**3GPP TSG-RAN WG4 Meeting #98-e R4-20XXXX**

**Electronic Meeting, Jan .25 – Feb. 5, 2020**

**Agenda item:** 12.2.1

**Source:** Huawei, HiSilicon

**Title:** Email discussion summary for RAN4#98\_#135\_NR\_RF\_FR1\_enh\_Part\_1

**Document for:** Information

# Introduction

This part includes contributions in agenda 12.2.1, 12.2.2.1 and 12.2.2.4.

Classify the contents into 3 topics:

1. Topic #1: Work Plan
2. Topic #2: UL MIMO configuration for SUL band configurations as in 12.2.2.1
3. Topic #3: intra-band contiguous UL CA for FR1 power class 2 which is for agenda 12.2.2.4
4. Topic #4: 4\*4 DL MIMO for CA\_n77(3A) and CA\_n77(4A)

Candidate target of email discussion are as below:

* 1st round:
	+ Make agreement on work plan
	+ Reach consensus on enabling UL MIMO configuration for SUL
	+ Reach consensus on intra-band contiguous UL CA PC2
	+ Reach consensus on 4\*4 DL MIMO for CA\_n77(3A) and CA\_n77(4A)
* 2nd round:
	+ Approve on the CR for enabling UL MIMO configuration for SUL
	+ Approve on the WF for intra-band contiguous UL CA HPUE
	+ Approve on WF for 4\*4 DL MIMO for CA\_n77(3A) and CA\_n77(4A)

#  Topic #1: Work plan for Rel-17 FR1 UE RF enhancement

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102627 | Huawei, HiSilicon | This paper provides additional Work Plan on Rel-17 FR1 UE RF enhancement according to the time budget agreed in RAN#90 meeting. |

## Open issues summary

### Sub-topic 1-1 Work plan for Rel-17 FR1 UE RF enhancement

**Issue 1-1: Work plan**

* **Proposals:**
	+ **Agree on the work plan in R4-2102627**
* **Recommended WF**
	+ TBA

## Companies views’ collection for 1st round

### Open issues

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| **Sub-topic** | **Comments: (Company: …)** |
| 1-1 |  |
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### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
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## Summary for 1st round

### Open issues

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

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| Sub-topic#1 | *Recommendations for 2nd round:* |
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*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
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### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round (if applicable)

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| --- | --- | --- |
| T-doc number | Title | Comments |
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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **Title** | **T-doc Status update recommendation** |
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# Topic #2: UL MIMO configuration for SUL band configurations

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100799 | CMCC | In RAN4#97E meeting, the draft CR: Introduce NR SUL bands n80 to UL-MIMO configuration (R4-2014735) was endorsed. This is an official CR to introduce SUL bands n80 to UL-MIMO configuration.1. Section 5.2D: Introduce band n80 in the table of NR operating bands for UL-MIMO in Table 5.2D-1.
2. Section 6.2D: Introduce band n80 in UL MIMO configuration in Table 6.2D.1-1
3. Section 5.2C: Remove Note 3 for SUL band combination in Table 5.2C-1 and Table 5.2C-2 (For UE supporting SUL band combination, UL MIMO is not configured on SUL carrier)
 |
| R4-2101854 | ZTE | Change Note 1 in Table 5.3C-1/2/3/4:NOTE 1: If a UE is configured with both NR UL and NR SUL carriers without enabling UL-MIMO in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us. |
| R4-2101855 | ZTE | Observation: 0µs switching time is not feasible with the UL-MIMO enabled for SULProposal: Revise Note 1 in Table 5.2C-1, 5.2C-2, 5.2C-3 and 5.2C-4 in TS 38.101-1 as:If a UE is configured with both NR UL and NR SUL carriers without enabling UL-MIMO in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us. |

## Open issues summary

### Sub-topic 2-1: 0µs switching time between SUL and NUL

**Issue 2-1-1: Whether 0µs switching time is feasible between SUL and NUL when SUL is MIMO enabled?**

* Proposals
	+ Not feasible
* Recommended WF
	+ **TBA**

**Issue 2-1-2: Note 1 Table 5.2C-1, 5.2C-2, 5.2C-3 and 5.2C-4 in TS 38.101-1**

* Proposals
	+ Option 1: change Note1 as in R4-2101854
	+ Option 2: No need to change the current contents of Note1
* Recommended WF
	+ **TBA**

## Companies views’ collection for 1st round

### Open issues

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| **Sub-topic** | **Comments: (Company: …)** |
| 2-1 | **Issue 2-1-1:** |
| **Issue 2-1-2** |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2100799 | Title: CR on introducing NR SUL bands n80 to UL-MIMO configuration |
|  |
| R4-2101854 | Title: Draft CR to TS 38.101-1 on switching time between SUL and NUL |
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## Summary for 1st round

### Open issues

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

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| **Sub-topic** | **Status summary**  |
| 2-1 |  |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
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### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round (if applicable)

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| T-doc number | Title | Comments |
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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| T-doc number | Title | **T-doc Status update recommendation** |
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# Topic #3: PC2 intra-band contiguous UL CA

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100544 | Skyworks | **Proposal 1 on HPUE architecture for class B/C contiguous UL CA:*** **A single TX with 200MHz PC2 PA (option1) is the baseline to develop MPR and A-MPR requirements**
* **Two 100MHz PC2 PA (option 2) may reuse the same MPR values as already the case for PC3 but it should be verified why the worst case 2xPC3 PA 1RB+1RB MPR for non-contiguous UL CA is worse that the 1xPC3 PA related class C PA.**
* **Additional requirement for two PC3 PAs architecture is FFS once single CC related requirements are finalized, potentially using a delta MPR compared to the option 1 baseline**

**Proposal 2 on contiguous allocations PC2 class C UL CA MPR:*** **Contiguous allocation PC3 class C QPSK MPR is adopted for PC2 class C MPR**
* **If specified, Class B PC2 MPR needs further evaluation**

**Proposal 3 on contiguous allocations NS04 PC2 class C A-MPR:*** **NS04 A-MPR = MPR for outer class C PC2**
* **NS04 A-MPR = MPR+0.5dB for inner class C PC2 when RBstart ≤ 0.33\*BWchannel\_CA/0.18MHz**
* **NS04 A-MPR = MPR for inner class C PC2 when RBstart > 0.33\*BWchannel\_CA/0.18MHz**

**Proposal 4 on non-contiguous allocations MPR:*** **PC3 QPSK MPR is adopted for PC2 (1Tx) with additional back-off as in Table 6.2A.2.1-3 below (yellow highlight)**

Table 6.2A.2.1-3: non-contiguous RB allocation for Power Class 2

|  |  |  |
| --- | --- | --- |
| Modulation | MPR for bandwidth class B(dB) | MPR for bandwidth class C(dB) |
| inner | Outer11 | Outer22 | inner | Outer11 | Outer22 |
| DFT-s-OFDM | Pi/2 BPSK | 3 | 6.5 | 13 | 3 | 6.5 | 13 |
| QPSK | 3 | 6.5 | 3 | 6.5 |
| 16QAM | 3 | 6.5 | 3 | 6.5 |
| 64QAM | 4.5 | 6.5 | 5 | 6.5 |
| 256QAM | 6 | 6.5 | 6.5 | 6.5 |
| CP-OFDM | QPSK | 3 | 6.5 | 14 | 3.5 | 7 | 14 |
| 16QAM | 3 | 7 | 3.5 | 7 |
| 64QAM | 5 | 7 | 5 | 7 |
| 256QAM | 7.5 | 7.5 | 7.5 | 7.5 |
| NOTE 1: Outer 1 MPR for Pi/2 BPSK and QPSK is reduced by 2dB for aggregated allocation bandwidth > 10MHz NOTE 2: Outer 2 MPR is reduced by 4.5dB for aggregated allocation bandwidth > 10MHz |

**Proposal 5 on non-contiguous allocations NS04 A-MPR:*** **For channels and allocations where IM3 is within the -13dBm/MHz NS04 region, the PC2 MPR is sufficient**
* **PC2 (1Tx) NS04 A-MPR for outer 1 and outer 2 with IM3 in -25dBm/MHz region is 15.5 for B<2.16**
* **All SEM limited allocations will see the back-off increase for PC2 vs PC3 but ACLR limited region will stay the same thus the following AMPR curve are proposed: AMPRIM3 to meet -25dBm/MHz**

**MA = 15.5; 0 ≤ B < 2.16** **14; 2.16 ≤ B < 3.24****13; 3.24 ≤ B < 5.04****11.5; 5.04 ≤ B < 10.08** **10; 10.08 ≤ B < 16.56** **8; 16.56 ≤ B < 21.96****6; 21.96 ≤ B** |
| R4-2101103 | Xiaomi | **Proposal 1: 2PA with PC3 shall be considered as reference for defining MPR requirements. Whether other set of MPR requirements are needed depends on the how much difference compared to 2PA with PC3 case.****Proposal 2: the mechanism for single carrier for PC2 to meet SAR requirments can be reused for high power UE intra-band contiguous CA.** |
| R4-2101160 | Qualcomm | **Observation 1**: Emissions are higher at FOOB edge of CA BW due to minimum CA guard band. Additional MPR is required due to added WOLA. Added MPR is only required for CA BW class B. Enough outer MPR for CA BW class C exists.**Proposal 1**: Increase MPR to 5.5dB for CA edge RB allocations for PC2 as shown in Table 2.1-1. The edge RB allocation is <= 2RBs.**Proposal 2**: Consolidate inner and outer 1 MPR for non-contiguous allocations for PC2 for CA BW class B. Increase inner and outer1 MPR for CA BW class C as shown in Table 2.2-1.**Proposal 3**: Use PC2 AMPR for CA\_NS\_04 for contiguous allocations as shown in table 2.3-1 when Fedge, low - BWChannel\_CA < 2490.5 MHz.**Proposal 4:** For PC2, when Fedge, low - BWChannel\_CA ≥ 2490.5 MHz, the AMPR = MPR for inner and outer 1 allocation, and AMPR= MPR – 1 for outer 2 allocations, else when Fedge, low - BWChannel\_CA < 2490.5 MHz AMPR = A-MPRIM3 defined in Clause 6.2A.3.1.2.2.1 of 38.101-1, where AMPRIM3=MA, Where MA is defined as follows for both power class 3 and power class 2MA = 13; 0 ≤ B < 2.16 11.5; 2.16 ≤ B < 3.2410.5; 3.24 ≤ B < 5.049.5; 5.04 ≤ B < 10.08 8; 10.08 ≤ B < 16.56 7; 16.56 ≤ B < 21.96 6; 21.96 ≤ B |
| R4-2101755 | OPPO | Observation 1: Option2 (two 100MHz PC2 PAs) is better than Option3 (two 200MHz PC3 PA) from power consumption perspective without UL MIMO.Observation 2: Option2 (two 100MHz PC2 PAs) cannot achieve UL MIMO and UL CA simultaneously due to transceiver limitation.Proposal 1: From future proof perspective, propose to down select Option2 (two 100MHz PC2 PAs) to simplify the discussion.Proposal 2: Keep both Option1 (one 200MHz PC2 PA) and Option3 (two 200MHz PC3 PA) in this WI.Observation 3: “dualPA-Architecture” capability was defined in Rel-15 to distinguish UEs with one PA or two PA architecture, and maybe it can be reused here to distinguish Option1 and Option3 UE architectures.Proposal 3: Signaling like “dualPA-Architecture” capability can be considered to distinguish Option 1 and Option3 UE architectures and corresponding requirements.Observation 4: Optional features are defined and tested separately in RAN4/RAN5 and no combined requirements were defined in the past.Observation 5: UL MIMO+UL CA HPUE is out of this WI scope.Proposal 4: Do not define UL MIMO+UL CA HPUE requirements in this Rel-17 WI. |
| R4-2102184 | ZTE | Proposal 1. For 2PA architecture, the emission requirement is defined as the sum from both UE transmit antenna connectors.Proposal 2. No need to defined 2 sets of RF requirements.Proposal 3. A single TX PC2 PA 200MHz 1LO is the baseline to develop requirement. |
| R4-2102657 | Huawei | Observation 1: transparent TxD is enabled for UE configured with single SRS port(DCI0\_0 or DCI0\_1), and the emission requirements are defined based on the sum of the emissions from both UE transmit antenna connector.Observation 2: From current RAN1 and RAN2 spec, full power transmission is used for both single carrier and CA. It means transparent TxD is enabled for intra-band UL CA.Proposal 1: For intra-band contiguous UL CA declared with 2PA architecture, emission requirements should be defined based on the sum of the emissions from both UE transmit antenna connector.Proposal 2: Take “PC2 UL CA with one 26dBm PA 200MHz 1LO” as the reference RF architecture to define requirements, other architectures are not precluded. |

## Open issues summary

### Sub-topic 3-1 RF architecture

**Issue 3-1-1: RF architecture baseline**

* Proposals
	+ Option 1:
		- A single TX PC2 PA is the baseline to develop MPR and A-MPR requirement;
		- Two 100MHz PC2 PA (option 2) may reuse the same MPR values as already the case for PC3 but it should be verified why the worst case 2xPC3 PA 1RB+1RB MPR for non-contiguous UL CA is worse that the 1xPC3 PA related class C PA
		- Additional requirement for two PC3 PAs architecture is FFS once single CC related requirements are finalized, potentially using a delta MPR compared to the option 1 baseline
	+ Option 2: Take “PC2 UL CA with one 26dBm PA 200MHz 1LO” as the reference RF architecture to define requirements, other architectures are not precluded. No need to defined 2 sets of RF requirements.
	+ Option 3: 2PA with PC3 shall be considered as reference for defining MPR requirements. Whether other set of MPR requirements are needed depends on the how much difference compared to 2PA with PC3 case.
	+ Option 4: down select Option2 (two 100MHz PC2 PAs) to simplify the discussion.

Keep both Option1 (one 200MHz PC2 PA) and Option3 (two 200MHz PC3 PA) in this WI.

* Recommended WF
	+ TBA

**Issue 3-1-2: signalling on RF architecture**

* Proposals
	+ Signaling like “dualPA-Architecture” capability can be considered to distinguish Option 1(one 200MHz PC2 PA) and Option3(two 200MHz PC3 PA) UE architectures and corresponding requirements.
* Recommended WF
	+ TBA

### Sub-topic 3-2 RF requirements

**Issue 3-2-1: MPR for contiguous allocation**

* Proposals
	+ Option 1: Contiguous allocation PC3 class C QPSK MPR is adopted for PC2 class C MPR; Class B PC2 MPR needs further evaluation(PC3 MPR requires and additional 1dB for PC2 inner and 0.5dB for outer for class B)
	+ Option 2: Increase MPR to 5.5dB for CA edge RB allocations for PC2 as shown in Table 2.1-1. The edge RB allocation is <= 2RBs.

|  |  |  |
| --- | --- | --- |
| Modulation | MPR for bandwidth class B(dB) | MPR for bandwidth class C(dB) |
| inner | outer | edge | inner | outer |
| DFT-s-OFDM | Pi/2 BPSK | 1.0 | 3.5 | [5.5] | 2.5 | 7 |
| QPSK | 1.0 | 3.5 | [5.5] | 2.5 | 7 |
| 16QAM | 1.5 | 3.5 | [5.5] | 2.5 | 7 |
| 64QAM | 3.0 | 4.0 | [5.5] | 5 | 7 |
| 256QAM | 5.5 | 6.0 | 7 | 7.5 |
| CP-OFDM | QPSK | 2.0 | 4.0 | [5.5] | 3.5 | 8 |
| 16QAM | 2.5 | 4.0 | [5.5] | 3.5 | 8 |
| 64QAM | 3.5 | 4.0 | [5.5] | 5 | 8 |
| 256QAM | 6.5 | 6.5 | 7 | 8 |

* + Option 3: R4-2102657 provides some initial simulation results: bandwidth class B, inner up to 2.6dB, outer up to 6.7dB; bandwidth class C, inner up to 4dB, outer up to 6.5dB.
* Recommended WF
	+ TBA

**Issue 3-2-2: MPR for non-contiguous allocation**

* Proposals
	+ Option 1:

**PC3 QPSK MPR is adopted for PC2 (1Tx) with additional back-off as in Table 6.2A.2.1-3 below (yellow highlight)**

Table 6.2A.2.1-3: non-contiguous RB allocation for Power Class 2

|  |  |  |
| --- | --- | --- |
| Modulation | MPR for bandwidth class B(dB) | MPR for bandwidth class C(dB) |
| inner | Outer11 | Outer22 | inner | Outer11 | Outer22 |
| DFT-s-OFDM | Pi/2 BPSK | 3 | 6.5 | 13 | 3 | 6.5 | 13 |
| QPSK | 3 | 6.5 | 3 | 6.5 |
| 16QAM | 3 | 6.5 | 3 | 6.5 |
| 64QAM | 4.5 | 6.5 | 5 | 6.5 |
| 256QAM | 6 | 6.5 | 6.5 | 6.5 |
| CP-OFDM | QPSK | 3 | 6.5 | 14 | 3.5 | 7 | 14 |
| 16QAM | 3 | 7 | 3.5 | 7 |
| 64QAM | 5 | 7 | 5 | 7 |
| 256QAM | 7.5 | 7.5 | 7.5 | 7.5 |
| NOTE 1: Outer 1 MPR for Pi/2 BPSK and QPSK is reduced by 2dB for aggregated allocation bandwidth > 10MHz NOTE 2: Outer 2 MPR is reduced by 4.5dB for aggregated allocation bandwidth > 10MHz |

* + Option 2:

Consolidate inner and outer 1 MPR for non-contiguous allocations for PC2 for CA BW class B. Increase inner and outer1 MPR for CA BW class C as shown in Table 2.2-1.

* Table 2.2-1: non-contiguous RB allocation for Power Class 2

|  |  |  |
| --- | --- | --- |
| Modulation | MPR for bandwidth class B(dB) | MPR for bandwidth class C(dB) |
|  | inner/ Outer11 | Outer22 | inner | Outer11 | Outer22 |
| DFT-s-OFDM | Pi/2 BPSK |  | 5.5 | 11.5 |  5.5 |  8.5 | 13 |
| QPSK |  | 5.5 |  5.5 |
| 16QAM |  | 5.5 |  5.5 |
| 64QAM |  | 6 |  5.5 |
| 256QAM |  | 6.5 |  6.5 |
| CP-OFDM | QPSK |  | 6.5 | 12 |  5.5 |  8.5 | 14 |
| 16QAM |  | 7 |  5.5 |
| 64QAM |  | 7 |  5.5 |
| 256QAM |  | 7.5 |  7.5 |
| NOTE 1: Outer 1 MPR for Pi/2 BPSK and QPSK is reduced by 2dB for aggregated allocation bandwidth > 10MHz NOTE 2: Outer 2 MPR is reduced by 4.5dB for aggregated allocation bandwidth > 10MHz |

* + Option 3: R4-2102657 provides some initial simulation results: for bandwidth class C, outer 1 up to 7.5dB, outer 2 up to 16.7dB.
* Recommended WF
	+ TBA

**Issue 3-2-3: AMPR for NS\_04 contiguous allocation**

* Proposals
	+ Option 1:
		- **NS04 A-MPR = MPR for outer class C PC2**
		- **NS04 A-MPR = MPR+0.5dB for inner class C PC2 when RBstart ≤ 0.33\*BWchannel\_CA/0.18MHz**
		- **NS04 A-MPR = MPR for inner class C PC2 when RBstart > 0.33\*BWchannel\_CA/0.18MHz**
	+ Option 2: **Use PC2 AMPR for CA\_NS\_04 for contiguous allocations as shown in table 2.3-1 when Fedge, low - BWChannel\_CA < 2490.5 MHz.**

CA\_NS\_04 Contiguous RB allocation for Power Class 2

|  |  |  |
| --- | --- | --- |
| Modulation | AMPR for bandwidth class B(dB) | AMPR for bandwidth class C(dB) |
| inner | inner1 | outer | inner | inner1 | outer |
| DFT-s-OFDM | Pi/2 BPSK | 1.0 | 5.5 | 5 | 2.5 | 5.5 | 7 |
| QPSK | 1.0 | 6 | 5.5 | 2.5 | 6 | 7 |
| 16QAM | 1.5 | 6 | 6 | 2.5 | 6 | 7 |
| 64QAM | 3.0 | 6.5 | 6 | 5 | 6.5 | 7 |
| 256QAM | 5.5 | 8 | [7.5] | 7 | 8 | 7.5 |
| CP-OFDM | QPSK | 2.0 | 7.5 | 6.5 | 3.5 | 7.5 | 8 |
| 16QAM | 2.5 | 7.5 | 6.5 | 3.5 | 7.5 | 8 |
| 64QAM | 3.5 | 7.5 | 6.5 | 5 | 7.5 | 8 |
| 256QAM | 6.5 | 10 | [8] | 7 | 10 | 8 |
| Note 1: RBstart ≤ 0.33\*BWchannel\_CA/0.18MHz, LCRB ≤ 4MHz/0.18MHz |

* Recommended WF
	+ TBA

**Issue 3-2-4: AMPR for NS\_04 non-contiguous allocation**

* Proposals
	+ Option 1:
* **For channels and allocations where IM3 is within the -13dBm/MHz NS04 region, the PC2 MPR is sufficient**
* **PC2 (1Tx) NS04 A-MPR for outer 1 and outer 2 with IM3 in -25dBm/MHz region is 15.5 for B<2.16**
* **All SEM limited allocations will see the back-off increase for PC2 vs PC3 but ACLR limited region will stay the same thus the following AMPR curve are proposed: AMPRIM3 to meet -25dBm/MHz**

**MA = 15.5; 0 ≤ B < 2.16**

 **14; 2.16 ≤ B < 3.24**

**13; 3.24 ≤ B < 5.04**

**11.5; 5.04 ≤ B < 10.08**

 **10; 10.08 ≤ B < 16.56**

 **8; 16.56 ≤ B < 21.96**

**6; 21.96 ≤ B**

* + Option 2: **For PC2, when Fedge, low - BWChannel\_CA ≥ 2490.5 MHz, the AMPR = MPR for inner and outer 1 allocation, and AMPR= MPR – 1 for outer 2 allocations, else when Fedge, low - BWChannel\_CA < 2490.5 MHz AMPR = A-MPRIM3 defined in Clause 6.2A.3.1.2.2.1 of 38.101-1, where AMPRIM3=MA, Where MA is defined as follows for both power class 3 and power class 2**

**MA = 13; 0 ≤ B < 2.16**

**11.5; 2.16 ≤ B < 3.24**

**10.5; 3.24 ≤ B < 5.04**

**9.5; 5.04 ≤ B < 10.08**

**8; 10.08 ≤ B < 16.56**

**7; 16.56 ≤ B < 21.96**

**6; 21.96 ≤ B**

* Recommended WF
	+ TBA

**Issue 3-2-5: emission requirements**

* Proposals
	+ For 2PA architecture, the emission requirement is defined as the sum from both UE transmit antenna connectors.
* Recommended WF
	+ TBA

**Issue 3-2-6: Whether CA UL MIMO requirement is needed?**

* Proposals
	+ Do not define UL MIMO+UL CA HPUE requirements in this Rel-17 WI
* Recommended WF
	+ TBA

**Issue 3-2-7: SAR Solution for TDD contiguous UL CA**

* Proposals
* **The mechanism for single carrier for PC2 to meet SAR requirements can be reused for high power UE intra-band contiguous CA.**

***Moderator note: in WF R4-2017827, already have agreements***

* + *Pcmax: mechanism as for single carrier*
	+ *Capability of MaxUplinkDutyCyUse the same power class fallback cle: Reuse the capability for single carrier case*

*Is there additional mechanism for SAR requirement?*

* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

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| **Sub-topic** | **Comments (Company: …)** |
| 3-1 | **Issue 3-1-1** |
| **Issue 3-1-2** |
| 3-2 | **Issue 3-2-1** |
| **Issue 3-2-2** |
| **Issue 3-2-3** |
| **Issue 3-2-4** |
| **Issue 3-2-5** |
| **Issue 3-2-6** |
| **Issue 3-2-7** |

### 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** |
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## Summary for 1st round

### Open issues

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

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| **Sub-topic#3** | **Status summary**  |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
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### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round (if applicable)

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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| T-doc number | Title | **T-doc Status update recommendation**  |
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# Topic #4: intra-band NC DL CA

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102284 | Skyworks | **Observation1:*** **The support of n77(3A) in Japan requires a UE architecture with 3 receive LO and 3 RF paths per DL antennas**
* **The same 3 LO architecture covers n77(3A) in the US with reduced total frequency span**
* **FFS if n77(4A) could also be supported with 3LO once operator spectrum allocation in the U.S. is understood and channel configuration and aggregated bandwidth adjusted accordingly (i.e. maximum 300 MHz?)**

**Observation2: If this mandate is still valid for n77(3A) and n77(4A) it means that for single band support:*** **3 LO and potentially 4 LO are needed**
* **12 and potentially up to 16 receive paths are needed**
* **The request being for 3x100MHz and 4x100 MHz the total baseband bandwidth is up to 1.6GHz**
* **There may be limited support for higher order inter-band combinations as a lot of RF and baseband resources are already in use for n77**
* **There is low probability that good 4x4 MIMO channel is available for the 3 or 4 CCs simultaneously**

**Proposal: To enable larger ecosystem support for n77(3A/4A) combinations and/or additional bands in related inter-band DL CA:*** **4x4 DL MIMO stays mandatory for n77 CA with 2CCs and all related higher order inter-band DL CA combinations**
* **4x4 DL MIMO is optional support with capability signaling for n77(3A) and n77(4A) DL CA (>2CC) and all related higher order inter-band DL CA combinations**
* **Related per band and per band combinations capability signaling and RAN4 specification update is needed**
 |
| R4-2100707*moderator Note: move to Agenda 12.2.1* | SoftBank | **Proposal 1: CA\_n77(3A) is release independence from Rel-16.** **Observation 1: The maximum throughput of CA\_n77(3A) is lower than that of CA\_n77(2A) if Option 3 is applied.** **Proposal 2: Option 1 is selected.**

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| * Option 1: 4x4 DL MIMO is mandatory support for n77(3A) DL CA and all related higher order inter-band DL CA combinations:
	+ No signaling and specification update needed
	+ Limited support for lower end phones but also potential limitation on how many additional bands are supported in inter-band DL CA
* Option 3: 4x4 DL MIMO is optional support for n77(3A) DL CA and all related higher order inter-band DL CA combinations:
	+ Signaling and specification update needed
	+ Larger support for n77(3A)combination and/or additional bands in related inter-band DL CA
 |

 |
| R4-2100708*moderator Note: move to Agenda 12.2.1* | SoftBank | **TP for TR 38.717-01-01: CA\_3DL\_n77(3A)\_1UL\_n77A** |

## Open issues summary

### Sub-topic 4-1 n77(3A) and n77(4A) DL CA

**Issue 4-1-1: Release independent definition for intra-band n77(3A) DL CA**

* Proposals
	+ Option 1: Rel-16
	+ Option 2: Rel-17
* Recommended WF
	+ **TBA**

**Issue 4-1-2: 4\*4 DL MIMO for n77(3A)**

* Proposals
	+ Option 1: 4x4 DL MIMO is optional support with capability signaling for n77(3A) DL CA and all related higher order inter-band DL CA combinations
	+ Option 2: 4x4 DL MIMO is mandatory support for n77(3A) DL CA and all related higher order inter-band DL CA combinations
* Recommended WF
	+ **TBA**

**Issue 4-1-3: 4\*4 DL MIMO for n77(4A)**

* Proposals
	+ 4x4 DL MIMO is optional support with capability signaling for n77(4A) DL CA and all related higher order inter-band DL CA combinations
* Recommended WF
	+ **TBA**

## Companies views’ collection for 1st round

### Open issues

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| **Sub-topic** | **Comments (Company: …)** |
| 4-1 | **Issue 4-1-1** |
| **Issue 4-1-2** |
| **Issue 4-1-3** |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2100708 | Title: TP for TR 38.717-01-01: CA\_3DL\_n77(3A)\_1UL\_n77A |
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## Summary for 1st round

### Open issues

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

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| **Sub-topic#3** | **Status summary**  |
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*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
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### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
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## Discussion on 2nd round (if applicable)

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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| T-doc number | Title | **T-doc Status update recommendation**  |
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