3GPP TSG-RAN WG4 Meeting # 99-e R4-21xxxxx

**Electronic Meeting, 19th – 27th May, 2021**

**Agenda item:** 8.8

**Source:** Moderator (Skyworks Solutions Inc.)

**Title:** Draftround2Email discussion summary for [99-e][116] NR\_Baskets\_Part\_1

**Document for:** Information

# Introduction

This email discussion is related to band combination aspects that requires further discussions, new features or more detailed analysis and thus cannot be part of the block approval process. It may also be used for flagged TP/draft CRs from the block approval process that may benefit from further discussion or require a wider attention from the group.

The scope is for NR based band combinations (NR AC, NR DC, EN DC, NE DC)

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: Go through discussion documents providing analysis and proposal, first review of CRs
* 2nd round: Agree on draft CRs and/or TP to TRs, generate draft CRs, TP to TRs and WF as required

*List of topics*

1. Inter-band combinations with intra-band ULCA as part of UL configuration
2. LB-LB and LB-LB-LB combinations
3. Update of ENDC test points for new n77 FCC frequency range
4. DC\_(n)71AA BCS2 and MSD test points
5. Discussions on band combinations MSD, rules and simplifications
6. NR-U intra-band UL CA
7. Way of working for combinations not for block approval

# Topic #1: Inter-band combinations with intra-band ULCA as part of UL configuration

*Main technical topic overview.* MSD proposals for IMD and triple beat related to intra-band ULCA as part of UL configuration for inter-band combinations. CR on PCmax to enable intra-band ULCA UL configurations

*The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111476.zip)MSD due to IMD from ULCA | Qualcomm Incorporated | **Proposal 1:** Use IMD values in Table 2.3-1 to help determine MSD values for the next meeting.*Moderator input: To be revised to* R4-2107625 |
| R4-2107625 Revision of R4-2111476 in inbox | Qualcomm Incorporated | Table 2.4-2: MSD test points for analysed inter-band combinations

|  |  |
| --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | Source of IMD |
| NR CA band combination | NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | Duplex mode |  |
| **CA\_n2A-n77(2A)** | **n2** | **N/A** | **5** | **N/A** | **1987.5** | **3.4** | **FDD** | **IMD7** |
|  | **n77** | **3455** | **10** | **1 (RBstart=10)** | **3455** | N/A | **TDD** | **N/A** |
| **3945** | **10** | **1 (RBstart=0)** | **3945** |
| CA\_n2A-n66(2A) | n2 | N/A | 5 | N/A | 1932.5 | 0.0 | FDD | IMD7 |
|  | n66 | 1722.5 | 5 | 1 (RBstart=14) | 1722.5 | N/A | TDD | N/A |
| 1777.5 | 5 | 1 (RBstart=0) | 1777.5 |
| CA\_n3A-n77(2A) | n3 | N/A | 5 | N/A | 1877.5 | 2.7 | FDD | IMD7 |
|  | n77 | 3455 | 10 | 1 (RBstart=10) | 3455 | N/A | TDD | N/A |
| 3945 | 10 | 1 (RBstart=0) | 3945 |
| CA\_n25A-n41C | n25 | N/A | 5 | N/A | 1987.5 | **7.3** | FDD | IMD7 |
|  | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
| 2460 | 100 | 1 (RBstart=229) | 2460 |
| **CA\_n30A-n77(2A)** | **n30** | **N/A** | **5** | **N/A** | **2352.5** | **4.0** | **FDD** | **IMD7** |
| **n77** | **3455** | **10** | **1 (RBstart=17)** | **3455** | N/A | **TDD** | **N/A** |
|  | **3825** | **10** | **1 (RBstart=0)** | **3825** |
| CA\_n41C-n66A | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
| 2640 | 100 | 1 (RBstart=171) | 2640 |
| n66 | N/A | 5 | N/A | 2197.5 | **[33.5]1** | FDD | IMD5 |
| CA\_n41C-n77A | n41 | 2545 | 60 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
| 2640 | 100 | 1 (RBstart=272) | 2640 |
| n77 | N/A | 5 | N/A | 3305 | 7.2 | FDD | IMD9 |
| CA\_n66A-n77(2A) | n66 | N/A | 5 | N/A | 2197.5 | 4.4 | FDD | IMD7 |
| n77 | 3455 | 10 | 1 (RBstart=10) | 3455 | N/A | TDD | N/A |
|  | 3875 | 10 | 1 (RBstart=0) | 3875 |
| DC\_3A\_n41C | 3 | N/A | 5 | N/A | 1877.5 | **3.3** | FDD | IMD9 |
|  | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
|  | 2460 | 100 | 1 (RBstart=190) | 2460 |

Note 1: Pending further internal verification |
| [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)MSD Due to NR Intra-band ULCA IMD within Inter-band Combinations | Skyworks Solutions Inc. | Table 6: MSD test points for analyzed inter-band combinations

|  |  |
| --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | Source of IMD |
| NR CA band combination | NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | Duplex mode |  |
| **CA\_n2A-n77(2A)** | **n2** | **N/A** | **5** | **N/A** | **1987.5** | **2** | **FDD** | **IMD7** |
|  | **n77** | **3455** | **10** | **1 (RBstart=10)** | **3455** | **N/A** | **TDD** | **N/A** |
| **3945** | **10** | **1 (RBstart=0)** | **3945** |
| CA\_n2A-n66(2A) | n2 | N/A | 5 | N/A | 1932.5 | 0.6 | FDD | IMD7 |
|  | n66 | 1722.5 | 5 | 1 (RBstart=14) | 1722.5 | N/A | TDD | N/A |
| 1777.5 | 5 | 1 (RBstart=0) | 1777.5 |
| CA\_n3A-n77(2A) | n3 | N/A | 5 | N/A | 1877.5 | 1.7 | FDD | IMD7 |
|  | n77 | 3455 | 10 | 1 (RBstart=10) | 3455 | N/A | TDD | N/A |
| 3945 | 10 | 1 (RBstart=0) | 3945 |
| CA\_n25A-n41C | n25 | N/A | 5 | N/A | 1987.5 | 9.6 | FDD | IMD7 |
|  | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
| 2460 | 100 | 1 (RBstart=225) | 2460 |
| **CA\_n30A-n77(2A)** | **n30** | **N/A** | **5** | **N/A** | **2352.5** | **2.3** | **FDD** | **IMD7** |
| **n77** | **3455** | **10** | **1 (RBstart=17)** | **3455** | **N/A** | **TDD** | **N/A** |
|  | **3825** | **10** | **1 (RBstart=0)** | **3825** |
| CA\_n41C-n66A | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
| 2640 | 100 | 1 (RBstart=171) | 2640 |
| n66 | N/A | 5 | N/A | 2197.5 | 22 | FDD | IMD5 |
| CA\_n41C-n77A | n41 | 2545 | 60 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
| 2640 | 100 | 1 (RBstart=272) | 2640 |
| n77 | N/A | 5 | N/A | 3305 | 1.1 | FDD | IMD9 |
| CA\_n66A-n77(2A) | n66 | N/A | 5 | N/A | 2197.5 | 2.3 | FDD | IMD7 |
| n77 | 3455 | 10 | 1 (RBstart=10) | 3455 | N/A | TDD | N/A |
|  | 3875 | 10 | 1 (RBstart=0) | 3875 |

**Proposal on MSD test points and values: If satisfactory for the proponents the table above can be used to provide draft CRs Table 7.3A.5-1 in 38.101-1. In any case, the analysis above can be used as a starting point for future discussion papers.****Proposal for combinations with negligible MSD related to IMD: CA\_n3A-n78(2A), CA\_n2(2A)-n66, CA\_n66 and CA\_n66(2A) can be introduced or confirmed in the specification with draft CRs without MSD related to IMD. However, DC\_3A\_n41C needs to be further checked for triple beat issue.****Proposal on CA\_n5B: MSD related to IMD3 of ULCA need to be specified****Proposal on guidelines: If agreeable, the principles developed in the contribution can be captured as guidelines for future discussion papers****Proposal on band n40 protection by n41C and n41(2A): protection level of band n40 by band n41 with UL CA needs to be studied. Alternatively some UL restrictions may be needed** |
| [**R4-2108930**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108930.zip)MSD analysis for n77(2A) UL cases | Nokia, Skyworks Solutions Inc. | **Proposal 1: MSD of band 2 and n30 from IMD7 of n77(2A) UL configuration is 2dB and 2.3dB respectively****Proposal 2: Above test points are added to Table 7.3A.5-1 in 38.101-1**Table 7.3A.5-1: 2DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC3 CA

|  |  |
| --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | Source of IMD |
| NR CA band combination | NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | Duplex mode |  |
| CA\_n2A-n77(2A) | n2 | N/A | 5 | N/A | 1987.5 | 2 | FDD | IMD7 |
|  | n77(2A) | 34553945 | 1010 | 1 (RBstart=10)1 (RBstart=0) | 34553945 | N/A | TDD | N/A |
| CA\_n30A-n77(2A) | n30 | N/A | 5 | N/A | 2352.5 | 2.3 | FDD | IMD7 |
|  | n77(2A) | 34553825 | 1010 | 1 (RBstart=17)1 (RBstart=0) | 34553825 | N/A | TDD | N/A |

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| [**R4-2108931**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108931.zip)draft CR to 38.101-1: CA\_n5A-n77(2A) introduction of UL CA\_n77(2A) | Nokia, AT&T | CR introducing UL CA\_n77(2A) for CA\_n5A-n77(2A) |
| [**R4-2108932**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108932.zip)draft CR to 38.101-1: CA\_n2-n77 | Nokia, Skyworks Solutions Inc., AT&T | CR introducing UL CA\_n77(2A) related MSD for CA\_n2A-n77(2A) |
| [**R4-2111475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111475.zip)Triple beat and 3ULCC MSD | Qualcomm Incorporated | Moderator comment: late revision R4-2107627 provides preliminary numbers that are worth considering |
| **R4-2107627** Triple beat and 3ULCC MSD (Check inbox) | Qualcomm Incorporated | Input numbers Table 7.3B.2.3.5.3-1: MSD test points for PCell due to dual uplink operation for EN-DC in NR FR1 (two bands)

|  |
| --- |
| NR or E-UTRA Band / Channel bandwidth / NRB / MSD |
| EN-DCConfiguration | EUTRA or NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | Duplex mode | Triple beat order |
| DC\_3A-n41C | 3 | 1782.5 | 5 | 25 | 1877.5 | [FFS] | FDD | 3 |
| n41C | 25452595 | 5050 | 1 (RBstart=0)1 (RBstart=250) | 25452595 | N/A | TDD | N/A |
| DC\_25A-n41C | 25 | 1912.5 | 5 | 25 | 1992.5 | [FFS] | FDD | 3 |
| n41C | 25452595 | 5050 | 1 (RBstart=0)1 (RBstart=250) | 25452595 | N/A | TDD | N/A |
| DC\_8A-n79C | 8 | 912.5 | 5 | 25 | 957.5 | [FFS] | FDD | 3 |
| n79C | 45454595 | 5050 | 1 (RBstart=0)1 (RBstart=250) | 45454595 | N/A | TDD | N/A |

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| [**R4-2109262**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109262.zip)CR for Pcmax - NR-DC for DC cat. A-B combinations | InterDigital Communications | Introduction of specific Pcmax requirements for inter-band NR-DC category A-B combos in sub-clause 6.2B.4.1 and add the required information in sub-clauses 6.2B.2, 6.2B.3. This is the formal CR submission based on the draft CR in R4-2105340 that has been endorsed in the meeting #98-bis-e. |
| [**R4-2108861**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108861.zip) Draft CR on CA\_n1-n3, CA\_n1-n78, CA\_n3-n78 | China Unicom, ZTE | Moderator: moved from 118: CA\_n1-n3 and CA\_n1-n78 are fine. To complete CA\_n3A-n78(2A), the triple beat aspect needs to be finalized. |

## Open issues summary

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

### Sub-topic 1-1

*Sub-topic description:* MSD due to IMD of intra-band ULCA in UL configuration of inter band combinations

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

**Issue 1-1A:** MSD proposals for CA\_n2A-n77(2A) and CA\_n30A-n77(2A)

* Proposals
* Option 1: Agree MSD values as proposed in [**R4-2108930**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108930.zip)
* Option 2: Agree MSD values as proposed in R4-2107625
* Option 3: merge values
* Recommended WF Option 3 and revise related CRs: [**R4-2108931**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108931.zip) and [**R4-2108932**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108932.zip)**.** Comment details CRs in the CR/TP section 1.3.2

**Issue 1-1B:** MSD calculation framework

* Proposals
* Option 1: MSD framework as in [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)
* Option 2: MSD framework as in [**R4-2111476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111476.zip)and its revisionR4-2107625

Option 3: Merge inputs from both

* Recommended WF
* If revision R4-2107625 is available early, compare approaches in order to provide a way forward on guidelines

### Sub-topic 1-2

*Sub-topic description:* Inputs from [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)andR4-2107625

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

Moderator: the table below shows the differences between Skyworks and Qualcomm to ease comparison.

|  |  |
| --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc** | **UL/DL**  | **UL LCRB** | **DL Fc**  | **MSD (dB)** | **Duplex mode** |  |
| **(MHz)** | **BW (MHz)** | **SKW / QCOM** | **(MHz)** |  |
| **CA\_n2A-n77(2A)** | **n2** | **N/A** | **5** | **same** | **1988** | **2 / 3.4** | **FDD** | **IMD7** |
|  | **n77** | **3455** | **10** | **same** | **3455** | same | **TDD** | **N/A** |
| **3945** | **10** | **same** | **3945** |
| CA\_n2A-n66(2A) | n2 | N/A | 5 | same | 1933 | 0.6 / 0 | FDD | IMD7 |
|   | n66 | 1722.5 | 5 | same | 1723 | same | TDD | N/A |
| 1777.5 | 5 | same | 1778 |
| CA\_n3A-n77(2A) | n3 | N/A | 5 | same | 1878 | 1.7 / 2.7 | FDD | IMD7 |
|   | n77 | 3455 | 10 | same | 3455 | same | TDD | N/A |
| 3945 | 10 | same | 3945 |
| CA\_n25A-n41C | n25 | N/A | 5 | same | 1988 | **9.6 / 7.3** | FDD | IMD7 |
|   | n41 | 2545 | 90 | same | 2545 | same | TDD | N/A |
| 2460 | 100 | 1 (RBstart=225) / 1 (RBstart=229) | 2460 |
| **CA\_n30A-n77(2A)** | **n30** | **N/A** | **5** | **same** | **2353** | **2.3 / 4** | **FDD** | **IMD7** |
| **n77** | **3455** | **10** | **same** | **3455** | same | **TDD** | **N/A** |
|  | **3825** | **10** | **same** | **3825** |
| CA\_n41C-n66A | n41 | 2545 | 90 | same | 2545 | same | TDD | N/A |
| 2640 | 100 | same | 2640 |
| n66 | N/A | 5 | same | 2198 | **22 / [33.5]1** | FDD | IMD5 |
| CA\_n41C-n77A | n41 | 2545 | 60 | same | 2545 | Same | TDD | N/A |
| 2640 | 100 | same | 2640 |
| n77 | N/A | 5 | same | 3305 | 1.1 / 4.2 | FDD | IMD9 |
| CA\_n66A-n77(2A) | n66 | N/A | 5 | same | 2198 | 2.3 / 4.4 | FDD | IMD7 |
| n77 | 3455 | 10 | same | 3455 | Same | TDD | N/A |
|   | 3875 | 10 | same | 3875 |
| DC\_3A\_n41C | 3 | N/A | 5 |  / N/A | 1878 | **0 / 3.3** | FDD | IMD9 |
|   | n41 | 2545 | 90 |  / 1 (RBstart=0) | 2545 |  / N/A | TDD | N/A |
|   | 2460 | 100 |  / 1 (RBstart=190) | 2460 |

**Issue 1-2A:** MSD test points and values from [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)andR4-2107625

* Proposals
* Option 1: Adopt MSD test points and values from [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)
* Option 2: Adopt MSD test points and values from R4-2107625
* Option 3: merge MSD test points from both contributions
* Recommended WF
* Further discuss in round 1 the proposed values from both contributions
* Decide if values can be used as is and added in a WF

**Issue 1-2B:** Intra-band MSD cases from [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)

* Proposals
* Option 1: CA\_n5B MSD related to IMD3 of ULCA need to be specified. CA\_n66(2A) and CA\_n66B do not need MSD
* Option 2: Any other suggestion – Please provide justification
* Recommended WF
* Option 1: CA\_n5B MSD related to IMD3 of ULCA need to be specified. CA\_n66(2A) and CA\_n66B do not need MSD

**Issue 1-2C:** Band protection issue for from [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)

* Proposals
* Option 1: Protection level of band n40 by band n41 with UL CA needs to be studied
* Option 2: Any other suggestion – Please provide justification
* Recommended WF
* Option 1: Protection level of band n40 by band n41 with UL CA needs to be studied

### Sub-topic 1-3

*Sub-topic description:* MSD due to triple beat of intra-band ULCA in UL configuration of inter band combinations [**R4-2117627**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111475.zip)

Note from moderator: based on outcome the CR [**R4-2108861**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108861.zip) may need revised to include triple beat MSD

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

**Issue 1-3:** MSD due to triple beat [**R4-2117627**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111475.zip)

* Proposals
* Option 1: MSD cases, test points and MSD values proposed are used for CRs.
* Option 2: Any other suggestion – Please provide justification
* Recommended WF:
* Option 1: MSD test point and combinations without MSD are discussed in round 1 in view of a WF or CRs in round2

### Sub-topic 1-4

*Sub-topic description:* PCmax equation revision for ULCA

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

**Issue 1-4:** PCmax equation revision for ULCA

* Recommended WF:
* CR is commented directly in the CR section

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1 MSD due to IMD of intra-band ULCA in UL configuration of inter band combinations

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1A: MTK: Option 2 or 3Sub topic 1-1B: Others: |
| AT&T | Sub topic 1-1A:Option 1Sub topic 1-1B:Option 1 |
| Qualcomm | Sub topic 1-1A: Option 2 or 3. Choosing to diplex bands on a single antenna comes at a cost of insertion loss for stand alone operation. So MSD can be reduced with differing interfering levels, but insertion loss in SA mode is higher. QC has a correction for 41C\_n77 combination where MSD is 4.2 not 7.2dB. The incorrect IMD order was used in this combination only.Sub topic 1-1B: Option 3. We need to double check RB positions to make sure IMD falls at the correct DL frequency. |
| ZTE | Issue 1-1(Sub topic 1-1A/B): Not sure how to merge the MSD values? average values? Also not sure if average value is always feasible but seems RAN4 usually do it by averaging.  |
| Verizon | Sub topic 1-1A: Option 3Sub topic 1-1B: Option 3 |
| Nokia | 1-1A: Not clear what merge of values mean, if it is average then it is ok for us. Revision of R4-2108931 seems not necessary as it is about CA\_n5A-n77(2A) which does not need MSD. Hence revision might be needed for R4-2108930 and R4-2108932.1-1B: Option 3 |
| Huawei | Sub topic 1-1A: Option 3Sub topic 1-1B: Option 3 |
| Skyworks | Sub topic 1-1A: since values are very close for the assessment of a new MSD type, we suggest to merge proposals, is averaging an option?Sub topic 1-1B: again the values are quite consistent across the cases thus being a first assessment done independently we can say the framework is very similar in both contributions and we just need to align on IMD levels, filter assumptions will always be slightly different between companies. The only exception is for CA\_n41C-n66A where difference is large but the largest value needs to be checked by proponent. This may be relate to considering MPR properly. We propose to further align the framework between contributing companies to resolve the differences in a WF that can be used as guideline in the future. |

Sub topic 1-2 Inputs from [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-2A:MTK: Option 2 or 3Sub topic 1-2B:MTK: Option 1. Agree with Recommended WFSub topic 1-2C:MTK: Option 1. Agree with Recommended WFOthers: |
| AT&T | Sub topic 1-2A:Option 1Sub topic 1-2B:Option 1. Agree with Recommended WF |
| Qualcomm | Sub topic 1-2A:Option 2 or 3. Choosing to diplex bands on a single antenna comes at a cost of insertion loss for stand alone operation. So MSD can be reduced with differing interfering levels, but insertion loss in SA mode is higher.Sub topic 1-2B:Option 1. Agree with Recommended WFSub topic 1-2C:Option 1. Agree with Recommended WF |
| ZTE | Sub topic 1-2A: Not sure how to merge the MSD test points.Sub topic 1-2B:Option 1. Agree with Recommended WFSub topic 1-2C:MTK: Option 1. Agree with Recommended WF |
| Verizon | Sub topic 1-2A: We agree with moderator recommended WFSub topic 1-2B: We agree with moderator recommended WF. Three cases need to be defined and required!  |
| Nokia | Sub topic 1-2A: WF OKSub topic 1-2B: WF OK |
| Huawei | Sub topic 1-2A:Can we derive a specific TR for MSD due to triple beat? It will help people understand how to calculate the MSD due to triple beat.Sub topic 1-2C:A clarification: Is the frequency range of protection the (n41C) spurious emission region overlapping with band n40? Or is it just the frequency range 2300~2400 even if the SEM region of n41C is overlapping with band n40 |
| Skyworks | Sub topic 1-2A: Again differences are small in general except for CA\_n41C-n66A that has a significant difference but higher value needs to be checked by proponent. Also we need to cross check the small allocation difference for CA\_n25A-n41C. Given this is first case for such an evaluation across multiple bands, the results are remarkably consistent and are don to small differences in IMD levels and filter attenuation. I suggest that the two companies work together to average values where the difference is <3dB and resolves the remaining cases by converging on assumptions.To HW triple beat is it sub-topic 1-3 but indeed the idea will be to capture both IMD and triple beat analysis as an example for future work. I cannot decide for a TR but we could use the FS\_BC\_handling SI to capture this.Sub topic 1-2C: to HW for n41C/2A protection of n40 the worst case is 41C where the -13dBm/MHz SEM region overlaps with n40. This is the only help we can get from MPR. |
| Qualcomm | For WF on 2UL IMD, we can support averaging for values that are close. n41C\_66 is a difficult problem. The IMD performance looks similar from both companies; a closer look at architecture is warranted here. |

Sub topic 1-3 MSD due to triple beat of intra-band ULCA in UL configuration of inter band combinations [**R4-2111475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111475.zip)

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
| Qualcomm | Sub topic 1-3:Revised contribution is R4-2107627. |
| Skyworks | Sub topic 1-3: first we want to thank Qualcomm for providing analysis. Since this triple beat case requires the introduction of new table in the IMD related exceptions we could use the values proposed in R4-2107627 in bracket in a way forward to agree on the table format and allow draft CR to introduce a first case. Tis is under the understanding that we may revise values after further assessment by other companies. Especially Skyworks would like to verify the contributions from receiver and transmitter non-linearities as both can generate the triple beat product |
| Qualcomm | Thanks Skyworks for driving the issues in this thread. I think we need more companies involved here since the linearity of both RX and TX must be considered. For 2nd round, we can fine tune the accuracy of actual MSD test points.  |

### 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** |
| [**R4-2108931**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108931.zip)draft CR to 38.101-1: CA\_n5A-n77(2A)  | Company A |
| Company B |
| Company C |
| [**R4-2108932**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108932.zip)draft CR to 38.101-1: CA\_n2-n77 | Company A |
| Company B |
| Company C |
| [**R4-2109262**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109262.zip)CR for Pcmax - NR-DC for DC cat. A-B combinations | Company A |
| Company B |
| Company C |

## 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.*

*There is good consistency between Qualcomm and Skyworks values, for differences less than ~3dB average can be used, others are discussed further to converge on architecture, assumptions, test points and values*

|  |  |
| --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc** | **UL/DL**  | **UL LCRB** | **DL Fc**  | **MSD (dB)** | **Duplex mode** |  |
| **(MHz)** | **BW (MHz)** | **SKW / QCOM** | **(MHz)** |  |
| **CA\_n2A-n77(2A)** | **n2** | **N/A** | **5** | **same** | **1988** | **2 / 3.4 => avg 2.7** | **FDD** | **IMD7** |
|  | **n77** | **3455** | **10** | **same** | **3455** | same | **TDD** | **N/A** |
| **3945** | **10** | **same** | **3945** |
| CA\_n2A-n66(2A) | n2 | N/A | 5 | same | 1933 | 0.6 / 0 => avg 0.3 => 0 | FDD | IMD7 |
|   | n66 | 1722.5 | 5 | same | 1723 | same | TDD | N/A |
| 1777.5 | 5 | same | 1778 |
| CA\_n3A-n77(2A) | n3 | N/A | 5 | same | 1878 | 1.7 / 2.7 => avg 2.2 | FDD | IMD7 |
|   | n77 | 3455 | 10 | same | 3455 | same | TDD | N/A |
| 3945 | 10 | same | 3945 |
| CA\_n25A-n41C | n25 | N/A | 5 | same | 1988 | **9.6 / 7.3 => avg 8.5** | FDD | IMD7 |
|   | n41 | 2545 | 90 | same | 2545 | same | TDD | N/A |
| 2460 | 100 | 1 (RBstart=225) / 1 (RBstart=229) | 2460 |
| **CA\_n30A-n77(2A)** | **n30** | **N/A** | **5** | **same** | **2353** | **2.3 / 4 => avg 3.2** | **FDD** | **IMD7** |
| **n77** | **3455** | **10** | **same** | **3455** | same | **TDD** | **N/A** |
|  | **3825** | **10** | **same** | **3825** |
| CA\_n41C-n66A | n41 | 2545 | 90 | same | 2545 | same | TDD | N/A |
| 2640 | 100 | same | 2640 |
| n66 | N/A | 5 | same | 2198 | **22 / [33.5]1** | FDD | IMD5 |
| CA\_n41C-n77A | n41 | 2545 | 60 | same | 2545 | Same | TDD | N/A |
| 2640 | 100 | same | 2640 |
| n77 | N/A | 5 | same | 3305 | 1.1 / 4.2 => avg 2.7 | FDD | IMD9 |
| CA\_n66A-n77(2A) | n66 | N/A | 5 | same | 2198 | 2.3 / 4.4 => avg 3.4 | FDD | IMD7 |
| n77 | 3455 | 10 | same | 3455 | Same | TDD | N/A |
|   | 3875 | 10 | same | 3875 |
| DC\_3A\_n41C | 3 | N/A | 5 |  / N/A | 1878 | **0 / 3.3 => avg 1.7** | FDD | IMD9 |
|   | n41 | 2545 | 90 |  / 1 (RBstart=0) | 2545 |  / N/A | TDD | N/A |
|   | 2460 | 100 |  / 1 (RBstart=190) | 2460 |

|  |  |
| --- | --- |
|  | **Status summary Sub-topic #1-1** |
| **Issue 1-1A:** | *Tentative agreements:* The two companies work together to average values where the difference is <3dB and resolves the remaining cases by converging on assumptions. CA\_n2A-n77(2A) can use averaged value of 2.7dB and related CR revised with this value*Candidate options:**Recommendations for 2nd round:* Capture agreements in WF on MSD due to IMD of intra-band UL CA UL configurations |
| **Issue 1-1**B**:** | *Tentative agreements:*Calculation framework in R4-2111016 and R4-2107625 have achieved good consistency across multiple cases and thus can be merged to serve as a framework for future contributions*Candidate options:**Recommendations for 2nd round:* Capture agreements in WF on MSD due to IMD of intra-band UL CA UL configurations |

|  |  |
| --- | --- |
|  | **Status summary Sub-topic #1-2** |
| **Issue 1-2A:** | *Tentative agreements:* The two companies work together to average values where the difference is <3dB and resolves the remaining cases by converging on assumptions*Candidate options:**Recommendations for 2nd round:* Capture agreements in WF on MSD due to IMD of intra-band UL CA UL configurations |
| **Issue 1-2**B**:** | *Tentative agreements:* All agree with moderator proposed WF: CA\_n5B MSD related to IMD3 of ULCA need to be specified. CA\_n66(2A) and CA\_n66B do not need MSD*Candidate options:**Recommendations for 2nd round:* Capture agreements in WF on MSD due to IMD of intra-band UL CA UL configurations |
| **Issue 1-2**C**:** | *Tentative agreements:*Most agree with moderator proposed WF and no objection: Protection level of band n40 by band n41 with UL CA needs to be studied*Candidate options:**Recommendations for 2nd round:* Capture agreements in WF on MSD due to IMD of intra-band UL CA UL configurations |

|  |  |
| --- | --- |
|  | **Status summary Sub-topic #1-3** |
| **Issue 1-3A:** | *Tentative agreements:* Agreement that input provided by Qualcomm is a good start and that more companies neeed to look at both Rx and Tx triple beat issues. Values, test point and format can be captured and DC\_3A\_n78(2A) can be used as starting point in 38.101-1 with brackets. *Candidate options:* May decide on CR in Rd2*Recommendations for 2nd round:* Capture agreements in WF on MSD due to triple beat of intra-band UL CA UL + FDD UL configurations |

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| [**R4-2108931**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108931.zip)draft CR to 38.101-1: CA\_n5A-n77(2A)  | *Agreeable as MSD due to IMD is negligible* |
| [**R4-2108932**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108932.zip)draft CR to 38.101-1: CA\_n2-n77 | *To be revised with 2.7dB average* |
| [**R4-2109262**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109262.zip)CR for Pcmax - NR-DC for DC cat. A-B combinations | *There is no comment so far, so should be agreeable. Moderator suggest to leave open for comment and verification in round 2* |

## Discussion on 2nd round (if applicable)

### Comments on WF

*To capture comments on way forward but can be commented in responses to the email providing link to draft way forward*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| WF on MSD due to IMD of intra-band UL CA UL configurations | MediaTek: Agree with moderator’s WF. For MSD due to IMD5 for CA\_n41C-n66A, our estimation is ~ 35dB. (IMD5 spur level ~ -40dBm at PA output and n41 filter rejection at n66 range is 15dB.)  |
| Company BSkyworks: after further check on DC\_3A\_n41C I found that difference between Qualcomm and Skyworks is that Qualcomm used the US frequency range (not applicable with Band 3) and found IMD9 issue while we took China frequency range which results in IMD11 thus we will have to re-discuss that one at next meeting. This does not change the WF |
| Company C |
| WF on MSD due to triple beat of intra-band UL CA UL + FDD UL configurations | Company ASkyworks, when preparing CR on triple beat I found that there are some errors in the test points thus we can still agree the WF but we need to revisit the test point frequencies and allocation at next meeting. For this reason I did not prepare a CR for 38.101-3 for triple beat, we can follow up on that in August |
| Company B |
| Company C |

### CRs/TPs Revision final review

*To capture comments on final CR document if neededt*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revision of [**R4-2108932**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108932.zip)draft CR to 38.101-1: CA\_n2-n77 | Company A |
| Company B |
| Company C |
| [**R4-2109262**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109262.zip)CR for Pcmax - NR-DC for DC cat. A-B combinations | Company A |
| Company B |
| Company C |
| R4-2107982      CR to 38.101-1: IMD MSD only  | Company A Skyworks: submitted draft with IMD MSDs for CA from the WF |
| Company B |
| Company C |
| R4-2107983      CR to 38.101-3: triple MSD  | Company A Skyworks: did not pursue due to errors in test points => will withdraw |
| Company B |
| Company C |

# Topic #2: LB-LB and LB-LB-LB combinations

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

Feasibility and MSD of LB-LB-LB combinations

MSD for LB-LB combination

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111478**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111478.zip) LB\_LB\_MB MSD and LB\_LB\_LB Feasibility | Qualcomm Incorporated | **Proposal 1**: Use IMD4 MSD as in Table 2.1.1-1.**Proposal 2**: Use IMD2 MSD as in Table 2.1.2-1.Table 2.1.2-1: MSD test points due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD |
| --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc (MHz) | UL/DL BW (MHz) | ULLCRB | DL Fc (MHz) | MSD (dB) | IMD order |
| DC\_8A-20A\_n3A | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
| 20 | 851 | 5 | 25 | 810 | 27 | IMD2 |
| n3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
| 8 | 885 | 5 | 25 | 930 | 27 | IMD2 |
| 20 | 840 | 5 | 25 | 799 | N/A | N/A |
| n3 | 1770 | 5 | 25 | 1865 | N/A | N/A |

**Observation 1:** 2 x 2 on 2 antennas is currently not possible due to the required wideband tuning of the antenna as well potential design issues of a pentaplexer.**Proposal 3**: MSD to be defined for DC\_8\_20\_n28 for the next meeting with a more detailed study on the feasibility on pentaplexer and wide low band antenna design. |
| [**R4-2110243**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110243.zip)TP for TR 37.717-21-11: DC\_8A-20A\_n28A | Huawei, HiSilicon | C:\Users\z00471447\AppData\Roaming\eSpace_Desktop\UserData\z00471447\imagefiles\72B9D9E0-E1EA-4B15-A997-22F3F359BA02.pngFigure 1 The RF front-end architecture Table 1 General linearity parameters

|  |  |
| --- | --- |
| **Component** | **IP3(dBm)** |
| Antenna switch | 68 |
| Diplexer | 86 |
| Triplexer/Duplexer | 74 |
| PA forward mixing | 30 |
| PA reverse mixing | 28 |
| LNA | -6 |

Table 2 Attenuation and isolation values

|  |  |  |
| --- | --- | --- |
| **Attenuation and Isolation Parameter** | **Value (dB)** | **Comment** |
| **Antenna ISO** | 10 |  |
| **PA gain** | 25 |  |
| **PCB isolation Paout-Pain** | 60 | PCB isolation (PA forward mixing) |
| **n28 Tx attenuation at Band 8 Rx** | 27 |  |
| **B20 Tx attenuation at B8 RX** | 43 |  |
| **The Triplexer isolation between band 20 Tx and band n28A Tx** | 50 |  |

**Proposal: It’s proposed to use the RF front-end architecture and parameters above to analysis the IMD3 of Tx band 20 + band n28 may fall into Rx of band 8.** |
| [Rev. 4 of R4-2110701 TP to TR 38.717-02-01 Addition of CA\_n5A-n14A.docx](https://urldefense.proofpoint.com/v2/url?u=ftp-3A__ftp.3gpp.org_tsg-5Fran_WG4-5FRadio_TSGR4-5F99-2De_Inbox_Drafts_-5B99-2De-5D-5B116-5D-2520NR-5FBaskets-5FPart-5F1_Round-25201_Rev.-25204-2520of-2520R4-2D2110701-2520TP-2520to-2520TR-252038.717-2D02-2D01-2520Addition-2520of-2520CA-5Fn5A-2Dn14A.docx&d=DwMFAg&c=VYRDWu-sKuQrybEAJ2u-dYX_FK6X1lTrDf-PKXUa2P4&r=pRthG0xxDB77vg4aSNBQn5JOtJLs0OZjgw-oylT0McI&m=n4IuTVOj1sDT8nEBTdvkEnhu4OOnT7qM-qVeLzHeqhs&s=x6fW5Kd485B_CXLNEp-rT5h0s-J6r0otLgSstECUOZU&e=) | Nokia, AT&T | Moderator: transferred from #118 block approval, MSD for IMD3 too low and needs revision**Table 6.X.2.3-1: MSD due to IMD issue**

|  |  |
| --- | --- |
| Operating band / Channel bandwidth / NRB / Duplex mode | Source of IMD |
| NR CA band combination | NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL CLRB | DL Fc (MHz) | MSD (dB) | Duplex mode |
| CA\_n5-n14 | n5 | 833 | 5 | 25 | 873 | 14.3 | FDD | IMD34 |
| n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
| n5 | 834 | 5 | 25 | 879 | N/A | FDD | N/A |
| n14 | 793 | 5 | 25 | 753 | 12.1 | FDD | IMD3 |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. |

 |
| [DRAFT Rev 2 of R4-2109399 TP to TR 38.717-02-01 Addition of CA\_n5A-n12A.docx](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.3gpp.org_ftp_tsg-5Fran_WG4-5FRadio_TSGR4-5F99-2De_Inbox_Drafts_-255B99-2De-255D-255B116-255D-2520NR-5FBaskets-5FPart-5F1_Round-25201_DRAFT-2520Rev-25202-2520of-2520R4-2D2109399-2520TP-2520to-2520TR-252038.717-2D02-2D01-2520Addition-2520of-2520CA-5Fn5A-2Dn12A.docx&d=DwMFAw&c=VYRDWu-sKuQrybEAJ2u-dYX_FK6X1lTrDf-PKXUa2P4&r=pRthG0xxDB77vg4aSNBQn5JOtJLs0OZjgw-oylT0McI&m=JY7CySn_1CuyNeaMs4k7EbMQLlq4jtz_Z2GFFpCK2J0&s=HNb0F9Mxmpb62B0OyF1pr9ekJQc_BsVf1iyb4dl1NME&e=) | Nokia, AT&T | Moderator: transferred from #118 block approval based on comment that it should be not for block approval |

## Open issues summary

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

### Sub-topic 2-1

*Sub-topic description:* MSD for DC\_8A-20A\_n3A

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

**Issue 2-1:** MSD for DC\_8A-20A\_n3A

* Proposals
* Option 1: Adopt MSD values from [**R4-2111478**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111478.zip)
* Option 2: Any other suggestion – Please provide justification
* Recommended WF: Adopt MSD test point proposed and discuss MSD value

### Sub-topic 2-2

*Sub-topic description:* Architecture for DC\_8A-20A\_n28A

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

**Issue 2-2:** DC\_8A-20A\_n28A architecture

* Proposals
* Option 1: Study architecture based on 2 antennas and pentaplexer as in [**R4-2111478**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111478.zip)
* Option 2: Study architecture based on 3 antennas and its applicability to all UEs
* Option 3: Any other suggestion – Please provide justification
* Recommended WF
* Discuss architecture options, their applicability to smartphones and their feasibility

### Sub-topic 2-3

*Sub-topic description:* CA\_n5-n14 IMD3 MSDs to be revised

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

**Issue 2-3:** CA\_n5-n14 IMD3 MSDs to be revised

* Proposals
* Option 1: Reuse DC\_8\_n20 values
* Option 2: study a specific IMD3 MSDs values
* Recommended WF
* Assess if the DC\_8\_n20 MSDs IMD3 values can be reused

### Sub-topic 2-4

*Sub-topic description:* CA\_n5-n12 architecture

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

**Issue 2-4:** CA\_n5-n12 architecture

* Proposals
* Option 1: Reuse DC\_12\_n5 and DC\_5\_n12 input
* Option 2: study a specific architecture and MSD
* Recommended WF
* Assess if the DC\_12\_n5 and DC\_5\_n12 can be reused

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 MSD for DC\_8A-20A\_n3A

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-1:MTK: Option 1Others: |
| Huawei | We also have a contribution for this combos treated in thread [117]. It seems to be approved. |
| Vodafone | Option 1. The TP in thread [117] seems to be approved with the same MSD value proposed in R4-2111478. |
| Skyworks (moderator) | If already agreed and the same. We can skip this topic and focus on other cases |

Sub topic 2-2 Architecture for DC\_8A-20A\_n28A

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-2:MTK: The FE architecture proposed in R4-2110243 seems feasible. Would like to hear voice from phone companies. If the architecture is agreed by RAN4, it shall be included in the TR for the band combination.Others: |
| Qualcomm | Sub topic 2-2:Option 2 for MSD based on architectural feasibility and because of the issues presented in R4-2111478. Single antenna with a pentaplex introduces insertion loss and antenna tuning issues. MSD should be calculated based on option 2.  |
| Huawei | Sub topic 2-2:Option 2, The FE architecture proposed in R4-2110243 can be a candidate an assumption. |
| Vodafone | Option 2. |
| Skyworks | In our view both cases have feasibility issues: * LB pentaplexer and antenna tuning issue together with IMD3 related MSD makes option 1 not practical for implementation
* The 3 LB antenna approach is not feasible in a smartphone as there is already issues with correlation of 2 antennas. So this one may be limited to larger form factors only. If there is an agreement to use this as the option for MSD evaluation, a note should clarify the form factor issues.
 |

Sub topic 2-3 CA\_n5-n14 IMD3 MSDs to be revised

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-3:MTK: Option 1. And we suggest test points as below to keep T/R frequency offset for the bands:

|  |  |
| --- | --- |
| Operating band / Channel bandwidth / NRB / Duplex mode | Source of IMD |
| NR CA band combination | NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL CLRB | DL Fc (MHz) | MSD (dB) | Duplex mode |
| CA\_n5-n14 | n5 | 833**836** | 5 | 25 | 873 **->881** | 25 | FDD | IMD34 |
| n14 | 793 ** 791** | 5 | 25 | 763**761** | N/A | FDD | N/A |
| n5 | 834** 826.5** | 5 | 25 | 879**871.5** | N/A | FDD | N/A |
| n14 | 793**795.5** | 5 | 25 | 753**765.5** | 25 | FDD | IMD3 |
| NOTE 4:   This band is subject to IMD5 also which MSD is not specified. |

Others: |
| Qualcomm | The same IMD values from DC\_8\_n20 can be used here since the TX-TX attenuation will be similar for the reverse IMD. MTK MSD values and test points are ok. |
| Nokia | Option 1 is acceptable |
| Skyworks | We support option 1 as proposed by MTK. |

Sub topic 2-4 CA\_n5-n12 architecture

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-4:MTK: Option 2. And we also have DC\_13\_n5 in existing spec. If qualplexer for the combo is adopted, then how to handle implementation with both DC\_12\_n5 and DC\_13\_n5 in one phone needs to be further studied. Others: |
| AT&T | Sub topic 2-4:Option 1. In addition, based on the co-existence studies for DC\_12\_n5, DC\_5\_n12, and CA\_n5-n12, there is no need to have MSD added as there are no IMD products that impact the corresponding operating bands. Therefore, we think that the latest revision of the TP can be approved and there is no need to open up the discussion concerning UE architecture. |
| Skyworks | At least in this case we do not see strong MSD issue as there are no IMD issues and there is precedence for DC. The fact that a phone needs to support multiple overlapping combination is not new and if any is partially accounted for in DT/DR. |

## 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 2-1** |
| **Sub-topic#2-1** | *Tentative agreements:*not needed values have been agreed in 118 already*Candidate options:**Recommendations for 2nd round:* no round2 |

|  |  |
| --- | --- |
|  | **Status summary topic 2-2** |
| **Sub-topic#2-2** | *Tentative agreements:*There is consensus that pentaplexer is not an option and that 3 LB antenna architecture is a feasible approach but the feasibility of this is questionable in a smartphone*Candidate options:**Recommendations for 2nd round:* Capture candidate architecture in WF on architecture and device type for DC\_8A-20A\_n28A and agree on form factor constraints and study for MSD. |

|  |  |
| --- | --- |
|  | **Status summary topic 2-3** |
| **Sub-topic#2-3** | *Tentative agreements:* There is consensus to use MSD test points and values based in DC\_20\_n28 according to MediaTek proposal

|  |  |
| --- | --- |
| Operating band / Channel bandwidth / NRB / Duplex mode | Source of IMD |
| NR CA band combination | NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL CLRB | DL Fc (MHz) | MSD (dB) | Duplex mode |
| CA\_n5-n14 | n5 | **836** | 5 | 25 | **881** | 25 | FDD | IMD34 |
| n14 | **791** | 5 | 25 | **761** | N/A | FDD | N/A |
| n5 | **826.5** | 5 | 25 | **871.5** | N/A | FDD | N/A |
| n14 | **795.5** | 5 | 25 | **765.5** | 25 | FDD | IMD3 |
| NOTE 4:   This band is subject to IMD5 also which MSD is not specified. |

*Candidate options:**Recommendations for 2nd round:* Rev. 5 of R4-2110701 TP to TR 38.717-02-01 Addition of CA\_n5A-n14A.docx is further revised to use above table, and reviewed for approval |

|  |  |
| --- | --- |
|  | **Status summary topic 2-4** |
| **Sub-topic#2-4** | *Tentative agreements:* Since there is no IMD issue and multiple combinations with band overlap is common practice in smartphone the TP should be agreeable, especially with the precedence of DC\_12\_n5 and DC\_5\_n12*Candidate options:**Recommendations for 2nd round:* [DRAFT Rev 2 of R4-2109399 TP to TR 38.717-02-01 Addition of CA\_n5A-n12A.docx](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.3gpp.org_ftp_tsg-5Fran_WG4-5FRadio_TSGR4-5F99-2De_Inbox_Drafts_-255B99-2De-255D-255B116-255D-2520NR-5FBaskets-5FPart-5F1_Round-25201_DRAFT-2520Rev-25202-2520of-2520R4-2D2109399-2520TP-2520to-2520TR-252038.717-2D02-2D01-2520Addition-2520of-2520CA-5Fn5A-2Dn12A.docx&d=DwMFAw&c=VYRDWu-sKuQrybEAJ2u-dYX_FK6X1lTrDf-PKXUa2P4&r=pRthG0xxDB77vg4aSNBQn5JOtJLs0OZjgw-oylT0McI&m=JY7CySn_1CuyNeaMs4k7EbMQLlq4jtz_Z2GFFpCK2J0&s=HNb0F9Mxmpb62B0OyF1pr9ekJQc_BsVf1iyb4dl1NME&e=) is agreeable and final revision put in inbox, basket moderator and relevant rapporteur copied by proponent at beginning of Rd2 |

## Discussion on 2nd round (if applicable)

### Comments on WF

*To capture comments on way forward but can be commented in responses to the email providing link to draft way forward*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| WF on architecture and device type for DC\_8A-20A\_n28A | MediaTek: As commented in 1st round, we agree with FE architecture proposed in R4-2110243. |
| Company B Skyworks, architecture and parameters are a good start we need to clarify feasibility of form factor at next meeting. OK for us |
| Company C |

### CRs/TPs Revision final review

*To capture comments on final CR document if needed*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Rev. 5 of R4-2110701 TP to TR 38.717-02-01 Addition of CA\_n5A-n14A | Moderator:  |
| MediaTek: The revision looks good. Thanks! |
| Company C |
| [DRAFT Rev 2 of R4-2109399 TP to TR 38.717-02-01 Addition of CA\_n5A-n12A](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.3gpp.org_ftp_tsg-5Fran_WG4-5FRadio_TSGR4-5F99-2De_Inbox_Drafts_-255B99-2De-255D-255B116-255D-2520NR-5FBaskets-5FPart-5F1_Round-25201_DRAFT-2520Rev-25202-2520of-2520R4-2D2109399-2520TP-2520to-2520TR-252038.717-2D02-2D01-2520Addition-2520of-2520CA-5Fn5A-2Dn12A.docx&d=DwMFAw&c=VYRDWu-sKuQrybEAJ2u-dYX_FK6X1lTrDf-PKXUa2P4&r=pRthG0xxDB77vg4aSNBQn5JOtJLs0OZjgw-oylT0McI&m=JY7CySn_1CuyNeaMs4k7EbMQLlq4jtz_Z2GFFpCK2J0&s=HNb0F9Mxmpb62B0OyF1pr9ekJQc_BsVf1iyb4dl1NME&e=)  | Moderator |
| Company B |
| Company C |

# Topic #3: Update of ENDC test points for new n77 FCC frequency range

*Main technical topic overview.*

n77 band combinations requires MSD test point to be checked for new FCC 3.45-3.55GHz frequency range

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110158**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110158.zip) MSD test points for US EN-DC combinations with n77 | Apple | **Proposal**: Adopt the MSD test configuration modifications for US EN-DC combinations with n77 as proposed in Table 2-4, Table 2-5, and Table 2-6.

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD |
| --- |
| EN-DCConfiguration | EUTRA or NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | IMD order |
| DC\_2A\_n77ADC\_2A-2A\_n77A | 2 | 1855 | 5 | 25 | 1935 | 26 | IMD2 |
|  |  |  |  |  |  | 28.74 |  |
|  | n77 | 3790 | 10 | 50 | 3790 | N/A | N/A |
|  | 2 | 1900 | 5 | 25 | 1980 | 8.0 | IMD4 |
|  |  |  |  |  |  | 10.74 |  |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |
|  | 2 | 1885 | 5 | 25 | 1965 | 5 | IMD5 |
|  |  |  |  |  |  | 7.74 |  |
|  | n77 | 3810 | 10 | 50 | 3810 | N/A | N/A |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| DC\_66A\_n77ADC\_66-66\_n77ADC\_66-66-66\_n77A | 66 | 1775 | 5 | 25 | 2175 | 31.0 | IMD2 |
|  | n77 | 3950 | 10 | 50 | 3950 | N/A | N/A |
|  | 66 | 1760 | 5 | 25 | 2160 | 5.0 | IMD5 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |

 **Table 2-4 Proposed MSD test configuration modifications for two-band combinations**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD |
| --- |
| EN-DCConfiguration | EUTRA or NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | IMD order |
| DC\_2A\_n77A | 2 | 1855 | 5 | 25 | 1935 | 32.10 | IMD2 |
| 34.852 |
| n77 | 3790 | 10 | 50 | 3790 | N/A | N/A |
| 2 | 1900 | 5 | 25 | 1980 | 19.10 | IMD41 |
| 21.852 |
| n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| DC\_66A\_n77A | 66 | 1730 | 5 | 25 | 2130 | 34.33 | IMD2 |
| n77 | 3860 | 10 | 50 | 3860 | N/A | N/A |
| 66 | 1760 | 5 | 25 | 2160 | 11.27 | IMD5 |
| n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |

**Table 2-5 Proposed MSD test configuration modifications for two-band PC2 combinations**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD |
| --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc (MHz) | UL/DL BW (MHz) | ULLCRB | DL Fc (MHz) | MSD (dB) | IMD order |
| DC\_2A\_n5A-n77A | 2 | 1880 | 5 | 25 | 1960 | N/A | N/A |
|  | n5 | 830 | 5 | 25 | 875 | N/A | N/A |
|  | n77 | 3540 | 10 | 50 | 3540 | 16.0 | IMD3 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| DC\_2A-66A\_n77A | 2 | 1855 | 5 | 25 | 1935 | N/A | N/A |
|  | 66 | 1715 | 5 | 25 | 2115 | 29.2 | IMD2 |
|  | n77 | 3970 | 5 | 25 | 3970 | N/A | N/A |
|  | 2 | 1880 | 5 | 25 | 1960 | M/A | N/A |
|  | 66 | 1740 | 5 | 25 | 2140 | 10.4 | IMD4 |
|  | n77 | 3500 | 5 | 25 | 3500 | N/A | N/A |
|  | 2 | 1885 | 5 | 25 | 1965 | M/A | N/A |
|  | 66 | 1775 | 5 | 25 | 2175 | 4.0 | IMD5 |
|  | n77 | 3915 | 5 | 25 | 3915 | N/A | N/A |
|  | 2 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
|  | 66 | 1760 | 5 | 25 | 2160 | N/A | N/A |
|  | n77 | 3720 | 5 | 25 | 3720 | N/A | N/A |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | 2 | 1855 | 5 | 25 | 1935 | 4.2 | IMD5 |
|  | 66 | 1715 | 5 | 25 | 2115 | N/A | N/A |
|  | n77 | 3540 | 5 | 25 | 3540 | N/A | N/A |
| DC\_2A\_n66A-n77ADC\_2A-2A\_n66A-n77A | 2 | 1855 | 5 | 25 | 1935 | N/A | N/A |
|  | n66 | 1715 | 5 | 25 | 2115 | 29.2 | IMD2 |
|  | n77 | 3970 | 10 | 50 | 3970 | N/A | N/A |
| DC\_13A\_n2A-n77A | 13 | 782 | 5 | 25 | 751 | N/A | N/A |
|  | n2 | 1896 | 5 | 25 | 1976 | N/A | N/A |
|  | n77 | 3460 | 10 | 50 | 3460 | 17.3 | IMD3 |
|  | 13 | 782 | 5 | 25 | 751 | N/A | N/A |
|  | n2 | 1880 | 5 | 25 | 1960 | 16.0 | IMD3 |
|  | n77 | 3524 | 10 | 50 | 3524 | N/A | N/A |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| DC\_13A-66A\_n77A | 13 | 782 | 5 | 25 | 751 | N/A | N/A |
|  | 66 | 1756 | 5 | 25 | 2156 | 17.1 | IMD3 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| DC\_25A-66A\_n77ADC\_25A-25A-66A\_n77A | 25 | 1855 | 5 | 25 | 1935 | N/A | N/A |
| 66 | 1715 | 5 | 25 | 2115 | 29.2 | IMD2 |
| n77 | 3970 | 10 | 25 | 3970 | N/A | N/A |
| 25 | 1880 | 5 | 25 | 1960 | M/A | N/A |
| 66 | 1740 | 5 | 25 | 2140 | 10.4 | IMD4 |
| n77 | 3500 | 10 | 25 | 3500 | N/A | N/A |
| 25 | 1885 | 5 | 25 | 1965 | M/A | N/A |
| 66 | 1775 | 5 | 25 | 2175 | 4.0 | IMD5 |
| n77 | 3915 | 10 | 25 | 3915 | N/A | N/A |
| 25 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
| 66 | 1760 | 5 | 25 | 2160 | N/A | N/A |
| n77 | 3720 | 10 | 25 | 3720 | N/A | N/A |
|  |  |  | - |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 25 | 1855 | 5 | 25 | 1935 | 4.2 | IMD5 |
| 66 | 1715 | 5 | 25 | 2115 | N/A | N/A |
| n77 | 3540 | 10 | 25 | 3540 | N/A | N/A |
| DC\_66A\_n2A-n77A |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | n2 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
|  | 66 | 1760 | 5 | 25 | 2160 | N/A | N/A |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |
| DC\_66A\_n5A-n77A | 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
|  | n5 | 845 | 5 | 25 | 890 | N/A | N/A |
|  | n77 | 3460 | 10 | 50 | 3460 | 16.6 | IMD3 |

 |
| [**R4-2110159**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110159.zip) CR for TS 38.101-3: MSD test configurations modifications for US EN-DC combinations with Band n77 | Apple | CR for TS 38.101-3: MSD test configurations modifications for US EN-DC combinations with Band n77  |

## Open issues summary

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

### Sub-topic 3-1

*Sub-topic description:* Revision of inter-band MSD test points to account for addition og 3.45-3.55GHz range for n77 for FCC

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

**Issue 3-1:** MSD test point update as in [**R4-2110158**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110158.zip)

* Proposals
* Option 1: Revise test points as proposed
* Option 2: Any restriction – addition to the above
* Recommended WF
* Option 1: Comment the in the CR directly

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| AT&T | Sub topic 3-1:We are not against specifying test points specific to US EN-DC combinations with n77. In fact, we prefer to limit the MSD analysis to the specific n77 frequency ranges for combinations that only exist in the US to avoid unnecessary MSD relaxation. However, we would like to point out that the MSD analyses for EN-DC and NR CA have not followed the same process for many combinations related to n77 to date. There are some that limit the analysis to only US frequency range and some that consider the entire operating band for US-based combinations. Perhaps, RAN4 can have a WF to align the treatment for such combinations in a future meeting to ensure consistency for MSD treatment and test points with a preference to limit the analysis to US frequency range in n77 for any US-based combinations.  |
| T-Mobile USA | Sub topic 3-1: We think that we understand AT&T’s point, but think it is unpractical. With a few exceptions, most “US” bands are also deployed in other countries including Canada, Latin America as well as some in Asia and the Middle East. The n77 deployment limitations in the US may not apply in the other countries. We think it would be better to test the requirements without allowing MSD where the MSD does not apply to the US frequency range, rather than complicating the MSD tables by specifying the MSD based on the US frequency range. Especially since the US frequency range for n77 is a moving target, initially restricted to 3.7=3.98 GHz, but likely to also include 3.45.3.55 GHz.  |
| Verizon | Sub topic 3-1: Option 1This Apple contribution is an example to help RAN4 to deal with ambiguous requirements which have been existed longtime. RAN4 should have a WF to clarify this as a guidance for the future work. |
| Huawei | We share the same view with T-Mobile, Most “US” bands are also deployed in other countries including Canada, Latin America as well as some in Asia and the Middle East. The n77 deployment limitations in the US may not apply in the other countries. RAN4 shouldn’t think these band combinations can only be used in US. |
| AT&T | Sub topic 3-1:In response to TMUS and Huawei, our proposal is related specifically to EN-DC and NR CA combinations that include Band n77 with other specific US operating bands. In this case, the corresponding CA/DC combination would not apply as it would not be configured in other countries.Regardless of our position on the proposal, RAN4 still needs a WF on this topic since some EN-DC and NR CA combinations including Band n77 have utilized the US operating frequency range approach to avoid MSD impact and some have not. |
| Skyworks | At least when band combination have clearly identified proponents and are region specific it is useful to chose test point such that they can be tested and are actually applicable to the regional deployment. In that sense we support the proposed changes. In order to be future proof it might be useful to add a note that clearly states the spectrum restrictions as some cases may need updates or re-considerations is the spectrum allocation evolves. |
| CHTTL | Sub topic 3-1: We are not sure whether it is a good idea to directly remove the MSD test points, those combinations will not be used in other country forever? Though we are not aginst to move the MSD test point in this case, but we are not sure this is a usual approach that can we also request to move some test point based on the spectrum allocation in our region? |

### 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** |
| [**R4-2110159**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110159.zip) CR for TS 38.101-3: MSD test configurations modifications for US EN-DC combinations with Band n77 | CHTTL: 1. Regarding the work item code, not only DC\_R17\_1BLTE\_1BNR\_2DL2UL is impacted, but also other work items are impacted, for example: 2 band LTE + 1 band NR, x band LTE + 2 band NR, PC2 EN-DC work item.2. We are not sure whether it is a good idea to remove the MSD test point, see comment in issue 3-1.3. if the content is agreeable, please also send a TP to fix the TR as well, otherwise the TR is not aligned with what defined in the spec. |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#3-1** | There is consensus that test points can be moved such that they can be tested within the new frequency range supported in the US for US based combinations but still these combinations could be used in other regions so it is not clear that test point that are not feasible in the US can be fully removed.*Tentative agreements: moved test point are agreeable but removed MSD may need to be rather left with N/A for MSD with a note that says that it does not apply for frequency range 3.45-3.55GHz and 3.7-3.98GHz* *Candidate options:**Recommendations for 2nd round:*Above approach is further discussed and CR revised accordingly |

### 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**  |
| [**R4-2110159**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110159.zip) CR for TS 38.101-3: MSD test configurations modifications for US EN-DC combinations with Band n77 | CR is revised to address CHTTL comments and capture agreements from round2 on removed MSDs |

## Discussion on 2nd round (if applicable)

### CRs/TPs

*To capture comments on final CR document if needed*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| [**R4-2110159**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110159.zip) CR for TS 38.101-3: MSD test configurations modifications for US EN-DC combinations with Band n77 | Moderator: CR is revised to address CHTTL comments and capture agreements from round2 on removed MSDsSkyworks: CR is good with keeping MSD case that are not valid for US frequency but might still ba applicable for other countries.  |

# Topic #4: DC\_(n)71AA BCS2 and MSD test points

*Main technical topic overview.*

New BCS for DC\_(n)71AA with UL in NR side only (for use in higher order combinations). Single UL MSD for DC\_(n)71

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109630.zip) MSD for DC\_(n)71AA BCS2 | MediaTek Inc. | ***Observation 1: BCS2 behaviour is different from BCS0/1 when UE supports dynamic power sharing.******Observation 2: With the “DC\_42\_n77-like” approach, UE must report BCS information of fallback combinations.*****Text Proposal for TR 38.717-01-01** **Table 5.x.3-1:** **Reference sensitivity (MSD) for intra-band contiguous EN-DC**

|  |
| --- |
| EN-DC configuration / channel allocations /MSD |
| EN-DC configuration | E-UTRA/NR band | FC (UL)(MHz) | Channel bandwidth(MHz) | ULallocation (LCRB) | FC (DL)(MHz) | MSD(dB) | Duplex mode |
| DC\_(n)71AA | 71 | NA | 5 | 0 (RBend =NA) | 639.5 | **7.2** | FDD |
|  | n71 | 673 | 20x | 5 (RBstart = **14**) | 627 | 0 |  |
| DC\_(n)71AA | 71 | NA | 10 | 0 (RBend = NA) | 642 | **19.7** |  |
|  | n71 | 673 | 20x | 5 (RBstart = **0**) | 627 | 0 |  |
| NOTE x: Only applicable for BCS2 configuration |

 |
| [**R4-2111534**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111534.zip) Single Uplink REFSENS for DC\_(n)71AA | Skyworks Solutions Inc. | Moderator: a late revision (R4-2107626) was made available; we propose it is considered for the progress of the combination. |
| R4-2107626 revision of R4-2111534 Single Uplink REFSENS for DC\_(n)71AA(check inbox) | Skyworks Solutions Inc. |

|  |
| --- |
| EN-DC configuration / channel allocations /MSD |
| EN-DC configuration | E-UTRA/NR band | FC (UL)(MHz) | UL Channel bandwidth(MHz) | UL allocation (LCRB) | FC (DL)(MHz) | MSD(dB) |
| DC\_(n)71AAX | 71 | N/A | 10 | N/A | 642.0 | **[20.3]** |
| n71 | 673.0 | 20 | [5 (RBstart = 0)] | 627.0 | N/A |
| DC\_(n)71AAX | 71 | N/A | 15 | N/A | 639.5 | **[3.4]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0)] | 624.5 | N/A |
| DC\_(n)71AAXX | 71 | 680.5 | 5 | N/A | 639.5 | **[3.5]** |
| n71 | 670.5 | 151 | [5 (RBstart = 2)] | 627.0 | N/A |
| DC\_(n)71AAXXX | 71 | 680.5 | 5 | N/A | 634.5 | **[2.8]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0) | 624.5 | N/A |
| NOTE 1: In accordance to BCS1, the NR uplink bandwidth is specified as in this table, but the corresponding NR downlink bandwidth is 5 MHz larger.NOTE X: Applicable only to BCS 2.NOTE XX: Applicable only to BCS 1.NOTE XXX: Applicable to BCS 0,1,2. For BCS2, the E-UTRA uplink carrier frequency is N/A. |

 |
| [**R4-2111487**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111487.zip) Impact on TS 38.101-3 due to the introduction of BCS2 for DC\_(n)71AA | T-Mobile USA, Skyworks Solutions |

|  |  |
| --- | --- |
| **Option** | **Impact to 38.101-3 and 38.101-1 TS** |
| **38.101-3 Table 5.3B.1.2-1****"BCS" table** | **38.101-3 Table 5.5B.2-1** **"SUO" table** | **38.101-3 Table 7.3B.2.1-1: "MSD" table** | **38.101-1 Table 5.3.6-1****"Asymmetric UL/DL" table** | **38.101-1 DC\_(n)71AA****A-MPR specifications** |
| **1** | **BCS2 only used with LTE Pcell in another**  | **New Footnote 6 adds text aligned with the new downlink only intra-band EN-DC wording in 38.306.** | **Note 4 states that SUO attributes are not applicable to BCS2** | **Single UL REFSENS test points needed1** | **No Impact** | **No impact** |
| **NOTE 1: Impact of UL n71 20MHz on LTE B71 MSD can be captured in the DC\_(n)71AA single UL MSD table with footnote “X”.** |

 |
| [**R4-2111488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111488.zip) Draft CR for 38.101-3: Introduction of DC\_(n)71AA\_BCS2 | T-Mobile USA, Skyworks Solutions | Adds BCS2 for DC\_(n)71AA. MSD changes need to be added |

## Open issues summary

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

### Sub-topic 4-1

*Sub-topic description:* Introduction of BCS2 w NR UL only for DC\_(n)71AA

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

**Issue 4-1:** Introduction of BCS2 w NR UL only for DC\_(n)71AA

* Proposals
* Option 1: Introduce DC\_(n)71AA BCS2 as described in [**R4-2111487**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111487.zip)
* Option 2: Any restriction – addition to the above
* Recommended WF
* Option 1: introduce BCS2 as proposed, CR details can be commented in the CR/TR section

### Sub-topic 4-2

*Sub-topic description:* MSD test points proposals for DC\_(n)71AA UL BCS2 in [**R4-2109630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109630.zip) and R4-2117626

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

**Issue 4-2:** MSD test points proposals for DC\_(n)71AA UL BCS2 in [**R4-2109630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109630.zip) and R4-2117626

* Proposals
* Option 1: MSD and MSD test points from [**R4-2109630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109630.zip)
* Option 2: MSD and MSD MSD test points from R4-2117626
* Option 3: Merge of both proposals
* Recommended WF
* Option 3: decide on MSD test point first then check how to proceed with MSD values

## Companies views’ collection for 1st round

### Open issues

Sub topic 4-1 Introduction of BCS2 w NR UL only for DC\_(n)71AA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 4-1:MTK: Option 1.Nokia: Option 1Skyworks: option 1Others: |

Sub topic 4-2 MSD test points proposals for DC\_(n)71AA UL BCS2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 4-2:MTK: Option 1 or 3. One question for option 2, is it asym-UL/DL NR BW or sym-UL/DL NR BW for BCS0/1 for note xxx ? In our view, asym-UL/DL NR BW test points shall be the worst case and sym-UL/DL test points are not necessary. This may need to be clarified in the test point.Others: |
| Qualcomm | Sub topic 4-2:Option 3. Merge proposals with justification. One of the test points in option 2 may not be required.Qualcomm would like to introduce additional MSD contribution with justification. We can formally present in a TDOC. We see an issue with option 1 and 2. The amount of MSD calculated should use the same TX interference level as was used for 20MHz single carrier REFSENS without any correction factor since the UL allocation is small,Using the MSD test points chosen in option 2 lead to the following MSD:**Qualcomm****Table 5:** Reference sensitivity (MSD) for intra-band contiguous EN-DC

|  |
| --- |
| EN-DC configuration / channel allocations /MSD |
| EN-DC configuration | E-UTRA/NR band | FC (UL)(MHz) | UL Channel bandwidth(MHz) | UL allocation (LCRB) | FC (DL)(MHz) | MSD(dB) |
| DC\_(n)71AAX | 71 | N/A | 10 | N/A | 642.0 | **[23.9]** |
| n71 | 673.0 | 20 | [5 (RBstart = 0)] | 627.0 | N/A |
| DC\_(n)71AAX | 71 | N/A | 15 | N/A | 639.5 | **[7.2]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0)] | 624.5 | N/A |
| DC\_(n)71AAXX | 71 | 680.5 | 5 | N/A | 639.5 | **[9.6]** |
| n71 | 670.5 | 151 | [5 (RBstart = 2)] | 627.0 | N/A |
| DC\_(n)71AAXXX | 71 | 680.5 | 5 | N/A | 634.5 | **[9.1]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0) | 624.5 | N/A |

 |
| Nokia |  Cannot find R4-2117626 should be R4-2107626. We support the concept of R4-2107626, MSD can be further discussed. |
| Skyworks | Sub topic 4-2:Our apologies for mistakenly using R4-2117626. The correct Tdoc with updated measurement data is R4-2107626, for which we propose the following table:

|  |
| --- |
| EN-DC configuration / channel allocations /MSD |
| EN-DC configuration | E-UTRA/NR band | FC (UL)(MHz) | UL Channel bandwidth(MHz) | UL allocation (LCRB) | FC (DL)(MHz) | MSD(dB) |
| DC\_(n)71AAX | 71 | N/A | 10 | N/A | 642.0 | **[20.3]** |
| n71 | 673.0 | 20 | [5 (RBstart = 0)] | 627.0 | N/A |
| DC\_(n)71AAX | 71 | N/A | 15 | N/A | 639.5 | **[3.4]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0)] | 624.5 | N/A |
| DC\_(n)71AAXX | 71 | 680.5 | 5 | N/A | 639.5 | **[3.5]** |
| n71 | 670.5 | 151 | [5 (RBstart = 2)] | 627.0 | N/A |
| DC\_(n)71AAXXX | 71 | 680.5 | 5 | N/A | 634.5 | **[2.8]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0) | 624.5 | N/A |
| NOTE 1: In accordance to BCS1, the NR uplink bandwidth is specified as in this table, but the corresponding NR downlink bandwidth is 5 MHz larger.NOTE X: Applicable only to BCS 2.NOTE XX: Applicable only to BCS 1.NOTE XXX: Applicable to BCS 0,1,2. For BCS2, the E-UTRA uplink carrier frequency is N/A. |

Our intention is to provide the minimum number of test points that covers all DC\_(n)71AA BCSs (0,1,2). while ensuring worst case MSD is verified.We seem to have agreement on the test point selection with QCOM. The only differences are the proposed MSD values for which are ready to find a compromise solution throughout second round. |
| Qualcomm | Yes, some alignment is required, and maybe we can focus on the interference level generated with 20MHz single carrier REFSENS to look at the actual MSD for combinations where 5th order come into play. |

### 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** |
| [**R4-2111488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111488.zip) Draft CR for 38.101-3: Introduction of DC\_(n)71AA\_BCS2 | MTK: Note 6 in Table 5.3B.1.2-1 is confusing that needs further explanation |
| Skyworks: In case we reach agreement on Single UL REFSENS test points and MSD, this CR needs a revision to update Table 7.3B.2.1-1. |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#4-1** | *Tentative agreements:*Agreement that BCS2 is introduced according to **R4-2111487***Candidate options:**Recommendations for 2nd round:*introduction agreed Rd2 only focusses on 4-2 on MSD values and test points |

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#4-2** | *Tentative agreements:* Agreement that MSD and test points can be converged between Mediatek, Qualcomm and Skyworks*Candidate options:**Recommendations for 2nd round:* Capture agreement on test points and MSD in WF on DC\_(n)71AA single UL |

### 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**  |
| [**R4-2111488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111488.zip) Draft CR for 38.101-3: Introduction of DC\_(n)71AA\_BCS2 | Draft CR is revised to capture agreed single UL MSD table and address comments on note 6 |

## Discussion on 2nd round (if applicable)

### Comments on WF

*To capture comments on way forward but can be commented in responses to the email providing link to draft way forward*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| WF on DC\_(n)71AA single UL | MediaTek: Agree with test points proposed by Skyworks/Qualcomm. MediaTek would like to provide our values as below. And since we’ve assigned test points for BCS 1 as note 1 and note xx stated which is worst case for BCS1, plus test points for BCS 2 as note x stated, note xxx can be modified to : Applicable to BCS 0,~~1,2. For BCS2, the E-UTRA uplink carrier frequency is N/A~~

|  |
| --- |
| EN-DC configuration / channel allocations /MSD |
| EN-DC configuration | E-UTRA/NR band | FC (UL)(MHz) | UL Channel bandwidth(MHz) | UL allocation (LCRB) | FC (DL)(MHz) | MSD(dB) |
| DC\_(n)71AAX | 71 | N/A | 10 | N/A | 642.0 | **[19.7]** |
| n71 | 673.0 | 20 | [5 (RBstart = 0)] | 627.0 | N/A |
| DC\_(n)71AAX | 71 | N/A | 15 | N/A | 639.5 | **[5.5]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0)] | 624.5 | N/A |
| DC\_(n)71AAXX | 71 | 680.5 | 5 | N/A | 639.5 | **[7.2]** |
| n71 | 670.5 | 151 | [5 (RBstart = 2)] | 627.0 | N/A |
| DC\_(n)71AAXXX | 71 | 680.5 | 5 | N/A | 634.5 | **[7.2]** |
| n71 | 670.5 | 15 | [5 (RBstart = 0) | 624.5 | N/A |
| NOTE 1: In accordance to BCS1, the NR uplink bandwidth is specified as in this table, but the corresponding NR downlink bandwidth is 5 MHz larger.NOTE X: Applicable only to BCS 2.NOTE XX: Applicable only to BCS 1.NOTE XXX: Applicable to BCS 0~~,1,2. For BCS2, the E-UTRA uplink carrier frequency is N/A.~~ |

 |
| Company B |
| Company C |

### CRs/TPs Revision final review

*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**  |
| [**R4-2111488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111488.zip) Draft CR for 38.101-3: Introduction of DC\_(n)71AA\_BCS2 | Moderator: Draft CR is revised to capture agreed single UL MSD table and address comments on note 6MediaTek: Regarding note 6 in R4-2111488: Bandwidth Combination Set 2 only applies to intra-band EN-DC paired with another E-UTRA band without both bands of the intra-band combination in the uplink.I’m confused with the highlighted sentence. It reads like there’s no UL in B71 neither in n71?It seems wording like this is more clear: The bandwidth combination set 2 is not used alone as fall back mode of higher order band combinations in which UL in E-UTRA Band 71 is not used |

# Topic #5: Discussions on band combinations MSD, rules and simplifications

*Main technical topic overview.*

Naming convention for NE-DC intra-band contiguous cases

MSD test points for single UL intra-band EN-DC REFSENS

Discussion on real world and 3GPP REFSENS

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110080**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110080.zip) discussion on the rules of NE-DC with contiguous intra-band NR and LTE carriers | Huawei,HiSilicon | **Observation 1: There is no definition on rules of NE-DC with contiguous intra-band NR and LTE carriers.****Proposal 1: Using DC\_x(n) AA to replace NE-DC with contiguous intra-band NR and LTE carriers.****Proposal 2: Companies are encouraged to offer other simple and feasible naming method of NE-DC with contiguous intra-band NR and LTE carriers.** |
| [**R4-2111537**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111537.zip)Intra-Band Single Uplink REFSENS Simplification | Skyworks Solutions Inc. | **Proposal 1: Only for single UL intra-band REFSENS MSD test points, and only in future Rel-17 intra-band EN-DC combinations or for future intra-band EN-DC BCS updates, adopt WF [1] agreement for the selection of the UL aggressor RB configuration with the additional optimization:****For intra-band non-contiguous EN-DC:*** **For each distinct Uplink Aggressor CBW, only specify one pair of test points:**
	+ **Test Point #1) Specify the range of Wgap for which the worst-case (highest) MSD is reached. This corresponds to the collision of the lowest victim’s CBW which experiences the greatest overlap with the lowest IMD order,**
	+ **Test Point #2) Specify the range of Wgap for which the best case (lowest) MSD is reached,**

**For intra-band contiguous EN-DC:*** + **For each distinct Uplink Aggressor CBW, only specify the worst-case (highest) MSD test point. This corresponds to the collision of the lowest victim’s CBW which experiences the greatest overlap with the lowest IMD order.**

**Proposal 2: For Rel-17 single UL REFSENS MSD test points,****For intra-band non-contiguous:*** **For all mirror cases of table 7.3B.3.2-2 (NR=aggressor), do not specify the NR MSD test points in table 7.3B.3.2-1 (LTE = aggressor). A mirror case is a case where the CBW permutations are identical, the only change is a swap of Aggressor / Victim (LTE 🡨🡪NR).**
* **MSD test points may be specified in table 7.3B.3.2-1 (LTE = aggressor) only if mirror the MSD test points are not specified in table 7.3B.3.2-2 (NR=aggressor).**

**For intra-band contiguous:*** **Only specify single UL REFSENS test point where NR is the aggressor and LTE the victim.**
 |
| [**R4-2111492**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111492.zip)MSD and real-world implications | T-Mobile USA, Deutsche Telekom, Verizon, CHTTL, AT&T, Dish Network | **Observation 1: The actual MSD can be 20 dB or more better than the MSD in the specs.****Observation 2: The network doesn’t know which UEs need the allowed MSD, and which UEs require little or no MSD.****Observation 3: If an operator decides to avoid using combinations with strong MSD, the result can be restrictive and potentially sub-optimal use of their spectrum resources.** **Observation 4: If a scheduler is designed to avoid MSD problems without knowing which UEs require the maximum MSD and which require little or no MSD, the resource allocations will also be sub-optimal.****Observation 5: 3GPP loses credibility when we warn about potential large MSD issues, and testing shows there to be no significant MSD.** **Proposal: RAN4 should discuss ways to introduce capability signalling to allow the network to know for a given combination if the UE needs the maximum MSD, or some alternative amount of MSD.**  |

## Open issues summary

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

### Sub-topic 5-1

*Sub-topic description:* Naming convention for intra-band contiguous NE-DC

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

**Issue 5-1:** Naming convention for intra-band contiguous NE-DC

* Proposals
* Option 1: Using DC\_x(n) AA to replace NE-DC with contiguous intra-band NR and LTE carriers.
* Option 2: Any alternative proposal
* Recommended WF
* Option 1: the proposal seems appropriate as it just swaps the (n)

### Sub-topic 5-2

*Sub-topic description:* MSD test points for single UL intra-band EN-DC REFSENS

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

**Issue 5-2:** MSD test points for single UL intra-band EN-DC REFSENS

* Proposals
* Option 1: Simplify MSD test point as proposed in [**R4-2111537**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111537.zip)
* Option 2: Any restriction – addition to the above
* Recommended WF
* Discuss proposal in [**R4-2111537**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111537.zip)in first round in view on a way forward

### Sub-topic 5-3

*Sub-topic description:* Options to support improved MSD for some UE

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

**Issue 5-3:** Options to support improved MSD for some UE

* Proposals
* Option 1: RAN4 to discuss how to introduce capability
* Option 2: Any restriction – addition to the above
* Recommended WF
	+ Discuss if improved MSD is feasible and in which amount, and if such capability should be introduced.

## Companies views’ collection for 1st round

### Open issues

Sub topic 5-1 Naming convention for intra-band contiguous NE-DC

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 5-1:Currently Option 2DC\_x(n) AA looks odd. For intra-band contiguous ENDC, DC\_(n)xAA is used, means band x(LTE band) + band nx (NR band), but it seems it can also be interprated as band nx (NR band) + band x(LTE band) for intra-band contiguous NEDC. (It is different with inter-band ENDC and NEDC.)So we would like to ask if there are problem/concern to reuse the DC\_(n)xAA notation for intra-band contiguous NEDC?Or alternative proposal: DC\_nx(x) AA.Others: |
| Huawei | Sub topic 5-1: Option 1DC\_x(n) AA representing NE-DC with contiguous intra-band NR and LTE carriers which just swaps the (n) comparing to (n)x\_AA representing EN-DC with contiguous intra-band LTE and NR carriers. We think it is the simplest and relative definition of NE-DC with contiguous intra-band NR and LTE carriers.To ZTE: As for DC\_(n)xAA，There will be a unclear description to reuse the DC\_(n)xAA notation for intra-band contiguous NEDC, because we can not make a difference between NE-DC with contiguous intra-band NR and LTE carriers and EN-DC with contiguous intra-band LTE and NR carriers when using DC\_(n)xAA. Although two kind of mode share the same RF parameters such as MSD , they are totally different mode in fact.As for DC\_nx(x)AA, it needs one more number than DC\_x(n) AA with the same result of distinguishing.As a result, we prefer simplest naming method as DC\_x(n) AA representing NE-DC with contiguous intra-band NR and LTE carriers. |
| Skyworks | We don’t have a strong view but Huawei proposal seems logical and unambiguous |
| CHTTL | Sub topic 5-1: Thanks Huawei for raising this issue. We also think the notation of intra-band contiguous EN-DC and NE-DC need to be differentiated to avoid confusion. How about an alternative: DC\_(N)xAA 🡨 the big N can potentially imply NR is the PCG. |
| ZTE | Maybe we can consider some other alternatives?DC\_((n))xAA or DC\_n(x)AA for the notation of intra-band contiguous NE-DC. |

Sub topic 5-2 MSD test points for single UL intra-band EN-DC REFSENS

|  |  |
| --- | --- |
| **Company** | **Comments** |
| T-Mobile USA | Sub topic 5-2:We support the proposals in R4-2111537Others: |
| Nokia | We support the proposals in R4-2111537, currently we have too many TPs which are also many times overly pessimistic |
| Skyworks | We would like to propose condensing P1 and P2 as:**Proposal** : For the selection of future REL-17 combinations or new BCS updates single UL REFSENS test points, adopt WF [R4-2105338] agreement with the following clarification:**Intra-band non-contiguous:** 1. For each distinct Uplink Aggressor CBW, specify only 1 pair of test points:
	* Test Point 1) Specify Wgap range for which the worst case (highest) MSD is reached. This corresponds to *the collision of the lowest victim’s CBW which experiences the greatest overlap with the lowest IMD order;*
	* Test Point 2) Specify Wgap range for which the best case (lowest) MSD is reached,
2. Handling of mirror cases:

2.1) For all mirror cases of table 7.3B.3.2-2 (NR=aggressor), do not specify the NR MSD test points in table 7.3B.3.2-1 (LTE = aggressor). A mirror case is a case where the CBW permutations are identical, the only change is a swap of Aggressor / Victim (LTE 🡨🡪NR).2.2) MSD test points may be specified in table 7.3B.3.2-1 (LTE = aggressor) only if the mirror MSD test points are not specified in table 7.3B.3.2-2 (NR=aggressor). **Intra-band contiguous:**1. For each distinct Uplink Aggressor CBW, only specify the worst-case (highest) MSD test point. This corresponds to *the collision of the lowest victim’s CBW which experiences the greatest overlap with the lowest IMD order;*
2. Test points for which MSD is less than 0.5 dB do not need to be specified.
3. Only specify single UL REFSENS test points where NR is the aggressor and LTE is the victim.

We have already applied guidelines #3,#4 and #5 to the selection of single uplink MSD test points for DC\_(n)71AA BCS 0,1,2 [R4-2107626]. |
| CHTTL | Sub topic 5-2:Sorry but so far we cannot agree on this. Currently the requirement for contiguous is based on MSD, but the requirement for non-contiguous is based on delta R IBNC, which is not based on the test point but based on how the reference relaxation will be on which condition, this approach is already used in LTE. So if lots of delta R IBNC is removed, we don’t know what the MSD is, or the MSD will be 0. As in the spec, it is stated that unless otherwise stated, delta R IBNC is 0. So we think this aspect also needs to be consider even the proposal is for newly Rel.17 combos.Also the parageaph for those requirements is only a few pages, not sure about the necessity of the optimization. |

Sub topic 5-3 Options to support improved MSD for some UE

|  |  |
| --- | --- |
| **Company** | **Comments** |
| AT&T | Sub topic 5-3:We agree with the moderator recommended WF.Others: |
| T-Mobile USA | Sub topic 5-3:RAN4 specifies MSD based on a flexible architecture that includes discrete RF and other assumptions that are often far exceeded in many implementations, to the point where some UEs require little if any MSD. It would be useful if there was a capability to allow operators to be able to determine which UEs will need close to the allowed MSD and which will require little if any MSD. This would allow us to avoid problematic configurations in UEs that would be most impacted by MSD.  |
| Qualcomm | Sub topic 5-3:Recommend WF.recognizing that this capability is not mandatory, the associated MSD should reflect what is possible from an excellent design as well as what is needed by the network. |
| Verizon | Sub topic 5-3The recommended WF from moderator is good. |
| Nokia | We support WF. One way is to used new BCS for improved MSD, this way no new signalling is needed. |
| Huawei | This topic has been discussed for several meetings in another thread [127]. We should avoid the duplicated discussion in this “not for block approval” thread. Many experts may not notice this topic. This thread is only for the specific band combination which is not for block approval. It is no surprise to see some UEs in the market perform better than the 3GPP minimum requirements. Typically high-end UEs are expected to perform better than low-end ones. As commented above, for combos that have up to 30 dB MSD in the current spec (e.g. due to IMD2), it’s very challenging to improve the MSD by 10 or 20 dB. Maybe only a small portion of UEs can achieve, which is not sufficient for an operator to deploy a network using those carrier frequency combinations. The economy of scale would be lost. The problem may be better solved by alternative frequency planning. |
| Skyworks | We support the WF as several considerations need to be FFS, for example how does the knowledge of a conducted test condition MSD may help bridge the gap to live network over the air “field” performance where factors such as, but not limited to, radio conditions and/or user interaction may dominate the conducted REFESENS performance. |
| Skyworks2 | We also need to clarify what is signalled: no MSD? 10dB less MSD? The MSD value? Or a second set of improved values in the spec vs actual? The ripple effect of such improvement may be huge for little gain: good UEs exist and they already appear so in the network if that improvement is maintained in radiated but also if the link is not interference limited. We do understand that it is important that the NW does not try to implement scheduler restrictions if these are not needed for all/most UEs. But with this in mind we may want to first look at large MSD cases and agree on what a better UE can do. Also if we start revisiting MSD everywhere it may become a real catch 22 issue: if REFSENS improvement is also discussed single band/CC case then we need to revisit MSDs that will automatically increase. Also we are discussing improved REFSEN for HPUE cases, how to reconcile? In order to agree to a new capability the scope, threshold should be first clearly identified and in our view requires a specific WI. |
| CHTTL | Sub topic 5-3:We support R4-2111492, we have same observation as in R4-2111492, and we support to consider the capability. |
| SoftBank | Sub topic 5-3:Support the WF. If the significant improvement of MSD is feasible, this capability might improve the system performance. Further discussion and study is much appreciated.  |
| DOCOMO | Sub topic 5-3:We support the moderator’s WF: Discuss if improved MSD is feasible and in which amount, and if such capability should be introduced. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#5-1** | *Tentative agreements:* Agreement that naming convention for NEDC intra-band contiguous is missing*Candidate options:*1. DC\_x(n) AA
2. ~~reuse the DC\_(n)xAA for NEDC~~
3. DC\_nx(x) AA
4. DC\_(N)xAA
5. DC\_((n))xAA
6. DC\_n(x)AA

*Recommendations for 2nd round:* discuss options 1/3/4/5/6 as there is a majority view that it should be distinctive from ENDC. Since this is non technical let’s try to not spend too much energy on this, and once reached, ask the agreement to be captured in chairman’s note or a way forward |

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#5-2** | The proposed approach seems mostly supported but some disagreement related to how to understand missing test point*Tentative agreements:**Candidate options:**Recommendations for 2nd round:* further discuss to reconcile positions with DC\_(n)71AA BCS0/1/2 as example in WF on DC\_(n)71AA single UL and address CHTTL concerns. |

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#5-3** | Most companies support the moderator suggestion to discuss if improved MSD is feasible and in which amount, and if such capability should be introduced, but similar discussion is happening in [127] and it is indeed questionable if this kind of discussion belongs to this AI*Tentative agreements:**Candidate options:**Recommendations for 2nd round:* Moderator will seek guidance from chair as to continue discussion here with WF or in [127] with a wider scope than PC2 => moved to [127] |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

### Sub-topic 5-1

*Sub-topic description:* Naming convention for intra-band contiguous NE-DC

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

**Issue 5-1:** Naming convention for intra-band contiguous NE-DC

* Proposals options
* DC\_x(n) AA
* ~~reuse the DC\_(n)xAA for NEDC~~
* DC\_nx(x) AA
* DC\_(N)xAA
* DC\_((n))xAA
* DC\_n(x)AA
* Recommended WF
* Chose one naming (if possible an easy translation from ENDC)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Issue 5-1: prefer Option 1 DC\_x(n) AAAs for proposal options, comments are as bellows:* DC\_nx(x) AA : one more x
* DC\_(N)xAA : it may bring another confusion when implement in product because some product have case-insensitive which is words can not differ in meaning based on differing use of uppercase and lowercase letters. Words with capital letters do sometimes have the same meaning when written with lowercase letters.
* DC\_((n))xAA : one more pair of brackets
* DC\_n(x)AA : seems also OK as candicate

Agree with moderator that this is non technical we would better try to not spend too much energy on this, and once reached.  |
| Skyworks | Issue 5-1: Option 1 DC\_x(n) AA is good and acceptable |

# Topic #6: NR-U intra-band UL CA

*Main technical topic overview.*

Requirements needed for the introduction of NR-U contiguous UL CA

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111253**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111253.zip) Introducing NR-U Intra-band UL CA UE RF requirements | Qualcomm Incorporated | **Proposal 1: Adopt the spectrum emission mask (SEM) requirements in Table 1 for NR-U intra-band UL CA.****Proposal 2: Adopt the Adjacent channel leakage ratio (ACLR) requirements in Table 2 for NR-U intra-band UL CA.****Proposal 3: Adopt the General Spurious emissions requirements in clause 6.5.3.1 from** **Appendix for NR-U intra-band UL CA.** |

## Open issues summary

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

### Sub-topic 6-1:

*Sub-topic description:* NR-U contiguous UL CA SEM mask

**Table [1]: General NR-U CA spectrum emission mask**

|  |  |  |
| --- | --- | --- |
| ΔfOOB(MHz) | Spectrum emission limit (dBr) | Measurement bandwidth |
| ± 0 - 1  | $$-20 \left|∆f\_{OOB}\right|$$ | [100kHz]3 |
| ± 1 - 5  | NOTE 1 | 1 MHz |
| ± 5 - BWChannel\_CA | NOTE 2 | 1 MHz |
| ± BWChannel\_CA – (BWChannel\_CA +5) | -40 | 1 MHz |
| NOTE 1: Given as: $-20-\left(^{8}/\_{A}\right) \left|∆f\_{OOB}-1\right|$ where $A= \left(^{BWChannel\\_CA}/\_{2}\right)-1$NOTE 2: Given as: $-16-\left(^{12}/\_{B}\right) \left|∆f\_{OOB}\right|$ where $B= \left(^{BWChannel\\_CA}/\_{2}\right)$NOTE 3: The measured value shall be scaled by a factor equal to the ratio of the reference bandwidth (1 MHz) to the measurement bandwidth before the emission limit (dBr) is applied. |

Moderator input: This seems applicable to cases where all sub-band have passed LBT but not for partially successful LBT

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

**Issue 6-1:** NR-U intra-band UL CA SEM

* Proposals
* Option 1: Agree on above table for SEM requirement
* Option 2: Clarify if applicable to wideband operation with failed LBT sub-bands
* Recommended WF
* Discuss applicability to wideband operation with

### Sub-topic 6-2

*Sub-topic description:* ACLR for NRU contiguous ULCA

**Table [2]: General requirements for intra-band contiguous NR-U CA ACLR**

|  |  |
| --- | --- |
|  | **ACLR / Measurement bandwidth** |
| CA ACLR | 27 dB |
| CA Measurement bandwidth (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA / - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1-1(see Appendix), respectively. |

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

**Issue 6-2:** NR-U UL CA ACLR

* Proposals
* Option 1: Agree on above table for ACLR requirement
* Option 2: Any restriction – addition to the above
* Recommended WF
* Option 1

### Sub-topic 6-3

*Sub-topic description:* Spurious emissions for NR-U contiguous UL CA

Table [3]: Boundary between out of band and spurious emission domain for intra-band contiguous carrier aggregation

|  |  |
| --- | --- |
| Aggregated Channel bandwidth | OOB boundary FOOB (MHz)  |
| BWChannel\_CA | BWChannel\_CA + 5 |

**Table [4]: Requirement for general spurious emissions limits for NR-U CA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **Maximum Level** | **Measurement bandwidth** | **NOTE** |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHzNOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHzNOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in clause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled.NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in clause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled. |

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

**Issue 6-3:** NR-U UL CA spurious emissions

* Proposals
* Option 1: Agree on above tables for Spurious emission requirement
* Option 2: Any restriction – addition to the above
* Recommended WF
* Option 1

## Companies views’ collection for 1st round

### Open issues

Sub topic 6-1 NR-U contiguous UL CA SEM mask

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | Sub topic 6-1: SEM in our view the proposed SEM mask only works for fully allocated Sub-bands for wideband operation. if only partially allocated the wideband operation mask should apply per CC. ON way out of this is to only consider cases where the allocated sub-band are contiguous within the two CCs which is consistent with the approach taken for wideband operation in UL. but we are not sure this can be done in TEI or should it be part of FR1 enh WIOthers |
| CHTTL | Would like to know whether this is in the scope of the basket WI? |

Sub topic 6-2 ACLR for NRU contiguous ULCA

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXXSkyworks | Sub topic 6-2: ACLR Option 1 but we are not sure this can be done in TEI or should it be part of FR1 enh WIOthers: |
| CHTTL | Would like to know whether this is in the scope of the basket WI? |

 Sub topic 6-3 NR-U UL CA spurious emissions

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | Sub topic 6-3: Spurious emissions Option 1 but we are not sure this can be done in TEI or should it be part of FR1 enh WIOthers: |
| CHTTL | Would like to know whether this is in the scope of the basket WI? |

## 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.*

It may be questionable that such NR-U general requirements are discussed in the scope of this AI and moderator will seek chair guidance on whether this discussion can continue and how. Note that proponent has not provided any responses or comments. For the sake of progress moderator will still capture the status below. => Chair guidance is to continue discussion in this AI for this meeting but need another WI for later meetings

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#6-1** | Proposed SEM Mask does not seem to support partially scheduled or failed sub-bands for wideband operation *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* need to provide complete SEM mask incl wideband operation in WF on introduction of NR-U ULCA requirements |

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#6-2** | Proposed ACLR seems agreeable*Tentative agreements:**Candidate options:**Recommendations for 2nd round:* capture in WF on introduction of NR-U ULCA requirements |

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#6-3** | Proposed spurious emissions seems agreeable*Tentative agreements:**Candidate options:**Recommendations for 2nd round:* capture in WF on introduction of NR-U ULCA requirements |

## Discussion on 2nd round (if applicable)

### Comments on WF

*To capture comments on way forward but can be commented in responses to the email providing link to draft way forward*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| WF on introduction of NR-U ULCA requirements | Company A Skyworks WF is OK but SEM mask for partial Sub-bands but this need to find a proper WI for wider discussion in RAN4 |
| Company B |
| Company C |

# Topic #7: Way of working for combinations not for block approval

*Main technical topic overview.*

Discussions on way of working between AI “not for block approval” and NR block approval moderators and band combination rapporteurs for contributions, draft CRs and TP to TR.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111481**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111481.zip)Way of working for combination not for block approval | Skyworks Solutions Inc. | Observation: First all the combinations not for block approval or not allowed in R17 are only related to:* Intra-band CA or DC (intra-band UL related MSD or band protection)
* 2 band inter-band CA or DC (intra-band UL CA IMD related MSD, LB-LB cases)
* 3 band inter-band CA or DC (intra-band UL CA triple beat related MSD, LB-LB-LB cases)
* Any case where simultaneous Tx/RX is not supported can still be in block approval
* Band combinations with >3 band are in block approval

**Proposal on draft CRs and TP to TR: The “not for block approval” is allowed to allocate and approve draft CRs and TP to TRs for inclusion in the related big CRs and TRs by the associated rapporteurs.****In order to “clean-up” the current situation, we propose to discuss the following way of working with band combination WI rapporteurs, moderators of block approval and the chair as required:*** **The “not for block approval” AI will provide the CRs to 38.101-1 and 38.101-3 specification to remove combinations that are not allowed for release 17**
* **The “not for block approval” AI will provide a list of 38.101-1 and 38.101-3 combinations that can be considered as complete as they do not need a MSD requirement**
* **The “not for block approval” AI will provide a draft CRs and TP to TRs to cover most of the backlog based on available contributions and identify the completeness status for the related rapporteurs.**
* **The rapporteur of concern must remove the not allowed in release 17 cases from the WI and the request sheets and provide feedback to the proponents. He/She should also refuse any request of such combinations**
* **From the request, and in the WI, it should be clarified by the proponent or the rapporteur when a combination is not for block approval**
* **The rapporteur of concern will include in its big CR or TR the draft CRs and TPs to TR that are approved within the “not for block approval AI**
* **The moderators for the block approval AIs should identify the contributions that belongs to the not for block approval AI and they should be moved to that AI and corresponding thread in the chairman report. They are also allowed to move other types of contributions if detailed discussion with experts is seen as beneficial.**
 |

## Open issues summary

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

### Sub-topic 7-1

*Sub-topic description:* Proposal on draft CRs and TP to TR

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

**Issue 7-1:** Proposal on draft CRs and TP to TR

* Proposals
* Option 1: The “not for block approval” is allowed to allocate and approve draft CRs and TP to TRs for inclusion in the related big CRs and TRs by the associated rapporteurs.
* Option 2: Any restriction – addition to the above
* Recommended WF
* Option 1: with agreed timelines for providing the list of agreed documents to each rapporteurs

### Sub-topic 7-2

*Sub-topic description:* Way of working for “not for block approval” AI

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

**Issue 7-2:** way of working with rapporteurs and moderators for band combinations

* Proposals

Option 1: In order to “clean-up” the current situation, we propose to discuss the following way of working with band combination WI rapporteurs, moderators of block approval and the chair as required:

* The “not for block approval” AI will provide the CRs to 38.101-1 and 38.101-3 specification to remove combinations that are not allowed for release 17
* The “not for block approval” AI will provide a list of 38.101-1 and 38.101-3 combinations that can be considered as complete as they do not need a MSD requirement
* The “not for block approval” AI will provide a draft CRs and TP to TRs to cover most of the backlog based on available contributions and identify the completeness status for the related rapporteurs.
* The rapporteur of concern must remove the not allowed in release 17 cases from the WI and the request sheets and provide feedback to the proponents. He/She should also refuse any request of such combinations
* From the request, and in the WI, it should be clarified by the proponent or the rapporteur when a combination is not for block approval
* The rapporteur of concern will include in its big CR or TR the draft CRs and TPs to TR that are approved within the “not for block approval AI
* The moderators for the block approval AIs should identify the contributions that belongs to the not for block approval AI and they should be moved to that AI and corresponding thread in the chairman report. They are also allowed to move other types of contributions if detailed discussion with experts is seen as beneficial.

Option 2: Any restriction – addition to the above

* Recommended WF
	+ Open discussion with moderators, rapporteurs, chair on how to best enable documents approved within the “not for block approval” AI to be included in the specification

## Companies views’ collection for 1st round

### Open issues

Sub topic 7-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| AT&T | Sub topic 7-1: Proposal on draft CRs and TP to TRWe agree with the recommended WF of Option 1. |
| T-Mobile USA | Sub topic 7-1: Option 1 |
| ZTE | Sub topic 7-1: Option 1, Alsowe have one question for claification, are these TPs or draft CRs submitted under the associated basket WID agenda item? If not, rapporteur may filter out them. |
| Verizon | Sub topic 7-1: We agree moderator recommended WF. The Option 1 is fine for us too.  |
| Nokia | 7-1: Option 1 |
| CHTTL | Sub topic 7-1: Option 2 (to add some restriction)We think some restrictions might needed, for example: do not contain multiple basket in one draft CR.Also it will be good if the aggreable draft CR/TP can be moved to the corresponding basket agenda in the final report, so that rapporteurs will not miss them. |

Sub topic 7-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| AT&T | Sub topic 7-2: way of working with rapporteurs and moderators for band combinationsConcerning the line item below in quotes, how will the combinations be treated within the existing approved RAN4 WIs so that the associated discussion papers, TPs or draft CRs can be submitted for each meeting? It would seem odd to allow any combination to be submitted without some approval at RAN. Maybe it is better to leave the combinations in the basket WI but change the template to add a column to indicate if the combination is subject to the “not for block approval” AI.“• The rapporteur of concern must remove the not allowed in release 17 cases from the WI and the request sheets and provide feedback to the proponents. He/She should also refuse any request of such combinations” |
| ZTE | Not sure how to implement the following bullet in reality.* From the request, and in the WI, it should be clarified by the proponent or the rapporteur when a combination is not for block approval

Since we are not sure which agenda item do the proponent ask for their Tdoc. Also there is ‘not for block approval’ agenda item (i.e. AI 8.8 in this meeting), we suppose this AI should be for all of ‘not for block approval’ Tdoc when proponent ask for the Tdoc number. |
| Verizon | Sub topic 7-2: We agree moderator recommended WF. The Option 1 has provided a good way of working “not for block approval”, but it is still a good WF to have further open discussions.  |
| Nokia | In principle yes except added responsibilities to WI rapporteurs and moderators. Responsibility should be on proponents.* The rapporteur of concern must remove the not allowed in release 17 cases from the WI and the request sheets and provide feedback to the proponents. He/She should also refuse any request of such combinations

NOKIA: Rapporteurs could do this but the list needs to come somewhere else what to remove, or as AT&T suggested add a note* From the request, and in the WI, it should be clarified by the proponent or the rapporteur when a combination is not for block approval

NOKIA: Rapporteurs should not be responsible here* The moderators for the block approval AIs should identify the contributions that belongs to the not for block approval AI and they should be moved to that AI and corresponding thread in the chairman report. They are also allowed to move other types of contributions if detailed discussion with experts is seen as beneficial.

NOKIA: Rapporteurs can also do this but cannot be only person responsible for this. All in all proponents needs to take responsibility and for that they need crystal clear instruction, Note that WF is not good enough, it gets forgotten. We prefer TR (the one in [151] for example. |
| Huawei | Maybe most of companies are not clear which kinds of band combinations are not allowed in Rel-17 and which kind of band combinations are not for block approval in Rel-17. Rapporteur can’t filter so many requests. I think the best way is to clarify it in the WID generally. And which kinds of band combinations are not allowed in Rel-17 can be clarified in RAN plenary. |
| Skyworks | Some clarifications: as already said in the contribution this is mostly a list of aspects to be discussed for the WoW.To ATT for the removal of combinations or refuse requests. This is not trying to superceede any decision in RAN but at least if features are not supported it is abvious they cannot be part of block approval requestsTo ZTE: at least we have agreed a set of not for block approval combination types, so when the request is done/taken it should be clear that contributions are to be submitted to not for block approval AITo Nokia: * yes we should provide a list of not supported in R17 but essentially there are case with contiguous 3UL or 3 non contiguous UL with the 3CCs in 1 or two bands. Ie CA\_n1A-n77(2A) UL is not allowed. Note that the not for block approval aspects are mainly related to 3band in same range, or UL configurations.
* Indeed proponent should be in charge but rapporteurs should play a role in educating companies if possible.
* We agree that proponents need to take responsibility and hopefully after a while this wil be the case and/or we will be enough used to these cases that they are included in a TR.

To HW: we agree that based on current agreement of not for block approval cases we could update the WI to add the relevant cases “not for block approval” and “not allowed in R17” |
| CHTTL | Sub topic 7-2:It seems like the procedure is more complicated.• From the request, and in the WI, it should be clarified by the proponent or the rapporteur when a combination is not for block approval.🡪 we think this is not practical, as the proponent should only focus on what they need, and the fallback status when requesting and error can still occurs. Some further analysis might not be preferred to be done before requesting. So the simplest way is the proponents directly submit their TP to the “not for block approval” agenda.• The “not for block approval” AI will provide a list of 38.101-1 and 38.101-3 combinations that can be considered as complete as they do not need a MSD requirement.🡪 not sure what this bullet means, once the TP or draft CR with all the information needed, the combination can be added to the big CR for email approval, then the combination can consider complete.And in general, it’s not good to provide lots of list… might cause more checking errors in reality.• The “not for block approval” AI will provide a draft CRs and TP to TRs to cover most of the backlog based on available contributions and identify the completeness status for the related rapporteurs.🡪 sorry but I am not sure what this bullet means…but the completeness status should be provided by the proponent in terms of the status report before the plenary meeting.Regarding the rest of content, which are related to removing sime combinations, as this is a one-shot action, maybe there is no need to be the way of work. Probably you can directly propose which combos to be removed, and the group can discuss later on. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#7-1** | *Tentative agreements:* ProposalThe “not for block approval” is allowed to allocate and approve draft CRs and TP to TRs for inclusion in the related big CRs and TRs by the associated rapporteurs.agreeable with modification: 1. draft CRs or TP should not contain multiple basket
2. draft CR/TP should be moved to the corresponding basket agenda in the final report, so that rapporteurs will not miss them.

*Candidate options:**Recommendations for 2nd round:* agreement is captured in WF on “not for block approval” AI way of working |

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#7-2** | In general, further clarification is needed for proposals and proposals sorted between short term clean up actions and long term way of working aspects*Tentative agreements:**Candidate options:**Recommendations for 2nd round:* these aspect are further discussed in WF on “not for block approval” AI way of working |

## Discussion on 2nd round (if applicable)

### Comments on WF

*To capture comments on way forward but can be commented in responses to the email providing link to draft way forward*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| WF on “not for block approval” AI way of working | ZTE: we share some comments:1. Wording modification in the last bullet in slide 4
2. Suggest to remove the first bullet in slide 5
3. Question on include ‘and “not for block approval” relevant cases’ in the WID in slide 6.

It can also be found at: https://www.3gpp.org/ftp/tsg\_ran/WG4\_Radio/TSGR4\_99-e/Inbox/Drafts/%5B99-e%5D%5B116%5D%20NR\_Baskets\_Part\_1/Round%202/draft%20WF%20on%20%E2%80%9Cnot%20for%20block%20approval%E2%80%9D%20AI%20way%20of%20working\_ZTE.pptx |
| Company B Skyworks: I believe I’ve covered most of your comments |
| Company C |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on MSD due to IMD of intra-band UL CA UL configurations | Skyworks, Qualcomm | WF merging R4-2107625 and R4-2111016 will be discussed in Rd2 |
| WF on MSD due to triple beat of intra-band UL CA UL + FDD UL configurations | Qualcomm, Skyworks | WF using R4-2107627 input to introduce triple beat MSD in 38.101-3 and 38.101-1 |
| WF on architecture and device type for DC\_8A-20A\_n28A | Huawei, HiSilicon, Qualcomm | WF on architecture options and links to UE form factor for feasibility |
| WF on DC\_(n)71AA single UL | Skyworks, MediaTek | WF on MSD test points and values for DC\_(n)71AA 1UL and rules for similar MSD. |
| WF on “not for block approval” AI way of working | Skyworks | Capturing agreements on the scope, WoW with basket rapporteurs and block approval moderators |
| WF on introduction of NR-U ULCA requirements | Qualcomm | Chair guideline is to continue discussion in this AI for this meeting |
| ~~WF on MSD capability~~ moved to [127] | T-Mobile US | Chair guideline: * Combine the discussions for MSD improving in 2nd round and further discuss them under [127]
* Proponents are suggested to consider how to treat this topic in future meeting, because we seems have no corresponding WID with very clear objective for this topic. The scope for MSD improving is not small.
* T-Mobile USA can lead the WF discussion under [127], and I will assign the Tdoc for T-Mobile USA.
 |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| [**R4-2111476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111476.zip) |  | Qualcomm Incorporated | Revised to R4-2107625, no action |  |
| R4-2107625  | Revision of R4-2111476 MSD due to IMD from ULCA | Qualcomm Incorporated | Noted | WF on MSD due to IMD merging R4-2107625 and R4-2111016 will be discussed in Rd2 |
| [**R4-2111016**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111016.zip) | MSD Due to NR Intra-band ULCA IMD within Inter-band Combinations | Skyworks Solutions Inc. | Noted | WF on MSD due to IMD merging R4-2107625 and R4-2111016 will be discussed in Rd2 |
| [**R4-2108930**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108930.zip) | MSD analysis for n77(2A) UL cases | Nokia, Skyworks Solutions Inc. | Noted | Will used averaged value with R4-2107625 for n2-n77(2A) |
| [**R4-2108931**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108931.zip) | draft CR to 38.101-1: CA\_n5A-n77(2A) introduction of UL CA\_n77(2A) | Nokia, AT&T | Agreeable | No MSD for CA\_n77(2A) UL configuration with n5 |
| [**R4-2108932**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108932.zip) | draft CR to 38.101-1: CA\_n2-n77 | Nokia, Skyworks Solutions Inc., AT&T | To be revised  | Update MSD due to IMD with average with R4-2107625: 2.7dB |
| [**R4-2111475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111475.zip) | Triple beat and 3ULCC MSD | Qualcomm Incorporated | Revised to R4-2107627, no action |  |
| **R4-2107627**  | Revision of [**R4-2111475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111475.zip)Triple beat and 3ULCC MSD | Qualcomm Incorporated | Noted  | Will be used as a basis for WF on MSD due to triple beat.. |
| [**R4-2109262**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109262.zip) | CR for Pcmax - NR-DC for DC cat. A-B combinations | InterDigital Communications | Seems agreeable as it had no comment, but will leave open for comment in Rd2 |  |
| [**R4-2108861**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108861.zip)  | Draft CR on CA\_n1-n3, CA\_n1-n78, CA\_n3-n78 | China Unicom, ZTE | Revised in [118] without the CA\_n3-n78, no action  | The CA\_n3\_n78(2A) UL configuration is discussed as one example of triple beat |
| [**R4-2111478**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111478.zip)  | LB\_LB\_MB MSD and LB\_LB\_LB Feasibility | Qualcomm Incorporated | Noted |  |
| [**R4-2110243**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110243.zip) | TP for TR 37.717-21-11: DC\_8A-20A\_n28A | Huawei, HiSilicon | Noted | Basis for WF on architecture and device type for DC\_8A-20A\_n28A |
| [Rev. 4 of R4-2110701](https://urldefense.proofpoint.com/v2/url?u=ftp-3A__ftp.3gpp.org_tsg-5Fran_WG4-5FRadio_TSGR4-5F99-2De_Inbox_Drafts_-5B99-2De-5D-5B116-5D-2520NR-5FBaskets-5FPart-5F1_Round-25201_Rev.-25204-2520of-2520R4-2D2110701-2520TP-2520to-2520TR-252038.717-2D02-2D01-2520Addition-2520of-2520CA-5Fn5A-2Dn14A.docx&d=DwMFAg&c=VYRDWu-sKuQrybEAJ2u-dYX_FK6X1lTrDf-PKXUa2P4&r=pRthG0xxDB77vg4aSNBQn5JOtJLs0OZjgw-oylT0McI&m=n4IuTVOj1sDT8nEBTdvkEnhu4OOnT7qM-qVeLzHeqhs&s=x6fW5Kd485B_CXLNEp-rT5h0s-J6r0otLgSstECUOZU&e=)  | TP to TR 38.717-02-01 Addition of CA\_n5A-n14A | Nokia, AT&T | To be further revised for approval in Rd2, no action  | To be revised with MSD table provided by mediatek |
| [DRAFT Rev 2 of R4-2109399](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.3gpp.org_ftp_tsg-5Fran_WG4-5FRadio_TSGR4-5F99-2De_Inbox_Drafts_-255B99-2De-255D-255B116-255D-2520NR-5FBaskets-5FPart-5F1_Round-25201_DRAFT-2520Rev-25202-2520of-2520R4-2D2109399-2520TP-2520to-2520TR-252038.717-2D02-2D01-2520Addition-2520of-2520CA-5Fn5A-2Dn12A.docx&d=DwMFAw&c=VYRDWu-sKuQrybEAJ2u-dYX_FK6X1lTrDf-PKXUa2P4&r=pRthG0xxDB77vg4aSNBQn5JOtJLs0OZjgw-oylT0McI&m=JY7CySn_1CuyNeaMs4k7EbMQLlq4jtz_Z2GFFpCK2J0&s=HNb0F9Mxmpb62B0OyF1pr9ekJQc_BsVf1iyb4dl1NME&e=)  | TP to TR 38.717-02-01 Addition of CA\_n5A-n12A | Nokia, AT&T | Agreeable |  |
| [**R4-2110158**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110158.zip)  | MSD test points for US EN-DC combinations with n77 | Apple | Noted |  |
| [**R4-2110159**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110159.zip)  | CR for TS 38.101-3: MSD test configurations modifications for US EN-DC combinations with Band n77 | Apple | Needs to be revised | Should be revised to account for comments and further discussion on removed cases and potential changes in spectrum allocation |
| [**R4-2109630**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109630.zip)  | MSD for DC\_(n)71AA BCS2 | MediaTek Inc. | Noted | Basis to WF on DC\_(n)71AA single UL |
| [**R4-2111534**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111534.zip)  | Single Uplink REFSENS for DC\_(n)71AA | Skyworks Solutions Inc. | Revised into R4-2107626, no action |  |
| R4-2107626 | revision of R4-2111534 Single Uplink REFSENS for DC\_(n)71AA | Skyworks Solutions Inc. | Noted | Basis to WF on DC\_(n)71AA single UL |
| [**R4-2111487**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111487.zip)  | Impact on TS 38.101-3 due to the introduction of BCS2 for DC\_(n)71AA | T-Mobile USA, Skyworks Solutions | Noted | Agreed  |
| [**R4-2111488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111488.zip)  | Draft CR for 38.101-3: Introduction of DC\_(n)71AA\_BCS2 | T-Mobile USA, Skyworks Solutions | Needs to be revised | Need to add MSD values and test points as agreed in WF on DC\_(n)71AA single UL  |
| [**R4-2110080**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110080.zip)  | discussion on the rules of NE-DC with contiguous intra-band NR and LTE carriers | Huawei,HiSilicon | Noted | Not sure it needs a way forward as only a few simple naming options can be discussed and agreed in Rd2, then agreement can be captured in chairman’s notes  |
| [**R4-2111537**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111537.zip) | Intra-Band Single Uplink REFSENS Simplification | Skyworks Solutions Inc. | Noted | Agreeable rules can be captured in WF on DC\_(n)71AA single UL |
| [**R4-2111492**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111492.zip) | MSD and real-world implications | T-Mobile USA, Deutsche Telekom, Verizon, CHTTL, AT&T, Dish Network | Noted | Similar discussion **on better MSD capability** happening in [127], not really in the scope of this basket related thread [116]. Suggest that discussion continues in [127]. If chair thinks this topic is better to handle here a WF on MSD capability can be assigned to T-Mobile USA. The scope is also larger than just PC2 like in [127] |
| [**R4-2111253**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111253.zip)  | Introducing NR-U Intra-band UL CA UE RF requirements | Qualcomm Incorporated | Noted, **no participation from proponent in the discussion. Difficult to handle as is.** | Need Guidance from chair, this is not the scope of basket (thus should not be [116] either) as it **defines requirements for NRU ULCA**. If chair thinks this topic can be handled here we could have a WF on introduction of NR-U ULCA requirements could be assigned to Qualcomm but this topic should find a proper AI to continue |
| [**R4-2111481**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111481.zip) | Way of working for combination not for block approval | Skyworks Solutions Inc. | Noted | Capture agreeable part in WF |

Notes:

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

## 2nd round

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

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