3GPP TSG-RAN WG4 Meeting # 100-e R4-2114901

Electronic Meeting, 16– 27 August, 2021

**Source:** Huawei, HiSilicon, […..]

**Title:** Discussion on DC\_8A-20A\_n28A

**Agenda Item:** 8.6.1

**Document for:** Approval

# Introduction

The WID for DC [1] was updated in RAN #92 meeting. This contribution provides a TP for TR 37.717-21-11 to finish the UE RF requirements for the band combination.

# References

[1] RP-211371, “New WID on Dual Connectivity (DC) of 2 bands LTE inter-band CA (2DL/1UL) and 1 NR band (1DL/1UL)”, Huawei, HiSilicon

# Text Proposal

**<TP for TR 37.717-21-11>**

## 5.x DC\_8-20\_n28

### 5.x.1 Configurations for DC

Table 5.x.1-1: Inter-band DC configurations (three bands)

| DCconfiguration | Uplink configuration |
| --- | --- |
| DC\_8A-20A\_n28A6,X | DC\_8A\_n28ADC\_20A\_n28A |
| NOTE 6: The frequency range in band n28 is restricted for this band combination to 703-733 MHz for the UL and 758 – 788 MHz for the DL.NOTE X: The implementation with 3 low-band antennas is targeted for FWA form factor for this band combination in Release 17. |

### 5.x.2 Co-existence studies

For UE coexistence study of Band 8 + Band n28, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.x.2-1.

Table 5.x.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 880 | 915 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz)  | 1406 | 1496 | 1760 | 1830 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 2640 | 2745 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 3520 | 3660 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 4400 | 4575 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 132 | 212 | 1583 | 1663 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 491 | 616 | 1012 | 1127 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2286 | 2411 | 2463 | 2578 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1194 | 1364 | 1892 | 2042 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 2989 | 3159 | 3343 | 3493 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 424 | 264 | 3166 | 3326 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 2957 | 2772 | 2112 | 1897 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1339 | 1144 | 484 | 279 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4223 | 4408 | 3692 | 3907 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 4046 | 4241 | 3869 | 4074 |

For UE coexistence study of Band 20 + Band n28, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.x.2-2.

Table 5.x.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 832 | 862 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz)  | 1406 | 1496 | 1664 | 1724 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 2496 | 2586 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 3328 | 3448 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 4160 | 4310 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 84 | 159 | 1535 | 1610 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 544 | 664 | 916 | 1021 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2238 | 2358 | 2367 | 2472 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1247 | 1412 | 1748 | 1883 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 2941 | 3106 | 3199 | 3334 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 318 | 168 | 3070 | 3220 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 2745 | 2580 | 2160 | 1950 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1180 | 1000 | 580 | 385 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4031 | 4196 | 3644 | 3854 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 3902 | 4082 | 3773 | 3968 |

IMD3 of Tx band 20 + band n28 may fall into Rx of band 8.

### 5.x.3 ∆TIB and ∆RIB values

For DC\_8-20\_n28, the ΔTIB,c and ΔRIB,c values are reused from DC\_20\_n28 and DC\_8\_n28, and are given in the tables below.

Table 5.x.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_8-20\_n28 | 8 | 0.6 |
| 20 | 0.5 |
| n28 | 0.5 |

**Table 5.x.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_8-20\_n28 | 8 | 0.2 |
| 20 | 0 |
| n28 | 0.1 |

### 5.x.4 Reference sensitivity exceptions

MSD due to IMD3 of Tx band 20 + band n28 can be specified as below. Currently, the RF architecture with three antennas for low band are assumed. The implementation with three antennas for low band need a larger form factor than implementation with two antennas.

Table 5.x.4-1: Reference sensitivity exceptions for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| **EN-DC Configuration** | **EUTRA/NR band** | **UL Fc (MHz)** | **UL/DL BW (MHz)** | **UL****LCRB** | **DL Fc (MHz)** | **MSD (dB)** | **IMD order** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DC\_8A-20A\_n28A | 8 | 901 | 5 | 25 | 946 | [23.5] | IMD3 |
| 20 | 837 | 5 | 25 | 796 | N/A | N/A |
| n28 | 728 | 5 | 25 | 773 | N/A | N/A |

**<End of TP >**