**3GPP TSG-RAN WG4 Meeting #100-e R4-2115036**

**Electronic Meeting, 16 – 27 August, 2021**

**Agenda item:** 9.15.6

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Email discussion summary for [100-e][136] NRSL\_enh\_Part\_3

**Document for:** Information

# Introduction

This email thread discuss Rel-17 PC2 HPUE for NR sidelink enhancements. The contributions are in agenda 9.15.6, which includes:

* Topic #1: Issues related to PC2 HPUE for SL enhancements
  1. Issue 1-1: Clarification of PC2 HPUE operating bands
  2. Issue 1-2: NR V2X power class capability
  3. Issue 1-3: power class capability for NR V2X intra-band concurrent operation
* Topic #2: MPR/A-MPR requirements
  1. Issue 2-1: MPR/A-MPR requirements for PC2 NR V2X UE
* Topic #3: Co-existence study
  1. Issue 3-1: Co-existence study for n38 (SL) and adjacent band n7 (Uu)
  2. Issue 3-2: Configured output power for intra-band con-current operation
  3. Issue 3-3: Co-channel co-existence

# Topic #1: Issues related to PC2 HPUE for SL enhancements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112608**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112608.zip) | Xiaomi | **Observation 1: For single band and single antenna case, no new capability design for PC2 V2X is needed.**  **Observation 2: For single band and multi antenna, no new capability design for PC2 V2X TXD is needed.**  **Observation 3: For inter-band concurrent operation case, no new capability design for PC2 V2X is needed.**  **Observation 4: For intra-band concurrent operation, power class signalling for each interface is needed.**  **Proposal 1: It is proposed to define power class signalling for intra-band concurrent operation.**  **Proposal 2: For other scenario of PC2 V2X, no new PC2 capability signalling is needed.**  **Proposal 3: Send an LS to RAN2 to inform the capability design request.** |
| [**R4-2112612**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112612.zip) | Xiaomi | **Current design of power class report is per band basis. However, for intra-band concurrent operation, UE can work on both Uu and PC5 interface within the same band. In this case, the per band basis power class signaling cannot correctly report the two power class for each interface of one UE in the same band.**  **To this extend, RAN4 has agreed to introduce the power class capability signaling for intra-band concurrent operation. Besides the original per band capability signaling, additional capability signaling per band per interface is recommended.** |
| [**R4-2112992**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112992.zip) | vivo | **Proposal 1: Clarify the feasibility of HPUE for sidelink operating bands based on the information in Table 1.**  **Proposal 2: No need to introduce PC2 power class capability for NR V2X.**  **Proposal 3: Remove the restriction ‘when the UE is not associated with a serving cell on the NR V2X carrier’ to cover the scenario of Uu and SL co-existence.**  **Proposal 4: No need to consider the co-channel existence issues for intra-band V2X operation.** |
| [**R4-2114507**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114507.zip) | Huawei, HiSilicon | ***Observation 1: Power class 2 UE capability for LTE-V2X is reported via Uu RRC message.***  ***Proposal 1: Specific PC2 power class for NR V2X needs to be defined.***  ***Proposal 2: The new PC2 power class for NR-V2X should be reported via Uu RRC message.***  ***Proposal 3: The new PC2 power class for NR-V2X should be introduced from Rel-16.***  ***Proposal 4: LS should be sent to RAN2 on the agreements for the new PC2 power class capability for NR-V2X.*** |
| [**R4-2114508**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114508.zip) | Huawei, HiSilicon | **draft LS on new power class 2 capability for NR-V2X** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Issue 1-1: Clarification of PC2 HPUE operating bands

***Clarify which operating bands should support PC2 HPUE in Rel-17*** *(R4-2112992, vivo)*

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| --- | --- | --- | --- | --- | --- | --- |
| V2X  Operating Band | Sidelink (SL) Transmission/ Reception operating band | | | Single Antenna 26 dBm | Multi antenna  (TxD, SL-MIMO) 26 dBm | Note |
| FUL\_low – FUL\_high | | |
| n14 | 788 MHz | - | 798 MHz |  |  | More discussion is needed whether to introduce PC1 for this band. |
| n79 | 4400 MHz | - | 5000 MHz |  |  | For Uu transmission, band n79 can support PC2 other than PC3. |
| n38 | 2570 MHz | - | 2620 MHz |  |  | RAN4 concluded the co-existence study, however not decide whether to support HPUE in this band. |
| n47 | 5855 MHz | - | 5925 MHz | 🗹 | 🗹 | It is feasible to support HPUE in this band. |

***Moderator’s recommendation:***

* Recommended WF
  + Collect views for the supported HPUE bands in Rel-17 in 1st round discussion

### Issue 1-2: NR V2X power class capability

***Whether need to define specific NR V2X PC2 capability signalling?***

* ***Option 1: Yes***
* ***Option 2: No***

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

### Issue 1-3: power class capability for NR V2X intra-band concurrent operation

***Whether need to define specific power class capability signalling for NR V2X intra-band concurrent operation?***

* ***Option 1: Yes***
* ***Option 2: No***

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Issues** | **Company Comments** |
| 1-1: Clarification of PC2 HPUE operating bands | ***Clarify which operating bands should support PC2 HPUE in Rel-17***  Xiaomi: At least for band n47 and band n79, PC2 can be agreed. Other bands depend on operator request.  CATT: In principle, whether licensed bands can support PC2 should be based on operator request.  LGE: For n47, n79, we also support PC2 V2X operation. For n14, they only request PC1/PC3, so it can be discussed in [134] e-mail thread. For n38, we also prefer that RAN4 can study PC2 V2X operation by operator request based on each regional regulation.  Ericsson: PC1 in n14 should be based on the coexisting study discussion in [134] to protect B13 and operator request for sure. For PC2 in other licensed band, it should be based on operator request.  Huawei: For PC2, we support n47 and n79, one is ITS band and the other one is licensed band. For other bands, it depends on requests. But it would be better to focus on these two bands firstly in Rel-17.  Vivo: For now, only band n47 is clear to support HPUE for both single antenna and multi antenna operation. For other bands, we don’t have conclusion.  OPPO: n79/n47 are ok, and n38 can be considered also which is similar as n41 license band.  AT&T: PC1 in n14 has already been requested by operator in previous meetings and proposed RAN4 to also consider this in any co-existence studies. Need RAN4 to confirm PC1 requirements for sidelink operation in band n14. |
| 1-2: NR V2X power class capability | ***Whether need to define specific NR V2X PC2 capability signalling?***  Xiaomi: Based on our discussion paper, we think for intra-band concurrent operation, the HUPE capability signaling is needed. However, for other cases as single band and inter-band cases, the signaling is not needed.  CATT: Option 1.  LGE: Prefer option 1. Single band PC2 V2X operation and PC2 intra-band/inter-band V2X operation will be needed for the PC2 capability.  Ericsson: Option 1.  The signaling is for network and thus it must be reported over Uu interface using the licensed band. If the UE power class of a UE for Uu operation would be the same with the NR V2X operation, there is no need to be reported and the UE power class framework can be directly reused by NR V2X.  However, as per band basis, in n38, there is a PC2 introduced for NR V2X but there is no PC2 UE power class in Uu and as thus the above assumption of same power class of NR V2X and NR Uu will is not valid any more. Therefore, there is a need to report PC2 NR V2X and PC3 NR Uu power class separately even for the same band. This seems what Huawei propose, but as the LTE signaling is only 1 bit on HPUE, there is aslo an ambiguity whether it is PC2 or PC1 NR V2X. So if the LS is to be sent, maybe it is good to indicate if there is different HPUE power class to RAN2 may be needed to be aware. This seems the case for the intra-band (NR V2X + NR Uu ).  For inter-band, perhaps the current signaling would be ok. The V2X band and Uu band would be indicated as combination and thus the power class is reported also separately.  Huawei: Option 1. Similar to LTE-V2X, additional power class reported via Uu RRC message is needed. Noted that PC3 is the default V2X power class, no need to introduce the additional V2X capability.  Xiaomi2: We share similar understanding of Ericsson as currently, the ambiguity exists when intra-band concurrent operation with different power class of each interface (Uu and PC5). For other cases as analyzed in our paper, the specific PC2 V2X capability per-band is not needed. But for intra-band concurrent operation, separate power class per interface within one band should be defined.  Vivo: Option 2.  OPPO: Option 1.  QCOM: Option 1. Our understand is signaling is needed. |
| 1-3: power class capability for NR V2X intra-band concurrent operation | ***Whether need to define specific power class capability signalling for NR V2X intra-band concurrent operation?***  Xiaomi: We believe the capability is needed as explained in our paper R4-2112608.  CATT: Option 1.  LGE: prefer option 1  Ericsson: Option 1. See above.  Huawei: Option 1.  Vivo: For now, only unlicensed band n47 is clear to support HPUE. We can clarify Issue 1-1 and then decide for the intra-band concurrent operation.  OPPO: Option 1.  QCOM: Option 1 |
| 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** |
|  | 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.*

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|  | **Status summary** |
| **Topic#1** | **Issue 1-1: Clarification of PC2 HPUE operating bands**  *Tentative agreements:*  *Candidate options:*  *Option 1:*  *PC2 bands in Rel-17: n47, n79*  *Option 2:*  *PC2 bands in Rel-17: n47, other licensed bands supporting PC2 depends on operator request*  *Recommendations for 2nd round:*  *To check besides n47, whether n79 should be considered to support PC2 in 2nd round as PC2 requirements for licensed band are relevant to other topics under discussion for SL enhancement.*  **Issue 1-2: NR V2X power class capability**  *Tentative agreements:*  *Candidate options:*  *Option 1: Yes, PC2 power class capability is needed (6 companies).*  *Option 2: No. PC2 power class capability is not needed (2 companies).*  *Recommendations for 2nd round:*  *To check in 2nd round whether PC2 power class capability should be introduced for NR V2X.*  **Issue 1-3: power class capability for NR V2X intra-band concurrent operation**  *Tentative agreements:*  *Candidate options:*  *Option 1: To introduce power class capability for NR V2X intra-band concurrent operation*  *Option 2: After conclusion on PC2 operating bands, then decide the capability issue*  *Recommendations for 2nd round:*  *With conclusion on issue 1-1, to further check if introducing power class capability for NR V2X intra-band concurrent operation is agreeable. If the capability is needed, the detailed info to be reported should be further discussed.* |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | Way forward on PC2 NR V2X | Huawei, HiSilicon |
| #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** |
| 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)

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2114985** | Huawei, HiSilicon | Way forward on PC2 NR V2X  **Issue 1-1: Clarification of PC2 HPUE operating bands**  *To check besides n47, whether n79 should be considered to support PC2 in 2nd round as PC2 requirements for licensed band are relevant to other topics under discussion for SL enhancement.*  LGE: support the proposed WF  CATT: n79 can be considered to support PC2. Support the proposed WF.Vivo: The Proposed WF is OK.  **Issue 1-2: NR V2X power class capability**  *To check in 2nd round whether PC2 power class capability should be introduced for NR V2X.*  Xiaomi: We can agree to define a PC2 power class capability for NR V2X. A clarification question as to be combined with issue 1-3, will this capability being per band basis? Also will this capability used when intra-band concurrent operation occurs?  LGE: support the proposed WF  CATT: support the proposed WF to define PC2 capability.  Vivo: If the majority companies support PC2 power class capability, then we are OK.  One question: In band n14 for SL, PC1 is likely to support for this band, do we need to consider power class signaling considering PC1?  **Issue 1-3: power class capability for NR V2X intra-band concurrent operation**  *With conclusion on issue 1-1, to further check if introducing power class capability for NR V2X intra-band concurrent operation is agreeable. If the capability is needed, the detailed info to be reported should be further discussed.*  Xiaomi: Agree to introduce the capability. A clarification question as can the PC5 interface has higher power class than the Uu interface considering the P-max?  LGE: support the proposed WF  CATT: support the proposed WF to define PC2 capability for intra-band operation.  Vivo: OK with this WF. We need to clarity the intra-band con-current band, is it n79? |
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## 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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# Topic #2: MPR/A-MPR requirements

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112678**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112678.zip) | LG Electronics | **TP for TR 38.785 on MPR and AMPR for NR V2X PC2** |
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## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Issue 2-1: MPR/A-MPR requirements for PC2 NR V2X

***2-1-1: TP on MPR/A-MPR requirements for PC2 NR V2X UE*** *(R4-2112678 LGE)*

* ***Option 1****: Agree the TP.*
* ***Option 2****: FFS*

***Moderator’s recommendation:***

* Recommended WF
  + Option 1

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Issues** | **Company Comments** |
| Issue 2-1: MPR/A-MPR requirements for PC2 NR V2X | **LGE:** For the MPR/A-MPR of PC2 NR V2X UE, RAN4 can captured the approved contents in WF (R4-2107873) at last RAN4 meeting.  The MPR/A-MPR for PC2 PSFCH, PC2 S-SSB will be captured based on WF(R4-2107873).  Huawei: Agree to capture the TP based on agreed WF.  QCOM: TP is agreeable |
|  |  |

### 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** |
| [**R4-2112678**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112678.zip)  (TP for TR 38.785 on MPR and AMPR for NR V2X PC2) | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
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## 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** |
| **Topic#2** | **Issue 2-1-1: MPR/A-MPR requirements for PC2 NR V2X**  *Tentative agreements:*  *The TP in R4-2112678 is agreeable.*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion 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 provided recommendation on CRs/TPs Status update suggestion*

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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)

|  |  |  |
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| **T-doc number** | **Company** | **Proposals / Observations** |
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## 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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# Topic #3: Co-existence study

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111946**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111946.zip) | CATT | **Observation 1: RAN4 have specified adjacent channel coexistence scenarios for PC2 NR V2X. Adjacent channel coexistence for band n38 (2.6GHz) is being evaluated, in which coexistence between band n38 and band n7 can be covered.**  **Proposal 1: To specify ACLR by coexistence evaluation to protect adjacent band n7 instead of A-MPR.** |
| [**R4-2112602**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112602.zip) | Xiaomi | **draft CR for TS 38.101-3 PEMAX for intra-band concurrent operation (R16)** |
| [**R4-2112603**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112603.zip) | Xiaomi | **draft CR for TS 38.101-3 PEMAX for intra-band concurrent operation (R17)** |
| [**R4-2112611**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112611.zip) | Xiaomi | **Observation 1: Using sl-maxTxPower instead of maxTxPower is acceptable for sidelink only operation.**  **Observation 2: Only using sl-maxTxPower or maxTxPower will cause problem for intra-band concurrent operation.**  **Observation 3: Inter-band concurrent operation configured output power scheme can be used as starting point for intra-band concurrent operation configured output power.**  **Proposal 1: For intra-band concurrent FDM operation, reuse the inter-band concurrent operation configured power scheme.**  **Proposal 2: For intra-band concurrent TDM operation, the configured power of NR apply for Uu interface while the configure power of NR SL apply for PC5 interface.** |
| [**R4-2113409**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113409.zip) | Huawei, HiSilicon | **TP to 38.785 to capture NR V2X PC2 coexistence results** |
| [**R4-2114336**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114336.zip) | Ericsson | **Proposal-1: update the** PEMAX,*c* **to consider the coexisting of NR V2X and NR Uu within the same licensed band.**  **Observation-1: The power control formula in TS 38.213 for NR V2X UE is associated with the serving cell and controlled by the network to activate/deactivate the PL compensation.**  **Proposal-2: use the wording of the associated cell c to define the Pcmax behavior of which maximum output power is limited by the IE P-max as the same as the NR Uu UE.**  **Observation-2: The co-channel coexistence between NR network and SL UE operating in out-of-coverage (Scenario #1) should be revisited when network IE p-max for NR Uu UE is configured with a lower value than IE maxTxPower. This corresponding the case where PC2 SL UE coexisting with PC3 NR Uu in band n38.**  **Observation-3: RAN4 should investigate the same/co-channel coexisting according to WID[3].**  **Proposal-3: Scenario #1 should be investigated for the co-channel coexisting between SL and NR Uu.**  **Observation-4: The highest supported power class for V2X is difference with highest supported power class for Uu in band n38.**  **Observation#5: PC2 V2X UE could generate the co-channel interference before detecting in-coverage of network using current in-coverage detection criteria.**  **Proposal-3: LS could be sent to RAN2 asking for solution on the co-channel interference issue.** |
| [**R4-2114509**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114509.zip) | Huawei, HiSilicon | ***Observation 1: New NS as well as A-MPR requirements need to be defined to guarantee the co-existence between adjacent band n38 and n7.***  ***Proposal 1: Whether to continue the study of PC2 requirements for n38 especially for co-existence requirements between n38 and n7 depends on requests from operators.***  ***Proposal 2: The PC2 Uu requirements for n38 should be studied in a separate WI.*** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Issue 3-1: Co-existence study for n38 (SL) and adjacent band n7 (Uu)

***3-1-1: co-existence between n38(SL) and n7(Uu).***

* ***Option 1****: To specify ACLR by coexistence evaluation to protect adjacent band n7 instead of A-MPR.*
* ***Option 2****: Whether to continue the study of PC2 requirements for n38 especially for co-existence requirements between n38 and n7 depends on whether there are requests from operators.*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion for above sub-issues

### Issue 3-2: configured output power for intra-band con-current operation

***3-2-1: Differentiate configured output power for TDM and FDM intra-band con-current operation*** *(R4-2112611, Xiaomi)*

* ***Option 1****: For intra-band concurrent FDM operation, reuse the inter-band concurrent operation configured power scheme. For intra-band concurrent TDM operation, the configured power of NR apply for Uu interface while the configure power of NR SL apply for PC5 interface.*
* ***Option 2****: FFS.*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion for above sub-issues

***3-2-2: Update PCMAX for Uu and SL intra-band con-current operation***

* ***Option 1****: Proposal in draft CR R4-2112602 (Xiaomi).*
* ***Option 2****: use the wording of the associated cell c to define the Pcmax behavior of which maximum output power is limited by the IE P-max as the same as the NR Uu UE (R4-2114336, Ericsson).*
* ***Option 3****: FFS.*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion for above sub-issues

***3-2-3: Update PEMAX for Uu and SL intra-band con-current operation***

* ***Option 1****: Proposal in (R4-2114336, Ericsson),* PEMAX,c is the value given by IE *maxTxPower*, defined by [TS 38.331], when the UE is not associated with a serving cell on the NR V2X carrier*.*
* ***Option 2****:FFS.*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion for above sub-issues

### Issue 3-3: Co-channel co-existence

***3-3-1: Whether need to continue the study the of co-channel co-existence issues***

* ***Option 1****: Yes*
* ***Option 2****: No*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion for above sub-issues

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Issues** | **Company Comments** |
| 3-1: Co-existence study for n38 (SL) and adjacent band n7 (Uu) | ***3-1-1: co-existence between n38(SL) and n7(Uu).***  CATT: Option 1.  LGE: Prefer Option 2  Ericsson: Option 3 (A-MPR needs be specified/studied to introduce the n38 band). Can we ignore A-MPR for regulatory requirement when introducing a new band?  Huawei: Option 2. Co-existence mechanism between n38 and n7 is specified for Uu, which can be considered for NR V2X for n38, but there are no requirements for PC2 n38 yet. It is expected that interference would be larger for HPUE. Whether to have PC2 V2X for n38, it would be better to be based on request from operators.  Vivo: Option 2.  OPPO: Option 2. |
| 3-2: configured output power for intra-band con-current operation | ***3-2-1: Differentiate configured output power for TDM and FDM intra-band con-current operation***  Xiaomi: As proponent of option 1, we think this method can help to overcome the ambiguity for intra-band concurrent operation as different power class for different interface.  LGE: This issue will be treated in [135] e-mail thread for intra-band V2X con-current operation regardless of PC3/PC2 V2X UE. LGE provided TP for configured Tx power for intra-band V2X con-current operation in [135] email thread.  Huawei: We think that same configured output power should be used for both TDM and FDM intra-band concurrent operation.  Xiaomi2: To clarify, the TDM and FDM here is to differentiate same carrier and different carrier cases. So maybe same carrier and different carrier to be the justification condition is more appropriate as even for TDM still there can be different carrier cases. Vivo: In email thread [134]. Issue 2-3-1 relates to the issue here. They can be discussed together.  ***3-2-2: Update PCMAX for Uu and SL intra-band con-current operation***  Xiaomi: As proponent of option 1, the method is to re-use the inter-band con-current operation method to derive the correct Pcmax for different carrier.  CATT: Several comments on option 1:  1. Subclause 6.2E.4.1 is specified for intra-band LTE V2X and NR V2X TDM operation (without Uu). It would be ambiguous to include intra-band Uu and V2X con-current operation in the same subclause.  2. In Rel-16, common understanding is that only NR Uu & NR V2X con-current operation is specified in 38.101-1 and NR Uu & LTE V2X and LTE Uu & NR V2X con-current operation are specified in 38.101-3. Based on this principle, intra-band NR Uu and NR V2X should be included in 38.101-1 instead of 38.101-3.  3. Both contiguous and non-contiguous cases should be considered.  LGE: Generally, it shall be treated in [135] e-mail thread. The Pemax definition for intra-band V2X operation in licensed band, can be added additional Pemax definition. And The configured Tx power will be captured in TS38.101-1 for NR SL+ NR Uu in licensed band.  LGE also provided configured Tx power in [135] e0mail thread to define configured Tx power for intra-band V2X con-current operation.  Xiaomi 3:  Reply to CATT: We agree with your comment that the NR+NR SL concurrent should be captured in TS 38.101-1.  Reply to LGE: We submit the CR within this agenda item because we think the issue exists when PC2 is introduced. If only PC3 is used for both NR and NR SL then there should be no issue. But we are ok to try to finalize this requirement in either thread but just need some guidance from both thread moderator and Chairman. After that we can further discuss in 2nd round.  Ericsson: Option 2 . Do we have a LTE uplink carrier for intra-band NR v2X operation in scope of the Rel-17 SL enh? For 2nd thing, the total Pcmax will depend on whether UE is dual PA or singla PA. Should clarify that In 38.101-3, the configured power for p, q overlapping depending whether the power sharing will be enabled  Huawei: As commented for issue 3-2-1, we think that same configured output power should be applied for both TDM and FDM operation, which is the way we adopted for LTE V2X.  Xiaomi 2: Reply to Ericsson, the inter-band concurrent operation of NR SL and LTE SL is used as an example, we are not adding LTE uplink carrier here. To Huawei, we might need to decide if same power class for Uu and PC5 interface for concurrent operation. If the same power class is applied then there should be no problem, but if different power class can be applied, then we might need to figure out how to handle the issue.  QCOM: We think this is a thread 135 issue and any discussion should probably occur there.  ***3-2-3: Update PEMAX for Uu and SL intra-band con-current operation***  CATT: Option 1.  LGE : Option 1  Ericsson: Option 1  Huawei：The meaning of *sl*-*maxTxPower* is different from that of *maxTxPowerfor Uu,* instead *sl-MaxTransPower-r16* is defined by RAN2. In addition, to consider both coverage and out-of-coverage scenarios, “when the UE is not associated with a serving cell on the NR V2X carrier” should be removed. |
| 3-3: Co-channel co-existence | ***3-3-1: Whether need to continue the study the of co-channel co-existence issues***  LGE: prefer option 2. The co-channel coexistence is not scope of RAN4. If it is needed, then RAN4 can send LS to RAN1 for the co-channel coexistence necessity.  Ericsson: This topic has been discussed in several meetings and I am not sure companies are on the same page. Here I make some short introduction on this issue itself:  The issue is related to the different power class definition for NR V2X and NR Uu. As the same discussion ongoing in the signalling side: the reason to define the new signalling is that there is a case where UE have two different power class for NR Uu operation and NR V2X operation. Companies may see this as an only signalling issue as traditionally it is RAN4 responsibility to notify RAN2 if there is a need to do so. We also see there is potential other RAN2 specification impact , e.g TS 38.304 which is a RAN2 specification. The issue relates to potential co-channel interference between NR Uu UE and NR V2X UE when V2X is configured in out-of-coverage operation. If companies think it is out of RAN4 scope to agree the TS 38.304 impact, it is ok to trigger a question to RAN2 at the same time the signalling is sent like the text below:  *RAN4 would like to inform RAN2 that RAN4 decide to define different power class for NR V2X operation and NR Uu operation in one licensed operating band (n38) and thus UE can report different power class for NR V2X operation and NR Uu operation, for example, the PC2 for NR V2X and PC3 for NR Uu in n38, RAN4 kindly ask RAN2 to evaluate the RAN2 specification impact, if there are any.*  Huawei: Option 2. It’s not clear by the clarification by Ericsson for the interference scenario where V2X is out-of-coverage. Besides, the example may not be appropriate using n38. Whether to consider PC2 for n38 is not decided yet.  Xiaomi: The co-channel co-existence issue exists even without considering the signalling issue. For example as below figure 1: For UE2 and UE3 with sidelink communication, as UE2 and UE3 are out-of-coverage, it has no information about the cell situation. Then it might have interference to the network. How to trigger this interference issue might be RAN1 responsibility.    Figure 1  vivo: Option 2.  OPPO: Option 2 maybe.  Ericsson: The issue is the definition of the criteria for out-of-coverage and in-coverage. Using Xiaomi Figure 1 for example, It should be no interference from out-of-coverage to in-coverage even UE2 and UE1 is configured with the same carrier if such definition correctly reflects the different power class of NR V2X and NR Uu operation. For high power class NR V2X, if it sees the same in-coverage criteria with PC3 NR V2X, it could generate interference to the network. But we understand also it may belong to RAN2 discussion domain and thus a LS to ask them to investigate maybe more suitable.  Xiaomi 3:  Firstly, we might need to conclude whether PC5 and Uu should have same power class which has been mentioned by Huawei. If so then there will be no issue.  Secondly, reply to Ericsson. Still take figure 1 for example, we agree that changing UE2 from out of coverage to in coverage can to some extend to help to solve the question. However, the question itself exists without the signalling and cell selection. That is why we think it a RAN1 issue for the co-channel co-existence topic. |
| 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** |
| [**R4-2113409**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113409.zip)  (TP to 38.785 to capture NR V2X PC2 coexistence results) | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
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## 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** |
| **Topic#3** | **Issue 3-1-1: co-existence between n38(SL) and n7(Uu)**  *Tentative agreements:*  *Candidate options:*   * ***Option 1****: To specify ACLR by coexistence evaluation to protect adjacent band n7 instead of A-MPR (1 company).* * ***Option 2****: Whether to continue the study of PC2 requirements for n38 especially for co-existence requirements between n38 and n7 depends on whether there are requests from operators (4 companies).* * ***Option 3:*** *A-MPR needs be specified/studied to introduce the n38 band (1 company)*   *Recommendations for 2nd round:*  *Most companies prefer to consider the scenario only based on request by operators. To check in 2nd round if that is an acceptable direction as the workload in RAN4 is already very high.*  **Issue 3-2-1: configured output power for TDM and FDM intra-band con-current operation**  *Tentative agreements:*  *Candidate options:*  *No majority view on the issue. The configured output power is relevant to the applicable MPR requirement(s). It should be noted that the existing timing alignment determined in Rel-16 is to align with DL timing, the transmission overlapping is unavoidable.*  *Recommendations for 2nd round:*  *To continue the discussion in 2nd round for the configured output power. Also consider relevant discussion in other threads.*  **Issue 3-2-2: Update PCMAX for Uu and SL co-existence scenario**  *Tentative agreements:*  *Candidate options:*  *No majority view on the issue.*  *Recommendations for 2nd round:*  *To continue the discussion in 2nd round. Also consider relevant discussion in other threads.*  **Issue 3-2-3: Update PEMAX for Uu and SL co-existence scenario**  *Tentative agreements:*  *Candidate options:*   * ***Option 1****: Proposal in (R4-2114336, Ericsson),* PEMAX,c is the value given by IE *maxTxPower*, defined by [TS 38.331], when the UE is not associated with a serving cell on the NR V2X carrier (3 companies)*.* * ***Option 2****: IE should be aligned with RAN1/RAN2 spec. For the serving cell, need to consider both in-coverage and out-of-coverage scenarios (1 company).*   *Recommendations for 2nd round:*  *To continue the discussion in 2nd round. Also consider relevant discussion in other threads.*  **Issue 3-3-1: Whether need to continue the study the of co-channel co-existence issues**  *Tentative agreements:*  *Candidate options:*   * ***Option 1****: Yes, continue the study of co-channel co-existence, or send an LS to RAN2 to highlight the potential issue (1 company)* * ***Option 2****: No (5 companies)*   *Recommendations for 2nd round:*  *To continue the discussion in 2nd round. Try to make a conclusion in this meeting. Either close the discussion or consider whether RAN2 impact is needed.* |

*Suggestion 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 provided recommendation on CRs/TPs Status update suggestion*

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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)

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2114985** | Huawei, HiSilicon | Way forward on PC2 NR V2X  **Issue 3-1-1: co-existence between n38(SL) and n7(Uu)**  *Most companies prefer to consider the scenario only based on request by operators. To check in 2nd round if that is an acceptable direction as the workload in RAN4 is already very high.*  LGE support the proposed WF:  CATT: support the proposed WF.  Vivo: Agree with the proposed WF.  **Issue 3-2-2: Update PCMAX for Uu and SL co-existence scenario**  *To continue the discussion in 2nd round. Also consider relevant discussion in other threads.*  Xiaomi: As we mentioned in issue 1-3, will the P-max limit the PC5 interface power class? If this is true, then Ericsson’s proposal can be accepted. Otherwise, it seems the power class of each interface needs to be reported separately, then Xiaomi’s proposal is more appropriate.  LGE: it is related to add Pemax definition in both single carrier and intra-band con-current V2X operation in licensed band. I t can be follow the [134] e-mail thread decision.  CATT: We suggest further studying configured power for intra-band operation in next meeting considering the diverse views among companies.  **Issue 3-2-3: Update PEMAX for Uu and SL co-existence scenario**  *To continue the discussion in 2nd round. Also consider relevant discussion in other threads.*  Company A:  **Issue 3-3-1: Whether need to continue the study the of co-channel co-existence issues**  *To continue the discussion in 2nd round. Try to make a conclusion in this meeting. Either close the discussion or consider whether RAN2 impact is needed.*  Xiaomi: We see moderator has proposed to finalize the discussion in RANP and we are ok with that WF.  LGE: it shall be discussed in RAN WG. Currently I inform to you the left over issue are not real SL enh. WI scope. So it is not possible to discuss in RAN plenary.  The leftover issue shall be treated in RAN4. So we prefer option 2. No need co-channel coexistence study when RAN4 decide to excluded the 3rd priority for FDM operation within non-adjacent carrier to support simultaneous Rx/Tx capability.  Vivo: Option 2. The proposed WF is OK. |

## 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** |
|  |  |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| Way forward on PC2 NR V2X | Huawei, HiSilicon |  |
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**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| [**R4-2111946**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2111946.zip) | On HPUE for NR SL enhancement | CATT | Noted |  |
| [**R4-2112602**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112602.zip) | draft CR for TS 38.101-3 PEMAX for intra-band concurrent operation | Xiaomi | Postponed |  |
| [**R4-2112603**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112603.zip) | draft CR for TS 38.101-3 PEMAX for intra-band concurrent operation | Xiaomi | Postponed |  |
| [**R4-2112608**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112608.zip) | on HPUE signalling issue | Xiaomi | Noted |  |
| [**R4-2112611**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112611.zip) | on PEMAX issue | Xiaomi | Noted |  |
| [**R4-2112612**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112612.zip) | draft LS out\_PC2 V2X intra-band concurrent | Xiaomi | Return to |  |
| [**R4-2112678**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112678.zip) | TP for TR 38.785 on MPR and AMPR for NR V2X PC2 | LG Electronics Inc. | Agreeable |  |
| [**R4-2112992**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112992.zip) | Discussion on HPUE issues for SL enhancements | vivo | Noted |  |
| [**R4-2113409**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113409.zip) | TP to 38.785 to capture NR V2X PC2 coexistence results | Huawei, HiSilicon | Agreeable |  |
| [**R4-2114336**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114336.zip) | Co-channel co-existence between SL and Uu | Ericsson | Noted |  |
| [**R4-2114507**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114507.zip) | On specific HPUE power class capability for NR V2X | Huawei, HiSilicon | Noted |  |
| [**R4-2114508**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114508.zip) | draft LS on new power class 2 capability for NR-V2X | Huawei, HiSilicon | Return to |  |
| [**R4-2114509**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114509.zip) | Further consideration on co-existence study for n38 (SL) and adjacent band n7 (Uu) | Huawei, HiSilicon | Noted |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
| R4-2114985 | Way forward on PC2 NR V2X | Huawei, HiSilicon |  |  |
| [R4-2112612](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112612.zip) | draft LS out\_PC2 V2X intra-band concurrent | Xiaomi |  |  |
| [R4-2114508](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114508.zip) | draft LS on new power class 2 capability for NR-V2X | Huawei, HiSilicon |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents