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

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

**Agenda item: 6.5**

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Email discussion summary for RAN4#94e\_#4\_NR\_NewRAT\_UE\_RF

**Document for:** Information

# Introduction

Agenda 6.5 is Rel-15 NR maintenance agenda. Most of the papers are alone with their topic and so being they are CRs. The treatment of the paper is to collect technical concerns on the proposed changes. Two topics seem to have more papers: FR1 UL MIMO PC2 where there are numerous open items in section 3.1.1 and in FR2 new requirements coming from World Radio Conference 2019 and open items are discussed in section 4.1.1.

# Topic #1: Editorial Corrections in to 38.101-1/-2/-3

## Editorial corrections on 38.101-1 Agenda 6.5.1.1

### Sub-topic #1.1.1: UL MIMO PC2 MPR reference

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000119](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000119.zip) | CR to 38.101-1 UL MIMO MPR reference table | vivo | 38.101-1 | Refer to clause 6.2.2 instead of Table 6.2.2-1 to cover MPR for all power classes |

### Sub-topic #1.1.2: Moving notes about 90 % spectral utilization

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000594](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000594.zip) | CR for TS38.101-1, Remove notes for UE channel bandwidth | CATT | 38.101-1 | Moves notes “90% spectrum utilization may not be achieved” from one table to an other |

### Sub-topic #1.1.3: maxUplinkDutyCycle

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000596](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000596.zip) | CR for TS38.101-1, Correction of IE RF-Parameters name of maxUplinkDutyCycle | CATT | 38.101-1 | Changes maxUplinkDutyCycle to maxUplinkDutyCycle-PC2-FR1+ some editorial corrections |

### Sub-topic #1.1.4: CBW Channel Bandwidth, which approach to choose?

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000743](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000743.zip) | CR for TS 38.101-1: Editorial addition of CBW definition in Abbreviations section | MediaTek Inc. | 38.101-1 | Adds CBW Channel Bandwidth into definitions |
| [R4-2000491](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000491.zip) | CR to TS 38.101-1: Replace CBW with symbols defined in the specification. | ZTE Corporation | 38.101-1 | Replaces CBW with BW\_ChannelFrom Agenda 6.5.3 |

### Sub-topic #1.1.5: offsetmax,IMD3

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2002148](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002148.zip) | Removal of unnecessary definition of offsetmax,IMD3 from Table 6.2.3.2-1 | Motorola Mobility España SA | 38.101-1 | Removes offsetmax,IMD3 and defines offsetmax,IMD3 as BWChannel – 6 MHz.  |

## Summary of Editorial corrections on 38.101-1 Agenda 6.5.1.1

### Companies views and open issues for Editorial corrections on 38.101-1

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| --- | --- |
| **Sub-topic** | **Company views** |
| 1.1.1: UL MIMO PC2 MPR reference | Company: |
| 1.1.2: Moving notes about 90 % spectral utilization |  |
| 1.1.3: maxUplinkDutyCycle |  |
| 1.1.4: CBW Channel Bandwidth, which approach to choose? |  |
| 1.1.5: offsetmax,IMD3 |  |

### Summary of discussion in the first round on editorial corrections on 38.101-1 Agenda 6.5.1.1

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| **Sub-topic** | **Summary** |
| 1.1.1: UL MIMO PC2 MPR reference |  |
| 1.1.2: Moving notes about 90 % spectral utilization |  |
| 1.1.3: maxUplinkDutyCycle |  |
| 1.1.4: CBW Channel Bandwidth, which approach to choose? |  |
| 1.1.5: offsetmax,IMD3 |  |

## Editorial corrections 38.101-2 Agenda 6.5.1.2

### Sub topic #1.3.1: all UL CCs in MPR

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000397](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000397.zip) | CR to 38.101-2 (Rel-15) MPR for CA | Intel Corporation | 38.101-2 | “and all UL CCs use the same SCS” moved from single CC allocation clause to more general section for determining inner outer allocation. CAT F CR! Should be treated 6.5.7  |

### Sub topic #1.3.2: Section modification for intra-contiguous and non-contiguous

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000695](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000695.zip) | CR to 38.101-2: Align Rx CA requirements structure with TS38.101-1 | Qualcomm Incorporated | 38.101-2 | Creating sections structure to accommodate intra-contiguous and non-contiguous RX requirements in separate sections |

### Sub topic #1.3.3: CABW and CBW, Align with sub-topic #1.1.4?

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000745](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000745.zip) | CR for TS 38.101-2: Editorial addition of CBW and CABW definitions in Abbreviations section | MediaTek Inc. | 38.101-2 | CABW =Cumulative Aggregated Channel BandwidthCBW=Channel BandwidthAdded to definitionsAlign with sub-topic #1.1.4 for FR1 treatment  |

### Sub topic #1.3.4: TDD Slot in mod(i, 10) from 10 to 5

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000912](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000912.zip) | CR to TS 38.101-2 Correction on FRC table for FR2 DL 64QAM(R15) | China Telecom | 38.101-2 | Change the number of TDD Slot in mod(i, 10) from 10 to 5 in A.3.3.4 FRC for receiver requirements for 64QAMcat F, should be treated in 6.5.8 |

## Summary of editorial corrections on 38.101-2 Agenda 6.5.1.2

### Company views and open issues for 38.101-2

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| **Sub-topic** | **Company views** |
| 1.3.1: all UL CCs in MPR |  |
| 1.3.2: Section modification for intra-contiguous and non-contiguous |  |
| 1.3.3: CABW and CBW. Align with sub-topic #1.1.4? |  |
| 1.3.4: TDD Slot in mod(i, 10) from 10 to 5 |  |

### Summary of open issues for 38.101-2 editorial corrections

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| **Sub-topic** | **Summary** |
| 1.2.1: all UL CCs in MPR | .  |
| 1.2.2: Section modification for intra-contiguous and non-contiguous |  |
| 1.2.3: CABW and CBW. Align with sub-topic #1.1.4? |  |
| 1.2.4: TDD Slot in mod(i, 10) from 10 to 5 |  |

## Editorial corrections 38.101-3 Agenda 6.5.1.3

### Sub-topic #1.5.1: PCMAX\_L,f,c,NR

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000453](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000453.zip) | CR to TS 38.101-3: editorial corrections on Rx requirements for intra-band contiguous EN-DC | Xiaomi | 38.101-3 | PCMAX\_L,f,c is replaced by PCMAX\_L,f,c,NRPCMAX\_L is replaced by PCMAX\_L\_E-TURA,c |

### Sub topic #1.5.2: maxUplinkDutyCycle

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000598](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000598.zip) | CR for TS38.101-3, Correction of IE RF-Parameters name of maxUplinkDutyCycle | CATT | 38.101-3 | Changes maxUplinkDutyCycle to maxUplinkDutyCycle-PC2-FR1And numerous combinations are reorganised in Table 6.2B.1.3-1 |

### Sub topic #1.5.3: Output power dynamics with/without dual PA

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000892](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000892.zip) | CR to TS 38.101-3: editorial correction for output power dynamics for intra-band EN-DC | CHTTL | 38.101-3 | Clarification on sentence for Output power dynamics for intra-band EN-DC with/without dual PA capability  |

### Sub topic #1.5.4: EN-DC table corrections

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2002098](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002098.zip) | EN-DC configuration table corrections | Nokia | 38.101-3 | EN-DC configuration grouping is further fixed for DC\_19-42\_n77, DC\_19-42\_n78, DC\_19-42\_n79 and DC\_66\_n257.The empty rows are removed. |

## Summary of Editorial corrections 38.101-3 Agenda 6.5.1.3

### Company views and Open issues for Editorial corrections 38.101-3 Agenda 6.5.1.3

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| **Sub-topic** | **Company views** |
| 1.5.1: PCMAX\_L,f,c,NR |  |
| 1.5.2: maxUplinkDutyCycle |  |
| 1.5.3: Output power dynamics with/without dual PA |  |
| 1.5.4: EN-DC table corrections |  |

### Summary for Editorial corrections 38.101-3 Agenda 6.5.1.3

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| **Sub-topic** | **Summary** |
| 1.5.1: PCMAX\_L,f,c,NR |  |
| 1.5.2: maxUplinkDutyCycle |  |
| 1.5.3: Output power dynamics with/without dual PA |  |
| 1.5.4: EN-DC table corrections |  |

# Topic #2: Band combination maintenance

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

## Maintenance for bands and band combinations for 38.101-1 Agenda 6.5.2.1

### Sub topic #2.1.1: A-MPR and spurious emission changes for NS\_04

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000413](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000413.zip) | CR for 38.101-1: n41 and n25 corrections | Sprint Corporation | 38.101-1 | Note “The A-MPR' values in this table apply for both A-MPR relative to 23 dBm for power class 3 and A-MPR relative to 26 dBm for power class 2”Removed and “NOTE 4:   Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled.”added (Different tables) |

### Sub topic #2.1.2: NR CA bandwidth class B and F changes

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000525](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000525.zip) | Correction of NR CA bandwidth classe B and F | Nokia, Nokia Shanghai Bell | 38.101-1 | Class F removed and applicability for B lower limit changed from 220 to 20 MHz |

### Sub topic #2.1.3: CA fallback group 1

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2001069](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001069.zip) | CR for 38.101-1: removing the fallback group for NR CA configuration (Rel-15) | Huawei, HiSilicon | 38.101-1 | “for fallback group 1” was removed in table 5.5A.1-1. |

### Sub topic #2.1.4: Modified MPR behavior

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2001308](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001308.zip) | Introduction of the Annex modifiedMPR-Behaviour into the NR SA specification | Ericsson | 38.101-1 | Introduces modified MPR behaviour in to 38.101-1 as annex G |

## Summary of Maintenance for bands and band combinations for 38.101-1 Agenda 6.5.2.1

### Discussions issues for 38.101-1 maintenance

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| **Sub-topic** | **Company views** |
| 2.1.1: A-MPR and spurious emission changes for NS\_04 | Company: |
| 2.1.2: NR CA bandwidth class B and F changes |  |
| 2.1.3: CA fallback group 1 |  |
| 2.1.4: Modified MPR behaviour |  |

### Summary of discussions in 1st round for 38.101-1 maintenance

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| **Sub-topic** | **Summary** |
| 2.1.1: A-MPR and spurious emission changes for NS\_04 |  |
| 2.1.2: NR CA bandwidth class B and F changes |  |
| 2.1.3: CA fallback group 1 |  |
| 2.1.4: Modified MPR behaviour |  |

## Maintenance for bands and band combinations for 38.101-2 Agenda 6.5.2.2

### Sub topic #2.3.1: Intra-contig and non-contig CA Table re-arrangment and corretion

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000521](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000521.zip) | CR FR2 CA tables REL15 | Nokia, Nokia Shanghai Bell | 38.101-2 | Table 5.5A.2-1 and -2 changed format from listing individual CH BWs to refer to configuration |
| [R4-2000559](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000559.zip) | CR to TS 38.101-2 on corrections to intra-band contiguous CA for FR2 bands (Rel-15) | ZTE Corporation |  | Adds 50 MHz CH BWs to many configurations |

### Sub topic #2.3.2: removal of fallback clause for CA and DC

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2001310](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001310.zip) | Removal of contradicting fall-back specification for intra-band non-contigous CA/DC | Ericsson | 38.101-2 | Removes:” A terminal which supports CA or DC configurations, which include FR2 intra-band CA combinations with multiple subblocks, where at least one of the subblocks consists of a contiguous CA combination, is not required to support all possible fallback combinations but can directly fall back to a single FR2 carrier. Deactivating carriers within the CA or DC combination is still possible.”Cover pages talks about adding this to 38.306.  |

## Summary for Maintenance for bands and band combinations for 38.101-2 Agenda 6.5.2.2

### Company views and open issues for 38.101-2 band and combo maintenance

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| **Sub-topic** | **Company views** |
| 2.3.1: Intra-contig and non-contig CA Table re-arrangement and correction | Xiaomi: Thanks Nokia for the paper R4-2000521. We support this new good table format, but why so many sub blocks (14) are list in the table? Can we use 8 sub blocks in the table? In addition, one editorial correction "class A" is missing in the second revised table. |
| 2.3.2: removal of fallback clause for CA and DC |  |

### Summary of 1st round of discussions 38.101-2 band and combo maintenance

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| **Sub-topic** | **Summary** |
| 2.3.1: Intra-contig and non-contig CA Table re-arrangement and correction |  |
| 2.3.2: removal of fallback clause for CA and DC |  |

## Maintenance for bands and band combinations for 38.101-3 Agenda 6.5.2.3

### Sub topic #2.5.1: Intra-EN-DC (n)41 power tolerance

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000410](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000410.zip) | CR for 38.101-3: Correction of MOP tolerance for B41/n41 EN-DC | Sprint Corporation | 38.101-3 |  Intra EN-DC n41 power tolerance relaxed from +2/-2 to +2/-3.  |

### Sub topic #2.5.2: Adding new BCS’s for intra EN-DC

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000854](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000854.zip) | CR to introduce new BCS of intra-band continuous EN-DC for TS 38.101-3(Rel-15) | KDDI Corporation | 38.101-3 | Adds new BCS’s DC\_(n)41AA and (n)41CA.  |

### Sub topic #2.5.3: removal of fallback clause for CA and DC

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2001312](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001312.zip) | Removal of contradicting fall-back specification for intra-band non-contigous CA/DC | Ericsson | 38.101-3 | Removes:” A terminal which supports CA or DC configurations, which include FR2 intra-band CA combinations with multiple subblocks, where at least one of the subblocks consists of a contiguous CA combination, is not required to support all possible fallback combinations but can directly fall back to a single FR2 carrier. Deactivating carriers within the CA or DC combination is still possible.” Cover page mentions conflict with 38.306 |

### Sub topic #2.5.4: removal of annex H

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2001314](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001314.zip) | Removal of the Annex modifiedMPR-Behaviour from the NSA specification | Ericsson | 38.101-3 | Removal of the Annex modifiedMPR-Behaviour Annex H |

### Sub topic #2.5.5: CA\_n78-n79 with simultaneous TX/RX

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2002118](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002118.zip) | CR for [agreed] asynchronous operation for NR CA n78-n79 | NTT DOCOMO INC. | 38.101-3 | Adds delta TA and MSD for CA 78+79Adds also a note:NOTE 2: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. The requirement does not apply for UEs supporting band n77 with a combined n77 and n78 filter.CR has two sets on change marks |

### Sub topic #2.5.6: Mising n78 and updates on MSD testpoints

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
|  **R4-2001518** | Editorial corrections | Ericsson | 38.101-3 | Add missing "n78" reference in DC\_20A\_n78A in Table 7.3B.2.3.5.1-1Correct CA -> DC for 28A\_n77A and 28A\_n78A in Table 7.3B.2.3.5.1-1Remove DC\_12\_n5 from DC\_12\_n66 entry in spurious emission tableCorrecting test frequencies for DC\_7A-28A\_n78A Table 7.3B.2.3.5.2-1 |

## Summary of Maintenance for bands and band combinations for 38.101-3 Agenda 6.5.2.3

### Company views and Open issues for 38.101-3

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| **Sub-topic** | **Company views** |
| 2.5.1: Intra-EN-DC (n)41 power tolerance  | Company: |
| 2.5.2: Adding new BCS’s for intra EN-DC |  |
| 2.5.3: removal of fallback clause for CA and DC |  |
| 2.5.4: removal of annex H |  |
| 2.5.5: CA\_n78-n79 with simultaneous TX/RX |  |
| 2.5.6: Mising n78 and updates on MSD testpoints |  |

### Summary of 1st round of discussions for bands and band combinations for 38.101-3 Agenda 6.5.2.3

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| **Sub-topic** | **Summary** |
| 2.5.1: Intra-EN-DC (n)41 power tolerance  |  |
| 2.5.2: Adding new BCS’s for intra EN-DC |  |
| 2.5.3: removal of fallback clause for CA and DC |  |
| 2.5.4: removal of annex H |  |
| 2.5.5: CA\_n78-n79 with simultaneous TX/RX |  |
| 2.5.6: Mising n78 and updates on MSD testpoints |  |

# Topic #3: FR1 general requirements

## FR1 Transmitter Agenda 6.5.4 and 6.5.3

### Sub-topic #3.1.1: UL MIMO PC2 (Agenda 6.5.4.5 and 6.5.4.1)

#### Discussion papers submitted for Sub-topic #3.1.1: UL MIMO PC2

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000063](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000063.zip) | Clarification of Power Class related features | NTT DOCOMO, INC. |  | Observation 1: Supported power class information is not clear if a UE supports UL MIMO for a certain band.Observation 2: In LTE, RAN4 does not have Tx diversity related requirements but RAN1/2 have. In NR, RAN1/2 does not have Tx diversity related requirements but RAN4 tries to have.Observation 3: Due to lack of Tx diversity capability, even more challenging to identify supported features and relevant power classes among normal NR single, Tx diversity and UL MIMO. (e.g., A UE supporting PC2 UL MIMO may achieve normal NR single as PC2 with one single Tx chain or two Tx chains (Tx diversity) and applicable requirements are different based on which implementation is used.Observation 4: Tx diversity may provide a better system performance while there are no specific capability signalling and requirements for NW to make maximum use of the feature.Observation 5: Supported power class information of each of the features comprising a certain band combination is not explicitly signalled with the current RAN2 spec.Proposal:For Rel15, not to set a power class bundling rules such as if a UE supporting UL MIMO transmits PC2 capability, consider the UE capable of PC2 for that band in normal NR single, UL MIMO as well as Tx diversity mode etc, but rather live with the current ambiguous power class definition. For Rel16, create a signalling mechanism to explicitly indicate supported power class when power class related features are simultaneously used as shown in Figure 2.2-1if RAN2 is possible to accommodate the request in Rel16 time-frame. |
| [R4-2001229](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001229.zip) | Further on UL MIMO PC2 fallback | OPPO |  | 23+23 and Tx diversityObservation 1: UEs with 23+23 PA configurations to support 26dBm HPUE is 3GPP compliant.Observation 2: Allow UE to declare whether PC2 or PC3 can be supported in basic transmission mode decouples the discussion of 23+23 UL MIMO and Tx diversity.Observation 3: With this change, UE can use 23+23 to support 26dBm in UL MIMO and use 1 PA transmission in basic transmission mode with PC3 in Rel-15.Observation 4: With this change, Tx diversity is not supported in Rel-15 RAN4 specification.Proposal 1: It is proposed to agree on “*A UE supporting power class 2 and UL-MIMO configured as specified in clause 6.2D.1 in any NR band, shall meet the requirements 6.2.1 for either power class 2 or power class 3.*”Proposal 2: Inform RAN5 that UE Tx diversity is not supported in RAN4 Rel-15 specification.Tx emissions and SEM requirementsObservation 5: Evaluating UE with one antenna is 3dB less than regulatory.Observation 6: MPR need to be revisited if SEM and Tx emission requirements are changed from one antenna to two antennas.Proposal 3: MPR, SEM and Tx emissions are revisited together due to change requirements from one antenna to two antennas.Observation 7: It has never been guaranteed that the 3GPP requirements are always consistent with regulatory requirements all over the world.Observation 8: UE passes 3GPP tests does not necessarily mean it will pass the regulatory tests.Observation 9: Regulation requirements can be guaranteed by regulatory certification themselves.Observation 10: The impact to UE development and certification caused by changing Rel-15 requirements can be eased by “specification effective transient period”, i.e. new requirements will not be tested in RAN5 conformance spec for several months.Observation 11: Re-visiting MPR, SEM and Tx emission may need several meetings which makes Rel-15 specs unstable.Proposal 4: Change MPR, SEM and Tx emissions in Rel-16 and keep Rel-15 unchanged considering the time limitations. |
| [R4-2002037](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002037.zip) | On UL MIMO requirements | Huawei, HiSilicon |  | Proposal: It is proposed to define the MPR requirements for PC2 UE supporting 2Tx transmission in Table 4*.* |
| [R4-2002038](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002038.zip) | On EN-DC power class | Huawei, HiSilicon |  | Proposal: It is proposed to introduce an explicit signaling for the power class for NR side in MR-DC mode in Rel-16. |
| [R4-2000356](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000356.zip) | Correction on UL MIMO Emission requirements and alignment with RAN1 terminology | Qualcomm Incorporated |  | Observation 1: If UE supports UL MIMO, it still has to meet general requirements. Observation 2: Usage of language “UE supporting UL MIMO” or “UE with two transmit connectors” to refer UE requirements is confusingAnd to clarify the text, we made one proposalProposal 1: Change language in Ran4 requirement specifications from “UE supporting UL MIMO” and “UE with two transmit connectors” when referring to UL MIMO requirements to “UE configured for UL MIMO”To understand better UL MIMO requirements, we made the following observationsObservation 3: UE output power is summed for UL MIMOObservation 4: UE emission requirements are defined per connectorThen we looked back and found out what assumptions were made when the discrepancy between observation 3 and 4 was initially agreed and made the following observation:Observation 5: The current specification for UL MIMO was assuming that each PA power is backed off by 3 dB from their maximum power Observation 6: Assumptions for implementation have changed since the LTE specification for UL MIMO was created and therefore NR specification should be written in a different wayTo correct the specification to reflect new assumptions, we made one proposal: Proposal 2: Update the UL MIMO emission requirements to support implementation where PA’s operate at declared UE power class power level when configured for UL MIMO.  |
| [R4-2000795](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000795.zip) | On the condition of antenna configuration for UL-MIMO in FR1 | SoftBank Corp. |  | Observation 1: In LTE, the total amount of unwanted emissions of UE supporting UL-MIMO is the same as that of UE not supporting UL-MMO considering the regulatory recommendation in ITU-R. Observation 2: The approach of "each transmit antenna connector" can be adopted only when the average transmission power per antenna connector in UL-MIMO transmission is reduced by 3 dB comparing with that of single antenna connector transmission. Proposal 1: In NR, the total amount of unwanted emissions of UE supporting UL-MIMO shall also be the same as that of UE not supporting UL-MMO like LTE.Proposal 2: RAN4 confirm whether "each transmit antenna connector" approach can be adopted or not in the current UL-MIMO spec and ongoing functions for UL-MIMO.  |

#### CRs submitted

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| **T-doc number** | **Title** | **Company** | **Spec** | **Changes** |
| [R4-2000117](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000117.zip) | CR to 38.101-1 clarification of MIMO power class in R15 | vivo | 38.101-1 |  |
| [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip) | Correction of transmitter characteristics for UL-MIMO: powerclass 2 and fallback | Ericsson | 38.101-1 |  |
| [R4-2000354](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000354.zip) | Correction on UL MIMO Emission requirements and alignment with RAN1 terminology | Qualcomm Incorporated | 38.101-1 |  |

#### LS’s submitted

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| **T-doc number** | **Title** | **Company** | **To** | **Actions** |
| [R4-2000118](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000118.zip) | draft LS on clarification of EN-DC power class in R15 | vivo |  |  |
| [R4-2002141](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002141.zip) | Draft LS on EN-DC power class | Huawei, HiSilicon |  |  |

#### Open issues for Sub-topic #3.1.1: UL MIMO PC2

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| **Issue #** | **Issue** | **Notes** |
| #3.1.1.1 | Power class ambiguity needs change or not | Change is prosed in [R4-2000117](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000117.zip), [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip), [R4-2001229](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001229.zip), [R4-2000118](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000118.zip)No Change is proposed: [R4-2000063](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000063.zip) |
| #3.1.1.2 | Which mode is the baseline for power class declaration, general (DCI 0\_0) or UL MIMO | Either text from [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip):For UEs indicating power class 3 in the *ue-PowerClass* field of the *UE-NR-Capability* IE, the UE shall meet the requirements 6.2D.1-1 for either power class 2 or power class 3.or Text from If above power class 2 UE is configured for transmission on single-antenna port, it shall meet the requirements for either power class 2 or power class 3 in subclause 6.2.1 |
| #3.1.1.3 | Spec language: “UE supporting UL MIMO” or “UE configured for UL MIMO” | Removal of language “UE supporting UL MIMO” proposed in [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip) and [R4-2000356](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000356.zip).  |
| #3.1.1.4 | Emission requirement correction for UL MIMO  | Emissions summed: [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip), [R4-2000063](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000063.zip), [R4-2000795](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000795.zip), [R4-2002037](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002037.zip) (Proposal is really for new MPR table but that assumes new emission reqs). Emissions changed in Rel-16: [R4-2001229](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001229.zip) |
| #3.1.1.5 | Power class signalling for Rel-16 | Proposed to add NR PC signalling when UE is in EN-DC [R4-2002038](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002038.zip).  |
| #3.1.1.6 | Need for new MPR requirements | If decision is to do a change in emission requirements, need for new MPR needs to be discussed. Proposed to add 2Tx MPR in: [R4-2002037](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2002037.zip), [R4-2001229](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001229.zip) |

#### Company views for Sub-topic #3.1.1: UL MIMO PC2

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| **Issue #** | **Issue** | **Companies views** |
| #3.1.1.1 | Power class ambiguity needs change or not | vivo: yes, change is needed for R15.Nokia, Nokia Shanghai Bell: The specification is not broken and therefore it is not critical to change the specification. The reason for requesting to specification change has been to allow relaxation to some UE implementations, which may support 26 dBn only in some cases but not in all cases like specified by the PC2 requirements. As a compromise we can accept that some relaxations for the power class definition is allowed in Rel-15 but Rel-15 relaxation should not cause further uncertainty or relaxations in the Rel-16 specifications. If change is desired by the group, in our view the Ericsson CR in [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip) should be used as basis as it also aims to corret the UE emission requirement for UL MIMO. |
| #3.1.1.2 | Which mode is the baseline for power class declaration, general (DCI 0\_0) or UL MIMO | vivo: “either power class 2 or power class 3” as in R4-2000117.Nokia, Nokia Shanghai Bell: In our view the text in [R4-2001316](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001316.zip) should be used as baseline. |
| #3.1.1.3 | Spec language: “UE supporting UL MIMO” or “UE configured for UL MIMO” | Nokia, Nokia Shanghai Bell: OK to improve the specification text as proposed |
| #3.1.1.4 | Emission requirement correction for UL MIMO  | Nokia, Nokia Shanghai Bell: Emission requirements should be corrected as the sum of the powers from all UE antenna connectors. In our view no further MPR relaxations should be added when correcting the emission requirements. |
| #3.1.1.5 | Power class signalling for Rel-16 | Nokia, Nokia Shanghai Bell: No new UE capability signalling should be introduced until Rel-15 and Rel-16 requirements are agreed. The details for potential new signalling should be clear and agreed before agreeing new signalling. Otherwise, further uncertainty and increased complexity is added to the specification and system. |
| #3.1.1.6 | Need for new MPR requirements | Nokia, Nokia Shanghai Bell: Emission requirements should be corrected as the sum of the powers from all UE antenna connectors. In our view no further MPR relaxations should be added when correcting the emission requirements. |

#### Summary of 1st round of discussions for Sub-topic #3.1.1: UL MIMO PC2

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| **Issue #** | **Issue** | **Summary** |
| #3.1.1.1 | Power class ambiguity needs change or not |  |
| #3.1.1.2 | Which mode is the baseline for power class declaration, general (DCI 0\_0) or UL MIMO |  |
| #3.1.1.3 | Spec language: “UE supporting UL MIMO” or “UE configured for UL MIMO” |  |
| #3.1.1.4 | Emission requirement correction for UL MIMO  |  |
| #3.1.1.5 | Power class signalling for Rel-16 |  |
| #3.1.1.6 | Need for new MPR requirements |  |

### Sub-topic #3.1.2: Tx modulation quality

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2001767](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001767.zip) | CR for inter-band CA Tx requirement\_Rel-15 | Huawei, HiSilicon | 38.101-1 | Adds a limitation to tx mod quality: ”PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.” |
| [R4-2001769](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001769.zip) | CR for inter-band ENDC Tx requirement\_Rel-15 | Huawei, HiSilicon | 38.101-3 | Adds a limitation:” applies with PRB allocation in one of the CG and the other CG unallocated” |

### Sub-topic #3.1.3: Tx EVM for UL MIMO

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000204](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000204.zip) | FR1 TX EVM test condition correction for ULMIMO | Qualcomm Incorporated |  | **Observation 1: A UE’s antenna mutual coupling dominates over conducted domain mechanisms in degrading channel quality in UL MIMO****Observation 2: An MMSE MIMO receiver’s throughput is much less sensitive to crosstalk than it is to uncorrelated noise****Observation 3: RAN4 EVM test for UL MIMO per v15.8 treats crosstalk as uncorrelated noise****Proposal 1: Transmit signal quality testing for UL MIMO shall employ TE with MIMO demodulation capability****Proposal 2: Until MIMO demod capability is available in TE, transmit signal quality testing for FR1 shall draw from v15.8 FR2 practice of configuring the UE for single layer operation with two ports.** |
| [R4-2000205](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000205.zip) | CR to 38.101-1: Revision to ULMIMO EVM spec | Qualcomm Incorporated | 38.101-1 | “The requirements apply when the UE is configured for 2-layer UL MIMO transmission as specified in Table 6.2D.1-2. The requirement may alternatively be verified in each of the single layer UL MIMO configurations as specified in Table 6.4D.2.0-1.” And table for Added for single layer TPMI’s |

### Sub-topic #3.1.4: Correction on UE co-ex tables

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000959](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000959.zip) | On correction of UE co-ex tables for Japan | SoftBank Corp., NTT docomo INC., KDDI Corporation |  | Adds notesNOTE 43: Applicable for 5, 10 or 15MHz channel bandwidth confined between 824 - 845MHz.NOTE 44: Applicable for 5 MHz and 15 MHz channel bandwidth confined between 900 MHz and 915 MHz and for 10 MHz channel BW confined between 905 MHz and 915 MHz.NOTE 45: Applicable for 5, 10, 15 and 20MHz channel bandwidth.To certain bands |

### Sub-topic #3.1.5: Avoidance of redundant power reduction for HPUE

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000227](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000227.zip) | Avoidance of redundant power reduction for HPUE | NTT DOCOMO, INC. | 38.101-1 | ***Proposal 1: ΔPPowerClass for a power class 2 capable UE shall be defined as follows for Rel15 and beyond******if MAX(MAX(MPRc, A-MPRc)+ ΔTIB,c + ∆TC,c + ∆TRxSRS, P-MPRc) is less than 3 dB, ΔPPowerClass shall be 3- MAX(MAX(MPRc, A-MPRc)+ ΔTIB,c + ∆TC,c + ∆TRxSRS, P-MPRc) dB******Else if ΔPPowerClass shall be 3 dB.******Proposal 2: ΔPPowerClass shall be 0 dB when P-max is lower than 23 dBm for Rel15 and beyond.*** |

### Sub-topic #3.1.6: Correct the NS\_xx abbreviation to ‘network signalling’

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| [R4-2000326](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000326.zip) | CR to TS 38.101-1 on corrections to network signalling value (Rel-15) | ZTE Corporation | 38.101-1 | ***(1) Correct the NS\_xx abbreviation to ‘network signalling’ in the titles of sub-clause 6.5.2.3 and 6.5.3.3.******(2) Modify the header of tables in sub-clause 6.5.2.3 for the additional requirement of network signalling values.******(3) Editorial correction in Table 6.5.3.3.2-1.*** |

### Sub-topic #3.1.7: power class fallback enhancement

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| **T-doc number** | **Title** | **Company** | **Spec** | **Proposals / Observations** |
| R4-2002158 | CR for power class fallback enhancement | Huawei, HiSilicon | 38.101-1 | Changes in this CR: Define the linear relation between ΔPPowerClass and uplink duty cycle. |

## Summary FR1 Transmitter Agenda 6.5.4 and 6.5.3

### Discussions for 1st round for FR1 transmitter

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| **Sub-topic** | **Company views** |
| 3.1.2: Tx modulation quality  |  |
| 3.1.3: Tx EVM for UL MIMO |  |
| 3.1.4: Correction on UE co-ex tables |  |
| 3.1.5: Avoidance of redundant power reduction for HPUE | Xiaomi: Thanks Docomo for the contribution R4-2000227. For clarification question, these proposals are only applied to the case that scheduling UL dutycycle excessed the signaled maxUPlinkDutycycle or whatever the UL dutycycle is?vivo: Thank DoCoMo for the contribution in R4-2000227, we support both proposal 1 and 2. I have two questions for clarification:1. Is it appropriate to apply the changes to both R15 and R16? (R4-2000228 and R4-2000229) Should it be R16 only?

If the proposed changes are agreed by the meeting for R16, can we conclude the R16 TEI on power class fallback? I.e. no more discussion on other solutions e.g. linear technique etc. in R16. |
| 3.1.6: Correct the NS\_xx abbreviation to ‘network signalling’ |  |
| 3.1.7: power class fallback enhancement |  |

### Summary after 1st round for FR1 transmitter

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| **Sub-topic** | **Summary** |
| 3.1.2: Tx modulation quality  |  |
| 3.1.3: Tx EVM for UL MIMO |  |
| 3.1.4: Correction on UE co-ex tables |  |
| 3.1.5: Avoidance of redundant power reduction for HPUE |  |
| 3.1.6: Correct the NS\_xx abbreviation to ‘network signalling’ |  |
| 3.1.7: power class fallback enhancement |  |

### Discussions for 2nd round for FR1 transmitter

### Summary after 2nd round for FR1 transmitter

## FR1 Receiver Agenda 6.5.5

### Sub-topic #3.3.1: OOB TX level change due to testability issue in EN-DC

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| Tdoc number | Title | Source | Spec | Proposals/ Observations |
| [R4-2000439](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000439.zip) | Testability issue with OoBB for FR1 EN-DC UE | Anritsu Corporation |  | ***Observation 1: Based on the current definition of the OoBB uplink signal levels, if an antenna (connector) is common between E-UTRA and NR in a UE, too much power imbalance will cause a testability issue with the FR1 EN-DC UE.******Observation 2: UL level difference between E-UTRA and NR is approximately 60 dB with the current requirement.******Observation 3: SS is in short of the dynamic range approximately 30 dB against the requirement and it is not possible to measure the throughput of UL signals******Observation 4: Filter performance may not be provided appropriately in a case bands are aligned nearby.******Proposal1: Change UL signal level settings of out-of-band blocking requirement for FR1 EN-DC UE. Choice of option and UL level are TBD.*****Option 1: PCMAX\_L – 4 dB for both E-UTRA and NR UL** **Option 2: PCMAX\_L – 7 dB for both E-UTRA and NR UL** **Option 3: PCMAX\_L – 4 dB (UL for the source of IMD) and PCMAX\_L – [14] dB (UL whose DL is being tested)**  |
| [R4-2000440](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000440.zip) | CR to out-of-band blocking for DC in FR1 | Anritsu Corporation | 38.101-3 | Has changes for all three candidates in the discussion paper.  |

### Sub-topic #3.3.2: ACS TX level change

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| Tdoc number | Title | Source | Spec | Proposals/ Observations |
| [R4-2000449](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000449.zip) | CR to TS 38.101-1: corrections on ACS for intra-band contiguous CA | Xiaomi | 38.101-1 | Change TX from Pcmax 4 dB below max to 24 dB below max |
| [R4-2000451](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000451.zip) | CR to TS 38.101-3: corrections on ACS for intra-band contiguous EN-DC | Xiaomi | 38.101-3 | Change TX from Pcmax 4 dB below max to 24 dB below max |

### Sub-topic #3.3.3: ACS RMC change FR1 and FR2

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| Tdoc number | Title | Source | Spec | Proposals/ Observations |
| [R4-2000747](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000747.zip) | NR UE receiver ACS test requirements | MediaTek Inc. |  | ***Proposal 1***: *Modify NR ACS test configuration by aligning the PDCCH/DCI power level to the same as PDSCH in DL reference measurement channel for both FR1 and FR2.* ***Proposal 2****: Send an LS to inform RAN5 for RAN4’s concern on current ACS test requirements and RAN4’s agreement to modify the ACS test configuration to align the PDCCH/DCI power level to the same as PDSCH in DL reference measurement channel for both FR1 and FR2.* ***Proposal 3****: Whether the same modification should be applied to other UE RF receiver test requirements or not is up to RAN5’s decision.*  |
| [R4-2000748](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000748.zip) | LS on NR UE receiver ACS test requirements | MediaTek Inc. | 38.101-3 | ” , RAN4 has agreed to modify the NR UE ACS test configuration by aligning the PDCCH/DCI power level to the same as PDSCH in DL reference measurement channel for both FR1 and FR2” |

## Summary FR1 Receiver Agenda 6.5.5

### Discussions for 1st round for FR1 receiver

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| **Sub-topic** | **Company views** |
| 3.3.1: OOB TX level change due to testability issue in EN-DC | Company: |
| 3.3.2: ACS TX level change |  |
| 3.3.3: ACS RMC change FR1 and FR2 |  |

### Summary for 1st round

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| --- | --- |
| **Sub-topic** | **Summary** |
| 3.3.1: OOB TX level change due to testability issue in EN-DC | Company: |
| 3.3.2: ACS TX level change |  |
| 3.3.3: ACS RMC change FR1 and FR2 |  |

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

### Summary on 2nd round (if applicable)

# Topic #4: FR2 General requirements

## FR2 Transmitter

### Sub topic #4.1.1: WRC-19 resolutions (Agenda 6.5.6.1)

#### Papers submitted for Sub-topic #4.1.1 WRC-19

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000091**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000091.zip) | On 3GPP band n258 and WRC-19 EESS unwanted emission limits | T-Mobile USA, AT&T | The proponents believe that RAN4 should revise current band n258 specifications to implement WRC-19 agreed phase-1 EESS limits only for now, and leave phase-2 limits for a future revision, when applicable. |
| [**R4-2000216**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000216.zip) | Impact of WRC19 resolutions on FR2 | Qualcomm Incorporated | None. WRC19 resolutions analyzed, 3GPP standards impact projected |
| [**R4-2000230**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000230.zip) | EESS protection from n257 (from 6.5.7.3) | NTT DOCOMO, INC. | Proposal 1: n257 UEs shall meet the unwanted emission limits to protect the EESS (passive) only when any portion of the UL transmission bandwidth is inside 26.5 - 27.5GHz.Proposal 2: Specify -5 dBm/200MHz for Band n257 UEs from the beginning(No spec change from 1 to -5 dBm/200MHz in the future). |
| [**R4-2000409**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000409.zip) | On 3GPP band n258 and WRC-19 EESS unwanted emission limits | T-Mobile USA, AT&T, U.S. Cellular | Duplicate?The proponents believe that RAN4 should revise current band n258 specifications to implement WRC-19 agreed phase-1 EESS limits only for now, and leave phase-2 limits for a future revision, when applicable. |
| [**R4-2001775**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001775.zip) | On FR2 EESS protection emission requirement | Huawei, HiSilicon | Observation 1: The current NS\_201 spurious emission can work well for the new ITU emission requirement.Proposal 1: RAN4 do not change or add AMPR and spurious requirement for EESS protection in Rel-15 and Rel-16, and pay close attention on the EESS protection requirement adoption.Proposal 2: slightly revise NS\_201 AMPR requirement as in Table 3. (*Moderator note:* *this proposal is identical to QC proposed change in* [*R4-2000212*](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000212.zip)) |

#### Open Issues Summary, Sub topic #4.1.1: WRC-19 resolutions

##### Additional Requirements or General Requirements?

* 4.1.1.2.1-1: Any new emissions requirements would go into general requirements
* 4.1.1.2.1-2: Any new emissions requirements would go into ‘Additional’ requirements

##### Timing of Introduction of new emissions requierments into 3GPP standard

* 4.1.1.2.2-1: Immediately
* 4.1.1.2.2-2: Wait for regulators to declare intent to change emissions limits

##### Emissions Limit for 3GPP

* 4.1.1.2.3-1: Adopt more stringent EESS protection limit (-5 dBm//200MHz)
* 4.1.1.2.3-2: Adopt emission limit that tracks regulatory requirement, not WRC-19 resolution
* 4.1.1.2.3-3: Retain emission limit from NS\_201 (-8 dBm/200MHz) as long as WRC-19 resolutions are more relaxed

#### Company Views on Open Issues Sub topic #4.1.1: WRC-19 resolutions

|  |  |  |  |
| --- | --- | --- | --- |
| Open Issue | Proposal | Description | Company Views |
| 4.1.1.2.1 | -1 | Any new emissions requirements would go into general requirements |  |
| -2 | Any new emissions requirements would go into ‘Additional’ requirements |
| 4.1.1.2.2 | -1 | Introduce requirements immediately |  |
| -2 | (Wait for regulators to declare intent to change emissions limits) |
| 4.1.1.2.3 | -1 | -5 dBm/200 MHz |  |
| -2 | (Wait for indication from regulators) |
| -3 | -8 dBm/200 MHz |

#### Summary of 1st rounds of discussion on Sub topic #4.1.1: WRC-19 resolutions

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| --- | --- | --- |
| Open Issue | Description | Summary |
| 4.1.1.1 | Additional or general requirements |  |
| 4.1.1.2 | Timing of introduction of new requierments |  |
| 4.1.1.3 | Emissions Limit to adopt in 3GPP |  |

### Sub topic #4.1.2: Correction on -8 dBm / 200 MHz

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000212**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000212.zip) | CR to 38.101-2: A-MPR Corrections | Qualcomm Incorporated | Removal of -8dBm/200 MHz general requirement duplicated in error from general requirements |

### Sub topic #4.1.3: Impact of ETSI harmonised std

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| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000214**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000214.zip) | Impact of EN 301 908-25 on FR2 | Qualcomm Incorporated | Proposal 1: NS\_201 and NS\_202 A-MPR framework in TS38.101-2 must be modified to include n257 in a release-independent manner if the ETSI harmonized standard EN 301 908-25 includes n257 |
| [**R4-2000218**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000218.zip) | dCR to 38.101-2: NS extension to n257 | Qualcomm Incorporated | CR according to 214 |

### Sub topic #4.1.4: PCMAX CA correction (Agenda 6.5.7.1)

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000109**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000109.zip) | Background for Pcmax correction for CA | Qualcomm Incorporated | Observation 1: PUSCH preparation time is short Observation 2: Power control process can not be iterative Observation 3: Section 7.1 through 7.4 conclude what are the desired powers for the channels in a transmission Observation 4: Actual power to be transmitted is known only after scaling according to section 7.5 in TS 38.213 is performed Observation 5: PCMAX can be calculated for each transmission occasion once based on only on grantObservation 6: RAN4 specification is misaligned with the assumptions made in RAN1 specificationProposal: RAN4 specification must be corrected to align with the RAN1 specification |
| [R4-2000107](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000107.zip) | Pcmax correction for CA | Qualcomm Incorporated | CR According to 109 |
| [**R4-2001765**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001765.zip) | CR for FR2 CA Pcmax\_Rel-15 | Huawei, HiSilicon | CR seems same as Qualcomm |

### Sub topic #4.1.5: Pumax evaluation period (Agenda 6.5.7.1)

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [R4-2000507](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000507.zip) | CR to 38.101-2 (Rel-15) Configured transmitted power for CA | Intel Corporation | Adds :” The evaluation period for PUMAX is determined by the longest slot duration among CCs. A UE expects there is no slot across the boundaries of an evaluation period. MPR and A-MPR are the largest values within the evaluation period.” to CA PCMAXFrom Agenda 6.5.7.3 |

### Sub topic #4.1.6: Relative power tolerance alignement (Agenda 6.5.7.1)

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| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| [R4-2001387](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001387.zip) | Correction on transmission gap for FR2 relative power tolerance | Ericsson | Adds less than or equal in “transmission gap between these sub-frames is less than or equal to 20 ms” n 6.3.4.3 Relative power tolerance. Justifies alignment with FR1 |

### Sub topic #4.1.7: Beam Correspondence correction (Agenda 6.5.7.2)

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [R4-2001763](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2001763.zip) | CR for 38.101-2 side condition for BC\_Rel15 | Huawei, HiSilicon | Adds agreed side conditions for power class 3 |

### Sub topic #4.1.8: Max duty cycle clarififcations (Agenda 6.5.7.3)

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| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000005**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000005.zip) | Clarification for the definition of the UL duty cycle | Apple Inc. | Proposal 1: Clarify that a UE maximum transmission power is assumed for the definition of the Rel-15 maximum UL duty cycle.Proposal 2: Send LS to RAN WG2 asking to introduce further clarifications into the definition of maximum UL duty cycle. |
| [R4-2000084](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000084.zip) | [draft] LS on clarification for the definition of the UL duty cycle | Apple Inc. | To RAN WG2 group. ACTION: RAN WG4 asks RAN WG2 to introduce changes into the definition of maxUplinkDutyCycle-FR2 parameter. |

### Sub topic #4.1.9: UL RMC correction for undefined slots (Agenda 6.5.7.3)

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [R4-2000003](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000003.zip) | Correction of the FR2 RMC slot patterns for MOP test cases | Apple Inc. | Correcting usage of undefined slots in Ul RMC:mod(slot index, 40) = {36,…,39} |

### Sub topic #4.1.10: PTRS introduction to 64 QAM RMC (Agenda 6.5.7.3)

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| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| [R4-2000010](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000010.zip) | Correction of FR2 64QAM UL RMC | Apple Inc. | Proposes to Introduce PTRS to 64 QAM UL RMC and EVM test |

### Sub topic #4.1.11: Correction to link angles (Agenda 6.5.6)

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [R4-2000198](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000198.zip) | CR to 38.101-2 to correct Link and Meas Angles | Keysight Technologies UK Ltd | Numerous corrections to link angle definitions and measurement grid definitions |

## Summary for FR2 transmitter

### Discussions for 1st round on FR2 transmitter

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| --- | --- |
| Sub topic | Company views: |
| 4.1.2: Correction on -8 dBm / 200 MHz |  |
| 4.1.3: Impact of ETSI harmonised std | Nokia: Does the same A-MPR apply to n257 as n258? n257 is in much higher frequency. As an editorial concearning Table 6.2.3.2.3-1 and Table 6.2A.3.2.3-1 only one row would be sufficient to n258 A-MPR. |
| 4.1.4: PCMAX CA correction |  |
| 4.1.5: Pumax evaluation period |  |
| 4.1.6: Relative power tolerance alignment |  |
| 4.1.7: Beam Correspondence correction |  |
| 4.1.8: Max duty cycle clarifications |  |
| 4.1.9: UL RMC correction for undefined slots |  |
| 4.1.10: PTRS introduction to 64 QAM RMC |  |
| 4.1.11: Correction to link angles |  |

### Summary of discussions after 1st round for FR2 transmitter

|  |  |
| --- | --- |
| Sub topic | Summary |
| 4.1.2: Correction on -8 dBm / 200 MHz |  |
| 4.1.3: Impact of ETSI harmonised std |  |
| 4.1.4: PCMAX CA correction |  |
| 4.1.5: Relative power tolerance alignement |  |
| 4.1.6: Beam Correspondence correction |  |
| 4.1.7: Max duty cycle clarififcations |  |
| 4.1.8: UL RMC correction for undefined slots |  |
| 4.1.9: PTRS introduction to 64 QAM RMC |  |
| 4.1.10: Correction to link angles |  |

### Discussions for 2dn round on FR2 transmitter

### Summary for 2dn round on FR2 transmitter

## FR2 Receiver (Agenda 6.5.8)

### Sub topic #4.3.1: Change on IBB blocker location

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| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000436**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000436.zip) | Condition of IBB blocker location in FR2 | Anritsu Corporation | Observation 1: Original motivation to place the blocker throughout the pass band is to confirm spurious responses within a UE. (e.g. Image response and Half-IF spurious response.) Observation 2: From the current design of the mmWave UE frontend architecture, an image of the interferer does not appear in a same FR2 band of the wanted signal.Observation 3: The half-IF spurious response also does not appear in-band or can be assumed as negligible in FR2.Proposal 1: Modify the requirement of IBB in TS 38.101-2 to place the in-band blocker only at the first non-adjacent channel position (FIoffset = +/- 2\*Channel BW). |

### Sub topic #4.3.2: RX requirements for UL MIMO

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| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000697**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000697.zip) | CR to 38.101-2: Removal of Rx requirement for UE in UL MIMO | Qualcomm Incorporated | Voids sections 7.3D, 7.4D |

### Sub topic #4.3.3: Uplink level change for RX tests

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| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| [**R4-2000749**](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Docs/R4-2000749.zip) | CR for TS 38.101-2: Clarifications on transmitter power for recevier requirements | MediaTek Inc. | Changes the tx level reference in max input level test to pumax, from “lower limit of pumax” and adds this condition to ACS and inband blocking |

## Summary for FR2 transmitter

### Discussions for 1st round on FR2 receiver

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| --- | --- |
| Sub topic | Company views: |
| 4.3.1: Change on IBB blocker location |  |
| 4.3.2: RX requirements for UL MIMO |  |
| 4.3.3: Uplink level change for RX tests | Xiaomi: Thanks MTK for the paper 2000749. Like our paper R4-2000449, we propose Changing TX from Pcmax 4 dB below PUMAX,f,c to 24 dB below PUMAX,f,c for ACS case 2 in table 7.5-3 and 7.5A-3. |

### Summary of discussions after 1st round for FR2 receiver

|  |  |
| --- | --- |
| Sub topic | Summary |
| 4.3.1: Change on IBB blocker location |  |
| 4.3.2: RX requirements for UL MIMO |  |
| 4.3.3: RX requirements for UL MIMO |  |

### Discussions for 2dn round on FR2 receiver

### Summary for 2dn round on FR2 receiver

# Topic #5: Signalling supported NS values

## Submitted contributions

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc** | Title | Company | **Proposals / Observations** |
| R4-2000220 | Necessity of signaling supported NS values | NTT DOCOMO, INC. | This contribution addressed to clarify the issues without means to convey supported NS values for a band by a UE to a NW. As a conclusion, we share three observations and propose the following. Companion CRs are also provided in [2-4].**Observation 1:****If at least two types of UEs whose supported NS values are different for a band exist simultaneously in a NW and the NW cannot distinguish them, Standalone NW will see *RRCReconfiguration failure* during handover and Nonstandalone NW will see *RRCReconfiguration failure* during EN-DC configuration.****Observation 2:****Without solving the issues, RAN4 has to create a new band whenever RAN4 identifies a new spectrum emission requirement for the existing bands.****Observation 3:****There is no RAN2 spec impact on broadening the definition of modifiedMPR-Bhaviour.****Proposal:** **Broaden a definition of “*modifiedMPR-Behaviour*” in RAN4 specifications in a way that a new bit is defined when MPR or A-MPR for the existing NS is modified or a new NS is added to an existing band from Rel15.** |
| R4-2000221 | Broadening a definition of “modifiedMPR-Behaviour” for 38.101-1 | NTT DOCOMO, INC. | Adds annex H to 38.101-1 |
| R4-2000222 | Broadening a definition of “modifiedMPR-Behaviour” for 38.101-1 | NTT DOCOMO, INC. | Adds annex H to 38.101-1 |
| R4-2000223 | Broadening a definition of “modifiedMPR-Behaviour” for 38.101-2 | NTT DOCOMO, INC. | Adds annex H to 38.101-2 |
| R4-2000224 | Broadening a definition of “modifiedMPR-Behaviour” for 38.101-2 | NTT DOCOMO, INC. | Adds annex H to 38.101-2 |
| R4-2000225 | Broadening a definition of “modifiedMPR-Behaviour” for 38.101-3 | NTT DOCOMO, INC. | Adds annex H to 38.101-3 |
| R4-2000226 | Broadening a definition of “modifiedMPR-Behaviour” for 38.101-3 | NTT DOCOMO, INC. | Adds annex H to 38.101-3 |

## Open issues

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| --- | --- | --- |
| **Issue #** | Issue | Company views |
| **#5.2.1** | Change the modified MPR behavior to define 15.8 as baseline |  |
| **#5.2.2** | Add modified MPR to all -1, -2 and -3 specs |  |

## Summary of Open issues

|  |  |
| --- | --- |
| **Issue #** | Summary |
| **#5.2.1** |  |
| **#5.2.2** |  |