**3GPP TSG-RAN WG4 Meeting #100-e R4-210xxxx**

**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

|  |  |  |
| --- | --- | --- |
| **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)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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. |
| 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. |
| 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. |
| 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** |
|  | 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** |
| **Topic#1** | **Issue 1-1: Clarification of PC2 HPUE operating bands**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  **Issue 1-2: NR V2X power class capability**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  **Issue 1-3: power class capability for NR V2X intra-band concurrent operation**  *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 |  |  |
| #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** |
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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*

|  |  |
| --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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** |
|  |  |  |

## 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

|  |  |
| --- | --- |
| **Issues** | **Company Comments** |
|  |  |
|  |  |

### 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** |
| [**R4-2112678**](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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Topic#2** | **Issue 2-1-1: MPR/A-MPR requirements for PC2 NR V2X**  *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)

|  |  |  |
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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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
|  |  |

# Topic #3: Co-existence study

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **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).***  Company A |
| 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.  ***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.  ***3-2-3: Update PEMAX for Uu and SL intra-band con-current operation***  Company A |
| 3-3: Co-channel co-existence | ***3-3-1: Whether need to continue the study the of co-channel co-existence issues***  Company A |
| 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 |
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|  | 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#3** | **Issue 3-1-1: co-existence between n38(SL) and n7(Uu)**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  **Issue 3-2-1: configured output power for TDM and FDM intra-band con-current operation**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  **Issue 3-2-2: Update PCMAX for Uu and SL co-existence scenario**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  **Issue 3-2-3: Update PEMAX for Uu and SL co-existence scenario**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  **Issue 3-3-1: Whether need to continue the study the of co-channel co-existence issues**  *Tentative agreements:*  *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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# Recommendations for Tdocs

## 1st round

**New tdocs**

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| **Title** | **Source** | **Comments** |
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**Existing tdocs**

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
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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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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 |  |
|  |  |  |  |  |

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