qualcomm Incorporated | other | 8.4.3 |
| 2 | 1-1 | [**R4-2000472**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000472.zip) | MPR, A-MPR results for PSSCH/PSCCH transmission | Qualcomm Incorporated | other | 8.4.2.1 |
| 3 | 1-2 | [**R4-2000473**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000473.zip) | MPR, A-MPR results for simultaneous PSFCH transmission | Qualcomm Incorporated | other | 8.4.2.1 |
| 4 | 5-3 | [**R4-2000688**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000688.zip) | Addition of TX diversity into V2X | Qualcomm Incorporated | CR | 8.4.4 |
| 5 | 5-2 | [**R4-2000690**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000690.zip) | Declare Supported Post Antenna Gain for UE | Qualcomm Incorporated | CR | 8.4.4 |
| 6 | 2 | [**R4-2000701**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000701.zip) | TP on Indevice Coexistence | Futurewei | discussion | 8.4.2.2 |
| 7 | 1 | [**R4-2000702**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000702.zip) | NR V2X UE RF requirements considerations | Futurewei | discussion | 8.4.4.1 |
| 8 | 1-2 | [**R4-2000703**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000703.zip) | Reply LS to RAN1 on simultaneous transmission of PSFCH | Futurewei | response | 8.4.1 |
| 9 | 1-2 | [**R4-2000704**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000704.zip) | On Simultaneous Transmission of PSFCH | Futurewei | discussion | 8.4.4.1 |
| 10 | 5-1 | [**R4-2000705**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000705.zip) | On UL-SL Prioritization | Futurewei | discussion | 8.4.4.1 |
| 11 | 5-1 | [**R4-2000706**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000706.zip) | Reply LS to RAN2 on UL-SL Prioritization | Futurewei | response | 8.4.1 |
| 12 | 1-2 | [**R4-2001079**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001079.zip) | [V2X] TP on PSFCH MPR requirements for NR V2X in band n47 | Huawei, HiSilicon | pCR | 8.4.4.1 |
| 13 | 1-1 | [**R4-2001080**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001080.zip) | [V2X] MPR simulation results for PC3 NR V2X in band n47 | Huawei, HiSilicon | discussion | 8.4.4.1 |
| 14 | 5-4 | [**R4-2001081**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001081.zip) | [V2X] MPR simulation results for PC2 NR V2X in band n47 | Huawei, HiSilicon | discussion | 8.4.4.1 |
| 15 | 1-1 | [**R4-2001082**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001082.zip) | [V2X] TP to update MPR simulation assumption for NR V2X in band n47 | Huawei, HiSilicon | pCR | 8.4.4.1 |
| 16 | 1-1 | [**R4-2001083**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001083.zip) | [V2X] TP on MPR requirements for PC3 NR V2X in band n47 | Huawei, HiSilicon | pCR | 8.4.4.1 |
| 17 | 5-4 | [**R4-2001084**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001084.zip) | [V2X] TP on RF requirements for PC2 NR V2X UE in band n47 | Huawei, HiSilicon | pCR | 8.4.4.1 |
| 18 | 1-3 | [**R4-2001085**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001085.zip) | [V2X] TP on S-SSB MPR requirements for NR V2X in band n47 | Huawei, HiSilicon | pCR | 8.4.4.1 |
| 19 | 4-1 | [**R4-2001214**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001214.zip) | TR update TR38.886 v0.5.0 | LG Electronics France | draft TR | 8.4.1 |
| 20 | 4-2 | [**R4-2001215**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001215.zip) | Summary on E-mail discussion for NR V2X | LG Electronics France | other | 8.4.1 |
| 21 | 2 | [**R4-2001216**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001216.zip) | TP on additional On/OFF Switching Time Mask for TDM operation between LTE SL and NR SL at n47 | LG Electronics France | pCR | 8.4.4.1 |
| 22 | 1 | [**R4-2001217**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001217.zip) | Draft CR on NR V2X UE Transmitter requirements for single carrier | LG Electronics France | draftCR | 8.4.4.1 |
| 23 | 1 & 3 | [**R4-2001218**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001218.zip) | TP on revised MPR simulation assumptions and update NR requirements to cover open issue | LG Electronics France | pCR | 8.4.4.1 |
| 24 | 1-4 | [**R4-2001220**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001220.zip) | A-MPR simulation assumptions and initial results for NR V2X at n47 | LG Electronics France | pCR | 8.4.4.1 |
| 25 | 4-3 | [**R4-2001221**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001221.zip) | TP on conclusion of NR V2X WI | LG Electronics France | pCR | 8.4.1 |
| 26 | 2 | [**R4-2001224**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001224.zip) | Draft CR on additional On/OFF Switching Time Mask for TDM operation between LTE SL and NR SL at n47 | LG Electronics France | draftCR | 8.4.4.1 |
| 27 | 1-1 | [**R4-2001240**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001240.zip) | MPR simulation results for PSSCH/PSCCH NR V2X UE | LG Electronics Finland | other | 8.4.4.1 |
| 28 | 1-2 | [**R4-2001719**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001719.zip) | MPR simulations results for multi-UE PSFCH transmission | LG Electronics Finland | discussion | 8.4.4.1 |
| 29 | 1 | [**R4-2002029**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002029.zip) | On remaining NR-V2X UE RF requirements | Huawei, HiSilicon | other | 8.4.4 |
| 30 | 3 | [**R4-2002030**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002030.zip) | draftCR for TS 38.101-1 Con-current operation for NR-V2X | Huawei, HiSilicon | draftCR | 8.4.4 |
| 31 | 3 | [**R4-2002031**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002031.zip) | draftCR for TS 38.101-3 Con-current operation for NR-V2X | Huawei, HiSilicon | draftCR | 8.4.4 |
| 32 | 5-4 | [**R4-2002032**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002032.zip) | draftCR for TS 38.101-1 PC2 RF requirements NR V2X | Huawei, HiSilicon | draftCR | 8.4.4.1 |
| 33 | 5-3 | [**R4-2002033**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2002033.zip) | draftCR for TS 38.101-1 UL MIMO for NR-V2X | Huawei, HiSilicon | draftCR | 8.4.4.1 |