**3GPP TSG-RAN WG4 Meeting # 111 R4-2410606**

**Fukuoka, Japan, 20th – 24th May 2024**

**Title:** WF on MSD Analysis for HPUE for CA with PC2 on FDD carrier

**Agenda Item:** 6.18.2

**Source:** China Unicom

**Document for:** Approval

# 1. Background

This WF captures the analysis and provides a way forward on MSD for HPUE for CA with PC2 on FDD carrier in RAN4-111 meeting [1], with following sub-topics:

Issue 1-1-1: MSD for PC2 DL\_n25A-n41A-UL\_n25

Issue 1-1-2: MSD for PC2 DL\_CA\_n2-n66 and CA\_n25-n66

Issue 1-1-3: MSD for PC2 DL\_n41A-n66A-UL\_n66

Issue 1-1-4: MSD for PC2 DL\_CA\_n25-n77-UL\_n25

Issue 1-1-5: MSD for PC2 DL\_CA\_n8-n41-UL\_n8

Issue 1-1-6: MSD for PC2 DL\_n71-n77-UL\_n71

Issue 1-1-7: MSD for PC2 DL\_n8-n79-UL\_n8

Issue 1-1-8: MSD for PC2 DL\_n71-n85-UL\_n71

Issue 1-1-9: MSD for PC2 DL\_n71(2A)-UL\_n71

Issue 1-1-9-1: PC3 n71(2A) MSD

Issue 1-1-9-2: PC2 CA\_n71(2A) MSD

Issue 1-1-9-3: Test points for PC3 and PC2 CA\_n71(2A) REFSENS

Issue 1-1-10: MSD for PC2 DL\_n71B-UL\_n71

Issue 1-1-10-1: PC3 n71B MSD

Issue 1-1-10-2: PC2 CA\_n71B MSD

# <Topic 1 MSD Analysis Overview>

For following sub-topics, TPs were submitted, the discussion will be focused on the TP documents and the revisions.

Issue 1-1-1: MSD for PC2 DL\_n25A-n41A-UL\_n25

|  |  |  |
| --- | --- | --- |
| R4-2407710 | T-Mobile USA | TP for TR 38.850 DL CA\_n25A-n41A UL n25A PC2 |

Issue 1-1-2: MSD for PC2 DL\_CA\_n2-n66 and CA\_n25-n66

|  |  |  |
| --- | --- | --- |
| R4-2407215 | AT&T | TP for TR 38.850 Addition of Single UL PC2 FDD for CA\_n2-n66 |
| R4-2407711 | T-Mobile USA | TP for TR 38.850 DL CA\_n25A-n66A UL n25A PC2 n66A PC2 |

Issue 1-1-5: MSD for PC2 DL\_CA\_n8-n41-UL\_n8

|  |  |  |
| --- | --- | --- |
| R4-2407946 | CMCC, Huawei, HiSilicon, Murata | (HPUE\_FR1\_FDD\_NR\_CADC\_R18) TP for TR 38.850 to introduce PC2 CA\_n8A-n41A on n8 with TxD |

Issue 1-1-7: MSD for PC2 DL\_n8-n79-UL\_n8

|  |  |  |
| --- | --- | --- |
| R4-2407947 | CMCC, Huawei, HiSilicon, Murata | (HPUE\_FR1\_FDD\_NR\_CADC\_R18)TP for TR 38.850 to introduce PC2 CA\_n8A-n79A on UL n8 with TxD |

Issue 1-1-9: MSD for PC2 DL\_n71(2A)-UL\_n71

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| --- | --- | --- |
| R4-2407708 | T-Mobile USA | TP for TR 38.850 DL CA\_n71(2A) UL PC2 n71A |

Issue 1-1-10: MSD for PC2 DL\_n71B-UL\_n71

|  |  |  |
| --- | --- | --- |
| R4-2407712 | T-Mobile USA | TP for TR 38.850 DL CA\_n71B UL PC2 n71A |

# <Topic 2 MSD Analysis>

For the following sub-topics, there were no TP submitted in this meeting, so they will be handled in this WF:

Issue 1-1-3: MSD for PC2 DL\_n41A-n66A-UL\_n66

Issue 1-1-4: MSD for PC2 DL\_CA\_n25-n77-UL\_n25

Issue 1-1-6: MSD for PC2 DL\_n71-n77-UL\_n71

Issue 1-1-8: MSD for PC2 DL\_n71-n85-UL\_n71

## <Sub-topic 1 MSD for PC2 DL\_n41A-n66A-UL\_n66>

* + Option 1: (R4-2407165, Skyworks) Band n41 is not affected by cross-band isolation interference from band n66 PC2 operation.
  + Option 2: (R4-2408856, Qualcomm) MSD for PC2 CA\_n41A-n66A was provided with the following results.

**PC2 1TX:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n66 | n41 | 1760 | 45 | 15 | 240 (RBstart=2) | 2501 | 10 | 1.2 | >ACLR2 |

**PC2 2TX:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n66 | n41 | 1760 | 45 | 15 | 240 (RBstart=2) | 2501 | 10 | 1.4 | >ACLR2 |

<Way forward>: Taking inputs from this meeting as starting points, try to finalize the MSD requirements for PC2 DL\_n41A-n66A-UL\_n66 in next RAN4 meeting.

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| Company | Comments |
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## <Sub-topic 2 MSD for PC2 DL\_CA\_n25-n77-UL\_n25>

* + Option 1: (R4-2407160, Skyworks) Introducing a single MSD test point for 10MHz CBW. And adopting the following PC2 test points.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD3** | **MSD4** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** | **(dB)** |
| n25 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 26.9 | 31.8 | NOTE X | UL2/DL1 |
| NOTE 3: Applicable to UE supporting PC2 with single Tx.  NOTE 4: Applicable to UE supporting PC2 with dual Tx. | | | | | | | | | |

<Agreement>: Agree on option 1.

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| Company | Comments |
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## <Sub-topic 3 MSD for PC2 DL\_n71-n77-UL\_n71>

* + Option 1: (R4-2407162, Skyworks) For Band n77 UL3/DL1 UL harmonic MSD in CA\_n8-n41, consider adopting the following PC2 test points.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD3** | **MSD4** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** | **(dB)** |
| n71 | n77 | 5 | 15 | 10 (RBstart=0) | 10 | 12.8 | 17.9 | NOTE X | UL5/DL1 |
| NOTE 3: Applicable to UE supporting PC2 with single Tx.  NOTE 4: Applicable to UE supporting PC2 with dual Tx. | | | | | | | | | |

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| Company | Comments |
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<Agreement>: Agree on option 1.

## <Sub-topic 4 MSD for PC2 DL\_n71-n85-UL\_n71>

* + Option 1: (R4-2407580, Murata) Use 2TX PC2 MSD as shown in Table.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n71 | n85 | 688 | 20 | 15 | 20 (RBstart=86) | 730.5 | 5 | 15.9x | ACLR2 |
| n71 | n85 | 680.5 | 35 | 15 | 20 (Rbstart=168) | 730.5 | 5 | 32.3y | ACLR1 |
| NOTE 1: Applicable only when harmonic mixing MSD for this combination is not applied.  NOTE 2: Void  NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.  NOTE x: Applicable to UE not supporting n71 optional maximum symmetrical UL/DL channel bandwidth  NOTE y: Applicable to UE supporting n71 optional maximum symmetrical UL/DL channel bandwidth | | | | | | | | | |

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| Company | Comments |
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<Agreement>: Agree on option 1.

# Reference

[1] R4-2408924 Topic summary for [111][113] HPUE\_Basket\_FDD Moderator (China Unicom) RAN4-111