**3GPP TSG-RAN WG4 Meeting # 97-e draft R4-2016604**

**Electronic Meeting, 2 – 13 Nov., 2020**

**Agenda item:** 4.2.1

**Source:** Hisashi Onozawa (Nokia)

**Title:** Email discussion summary for [97e][102] NR\_NewRAT\_UE\_RF\_Part\_1

**Document for:** Information

# Introduction

Rel-15 NR UE RF requirement maintenance is handled in this agenda.

Agenda Change:

R4-2014404 and its mirror CR R4-2014405 are discussed in [97e][103] NR\_NewRAT\_UE\_RF\_Part\_2.

R4-2015016 and its mirror CR R4-2015017 are discussed in [97e][104] NR\_NewRAT\_UE\_RF\_Part\_3.

R4-2016470 and its mirror CR R4-2016471 are discussed in [97e][104] NR\_NewRAT\_UE\_RF\_Part\_3.

# Topic #1: [FR1] Maintenance for 38.101-1 Transmitter characteristics

Rel-15 NR UE RF transmitter requirement maintenance is handled in Topic #1.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2015031](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015031.zip)**  CR to TS 38.101-1: Correction on the Aggregated Channel Bandwidth | ZTE Corporation | Summary of change:  1. Apply largest u for SCSlow, SCShigh, NRB,low, NRB,high and BWGB,Channel(k), aligned with Rel-16 spec.  2. On top of 1, apply μ=1 for SCSlow, SCShigh, NRB,low, NRB,high and BWGB,Channel(k) in the case of no common μ value for both of the channel bandwidths. |
| **[R4-2016041](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016041.zip)**  CR Removal of Band 10 protection 38101-1 Rel15 | Skyworks Solutions Inc. | Summary of change:  E-UTRA Band 10 protection:  - removed from NR bands:  n2,n5/n89,n7,n12,n25,n28/n83,n38,n41,n66/n86,n70 |
| **[R4-2014254](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014254.zip)**  CR to 38.101-1: UL MIMO EVM and emission requirements update | Qualcomm Incorporated | Summary of change:  1. Introduction of wording changes for consistency with Rel-16 on emissions requirement  2. Redirection clause clarification  3. Tx modulation quality requirements apply on per layer basis |
| **[R4-2014256](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014256.zip)**  FR1 transmitter requirements for 2-layer UL | Qualcomm Incorporated | Observation 1: RAN1 design does not mandate a 1 by 1 mapping between logical antenna ports and physical antenna connectors, so the procedure implied by the RAN4 UL MIMO EVM requirement should not either.  Observation 2: The 2L UL MIMO RAN4 EVM requirement in v15.11 is not valid because the test method restricts the UE’s choice to map ‘port’ to ‘connector’  Proposal 1: The 2L UL MIMO RAN4 EVM requirement shall be evaluated per layer.  Proposal 2: Use the linear zero-forcing 2L MIMO equalizer to define and measure the transmit EVM for multi-layer MIMO transmission  Proposal 3: Change the emissions definition in Rel-15 TS 38.101-1 to reflect Rel-16 TS 38.101-1. |
| **[R4-2014307](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014307.zip)**  Clarification of additional spurious emission requirements on two bands uplink Inter-band CA(R15)  **[R4-2014308](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014308.zip)**  (Cat A CR)  Moderator: Please do not upload Cat A CR before Cat F is approved! | SoftBank Corp. | Summary of change:  Conditions to apply additional spurious requirements are added |
| **[R4-2014402](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014402.zip)**  CR for TS38.101-1 Rel-15, Correction for definition of P-MPR | CATT | Summary of change:  The definitions of P-MPR are modified from “Maximum allowed UE output power reduction” to “Power Management Maximum Power Reduction”. |
| **[R4-2014718](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014718.zip)**  CR to TS38.101-1 on DC location correction | Samsung | Summary of change:  Change “txDirectCurrentLocation IE” to “the parameter txDirectCurrentLocation in UplinkTxDirectCurrent IE” |
| **[R4-2014898](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014898.zip)**  Coexistence cleanup for 38.101-1 Rel15 | Apple Inc. | Summary of change:  Duplicate protections with contradicting requirements are corrected for single bands n28, n83. Band 66 is protected twice with contradicting requirements. This is corrected to match Rel-16. |
| **[R4-2014905](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014905.zip)**  CR for TS 38.101-1: Correction to FR1 time mask for SRS antenna switching | Apple Inc. | Summary of change:  Revise Figure 6.3.3.6-5 by adding a guard symbol between SRS (Ant. “y”, Ant. switch) and SRS (Ant. “x”, Ant. switch) and evenly splitting the 15s transient period between SRS (Ant. “x”, other sets) and SRS (Ant. “y”, Ant. switch). |
| **[R4-2015998](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015998.zip)**  Correction to spurious co-existence requirements for n28 and n83 | Keysight Technologies UK Ltd | Summary of change:  Clarifying NOTE 2 applicability when protecting frequency band n66 against n28 and n83 (forcing NOTE 2 to be applicable) in spurious coexistence requirements. |
| **[R4-2016490](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016490.zip)**  CR for TS 38.101-1: correction of delta Tib for UE supporting multiple band combinations (R15) | Huawei, HiSilicon | Similar to Rx, make it clear that:  1. When the operating band frequency range is ≤ 1 GHz, the applicable additional ∆TIB,c shall be the average value for all band combinations.  2. When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations |
| **[R4-2016494](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016494.zip)**  Update of configured transmitted power to remove ambiguity in TL,C (Rel-15)  **[R4-2016495](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016495.zip)**  Moderator: Please do not upload Cat A CR before Cat F is approved!  Coversheet shall be changed to Rel-16. | Huawei, HiSilicon | Clarifying that tolerance TL,c doesn’t consider 1.5dB relaxation when deciding T(PCMAX,f,c). |
| **[R4-2016521](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016521.zip)**  CR for TS 38.101-1 Pcmax | Huawei, HiSilicon | Change ‘DL-only carrier’ to PUSCH-less carrier. |
| **[R4-2016531](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016531.zip)**  On 5MHz AMPR for NS\_38 | Huawei, HiSilicon | ***Observation 1: UE could transmit power >15dBm in the real network on Band n74 with NS\_38 signaling, but no AMPR is defined for 5MHz CBW.***  ***Observation 2: UE is allowed to transmit power of >15dBm, but there is no AMPR defined for 5MHz.***  ***Observation 3: when AMPR is larger than 8dB, the Pcmax would be lower than 15dBm.***  ***Proposal 1: Revise AMPR and ASE requirement as in Table 1 and Table 2, the corresponding CR is as in [1].*** |
| **[R4-2016534](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016534.zip)**  CR on correction for AMPR NS\_38,NS\_40 and NS\_41 | Huawei, HiSilicon | 1. Clarify that transmission power can be lower than 15dBm when verify NS\_38, NS\_40 and NS\_41 ASE requirement.  2. Adding NS\_38 AMPR for 5MHz. |
| **[R4-2016578](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016578.zip)**  CR to DMRS position in UL RMC for FR1 | Qualcomm Incorporated | Updated DM-RS symbol positions in UL RMC Tables. |
| R4-2016569  EVM Measurement for 2-Layer Uplink MIMO  Late submission in [inbox](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_97_e/Inbox/). | Lenovo, Motorola Mobility | **Proposal 1:** For two-layer uplink MIMO, the EVM should be evaluated per layer.  **Proposal 2:** The linear zero-forcing MIMO receiver should be used to define and measure the EVM for multi-layer MIMO transmissions. |

## Open issues summary

Sub topic 1-1: UL MIMO EVM: Are proposal in R4-2014254 agreeable? You can also comment directly to CR draft.

Sub topic 1-2: 5 MHz A-MPR to NS\_38: Are proposals in R4-2016531 agreeable? You can also comment directly to CR draft.

## Companies views’ collection for 1st round

### Open issues

Moderator: Please add your comments to sub-topic 1-1 and 1-2 here. Instead, you can directly comment to CR draft.

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| **Company** | **Comments** |
| Ericsson | Sub topic 1-1: EVM should be measured per layer, the 2-layer precoder shall be used (TPMI = 0). Antenna virtualization is not precluded by the specification (and not impossible for 2-port). Is it decided that TE will implement a ZF MIMO equalizer for Rel-15 to this end? Would this test configuration be validated for Rel-15?  See also comments to the CR.  Sub topic 1-2: Regarding the power limitation, we note that the WRC-15 Res. 750 does not require that the power of a mobile station should be less than 15 dBm, it states "The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm." Hence this does not mean that the MOP must be verified with a P-Max limitation of 15 dBm as suggested in the NOTE 1 of the additional spurious emissions requirement. The 15 dBm average was used in coexistence studies with the victim service (among several methods).  See also comments to the CR  ….  Others: |

### CRs/TPs comments collection

Moderator: Please add comments to CR drafts here.

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| **CR/TP number** | **Comments collection** |
| **[R4-2015031](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015031.zip)** | Ericsson:  This CR should be modified: the GB should be derived by the largest  value supported by “both of the channel bandwidths of the adjacent outer carriers at the respective low and high edge of the sub-block” or similar (except for aggregation with 5 MHz the same  value is used for all aggregated carriers).  ZTE: To Ericsson. Actually such sentences were approved when RAN4 discussed the intra-band contiguous CA RF requirements.  For the modifications suggested by Ericsson, there is a sentence above “The lower and upper frequency offsets depend on the transmission bandwidth configurations of the lowest and highest assigned edge component carrier and are defined as”. That’s imply the GB is based on the adjacent outer carriers at the respective low and high edge of the sub-block. We can accept Ericsson’s suggestion. |
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| **[R4-2016041](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016041.zip)** |  |
| **[R4-2014256](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014256.zip)**  **R4-2014254?**  **R4-2014255?** | Ericsson: (comments to R4-2014254)  We can agree with this CR: in case antenna virtualization is not used the EVM can be still be measured per antenna connector.  Good that fallback requirements are clearly specified (and aligned with Rel-16).  OPPO: To 4254  The EVM is defined per layer, is this applicable to Rel-15 TE? If there is no testability issue, then we are ok with this CR. |
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| **[R4-2014307](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014307.zip)**  **[R4-2014308](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014308.zip)** | Ericsson:  This CR should be modified: the change is relevant but applies to all bands of the combinations that are subject to an additional requirements (NS), should be "*at least* one band of the combination". The provision should be under a new sub-clause (additional spurious emissions for inter-band CA) |
| **[R4-2014402](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014402.zip)** | Ericsson:  This change is not really necessary. The description of the P-MPR has remained unchanged since P-MPR was introduced.  OPPO: No need for the change, current definition is clear enough. |
| **[R4-2014718](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014718.zip)** | Ericsson:  This CR should be modified: the name of the IE containing the TX DC locations is *uplinkTxDirectCurrentBWP* in the *uplinkTxDirectCurrentList*  OPPO: The intention is understood, but the name is not correct. In 38.331, there is no *UplinkTxDirectCurrent* IE, instead *UplinkTxDirectCurrentBWP* is defined.  ZTE: We have a question, why RAN4 spec usually includes the IE name in RAN2? The potential risk is when the IE name is changed in RAN2 or modified by RAN2 CR, then RAN4 may not know the changes in time. We prefer to remove the IE. |
| **[R4-2014898](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014898.zip)** |  |
| **[R4-2014905](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014905.zip)** |  |
| **[R4-2015998](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015998.zip)** | Ericsson:  Agreed but overlapping with other CRs on UE band coexistence. Perhaps merge with a joint CR collecting corrections of the coexistence table? |
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| **[R4-2016490](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016490.zip)** | ZTE: We feel a bit confusion for this new added sentence, maybe some examples can be further claified. In addition, why different approach are used for <=1GHz and >1 GHz? |
| **[R4-2016494](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016494.zip)**  **[R4-2016495](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016495.zip)** | Ericsson:  Not agreed, the (absolute value) of the lower tolerance can never be less than that specified by table 6.2.1-1 which is captured in the equation.  ZTE: In our understanding, the current sentence "The tolerance TL,c is the absolute value of the lower tolerance for the applicable operating band as specified in Table 6.2.1-1" means the TL,c is for some operating band corresponding to the note 4 in table 6.2.1-1, which means it is independent with Note 3. For some operating bands, for example n91, both note 3 and note 4 are applied. Therefore, it is clear and no need to add such corrections. |
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| **[R4-2016521](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016521.zip)** | Ericsson:  Not agreed, what is a “PUSCH-less carrier”?  OPPO: The PUSCH-less carrier is not identical to DL only carrier. In 38331 PUSCH-Less SCell is defined as “An SCell configured without PUSCH”, however, there might be carriers with SRS transmission.  ZTE: Same comments as Ericsson. In addition, It is weird that huawei submit two separated CRs(16521 and 16494) for the same section although different changes in this two CRs. 16521 and 16494 should be merged. |
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| **[R4-2016534](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016534.zip)** | Ericsson:  This CR should be modified: the WRC-15 Res. 750 does not require that the UE output power is less than 15 dBm, the notes refer setting to a P-Max limitation (cap). The output power will be of the order of 15 dBm if the allowed back-off is used. No comments on the A-MPR values. |
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| **[R4-2016578](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016578.zip)** | Ericsson:  Is this change correct? The duration from the first to the last OFDM symbols should be 14 with 11 OFDM symbols and 3 DMRS positions (i.e. additional positions in 7 and 11 for Type A) |
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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** |
| **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: [FR1] Maintenance for 38.101-1 Receiver characteristics

Rel-15 NR UE RF receiver requirement maintenance is handled in Topic #2.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2015029](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015029.zip)**  CR to TS 38.101-1: Correction on applicability of 4Rx requirements for CA | ZTE Corporation | Apply the additional requirements for four Rx ports for carrier aggregation. |
| **[R4-2015558](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015558.zip)**  Discussion and reply draft LS on structure of NR CA reference sensitivity requirements in 38.101-1 | Huawei, HiSilicon | Proposal 1: It’s proposed to inform RAN5 that the requirement structure in both clause 7.3A.4 and 7.3A.6 listing only aggressor and victim will be retained in future.  Proposal 2: It’s proposed to inform RAN5 that band combination specific manner will be used to specify IMD exception requirements in clause 7.3A.5.  Proposal 3: It’s proposed to move the SDL requirements in 7.3A.2.4 to 7.3. The exceptions for SDL band combinations can be specified in clause 7.3A.4, 7.3A.5 and 7.3A.6. |
| **[R4-2015559](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015559.zip)**  CR for 38.101-1 to adjust the structure of NR CA REFSENS | Huawei, HiSilicon | 1. The SDL requirements are moved from 7.3A.2.4 to 7.3 especially for n75 and n76. For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band. The contents in clause 7.3A.2.4 are voided since the requirements specified in clause 7.3A.2.3 can be reused.  2. The NR CA configurations are replaced by band combination in clause 7.3A.5. The brackets are removed. |

## Open issues summary

### Sub-topic 2-1 Structure of NR CA REFSENS (R4-2015558)

Issue 2-1: Are proposals in R4-2015558 acceptable?

Issue 2-2: Is LS draft (attached in R4-2015558) acceptable?

## Companies views’ collection for 1st round

### Open issues

Moderator: Please add your comments to sub-topic 2-1 here. Be aware of LS draft attached in R4-2015558.

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| **Company** | **Comments** |
| Ericsson | Sub topic 2-1:  Issue 2-1: proposals acceptable (follow RAN5 guidance)  Issue 2-2: the LS draft acceptable.  ….  Others: |
| ZTE | Issue 2-1: For proposal 2, the format for ENDC, NR CA and SUL should be keep consistent in RAN4 specs, not just for NR CA. For proposal 3, we think it is more clear to keep SDL band combination table although the REFSEN are same since the SDL cannot operate alone. If the SDL band REFSENs are captured in the normal band table, then it may be interpreted any normal band can constitute of SDL band as band combiantions, but actually that's not true. |

### CRs/TPs comments collection

Moderator: Please add comments to CR drafts here.

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| **CR/TP number** | **Comments collection** |
| **[R4-2015029](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015029.zip)** | Ericsson:  The CR should be modified: requirements for 4 RX should apply for the operating bands of band combinations for which requirements for 4RX applies. |
| ZTE: To Ericsson, actually we borrowed the sentence from TS36.101. |
|  |
| **[R4-2015559](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015559.zip)** | ZTE: We think it is more clear to keep SDL band combination table although the REFSEN are same since the SDL cannot operate alone. If the SDL band REFSENs are captured in the normal band table, then it may be interpreted any normal band can constitute of SDL band as band combiantions, but actually that's not true. |

## 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:* |

*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)

## 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”* |