**3GPP TSG-WG RAN4 Meeting #98-e *rev R4-2100734***

**Online, 25th January – 5th February, 2021**

**Source:** Nokia, Nokia Shanghai Bell, [Bell Mobility]

**Title:** TP to TR 37.717-21-11 DC\_7-25\_n77

**Agenda Item:** 9.4.2 [DC\_R17\_2BLTE\_1BNR\_3DL2UL]

**Document for:** Approval

# Introduction

In this contribution, a text proposal to complete 3DL/2UL EN-DC configurations, DC\_7A-25A\_n77A, DC\_7A-7A-25A\_n77A, DC\_7C-25A\_n77A, DC\_7C-25A-25A\_n77A, DC\_7A-25A-25A\_n77A and DC\_7A-7A-25A-25A\_n77A, is provided.

# TP to TR 37.717-21-11

## 5.X DC\_7-25\_n77

5.X.1 Operating bands for DC

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

| DCconfiguration | Uplink configuration |
| --- | --- |
| DC\_7A-25A\_n77ADC\_7A-7A-25A\_n77ADC\_7C-25A\_n77ADC\_7C-25A-25A\_n77ADC\_7A-25A-25A\_n77ADC\_7A-7A-25A-25A\_n77A | DC\_7A\_n77ADC\_25A\_n77A |

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

For UE coexistence study of Band 7 + Band n77, 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 for DC\_7\_n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 2500 | 2570 | 3300 | 4200 |
| 2nd harmonic  | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 5000 | 5140 | 6600 | 8400 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 7500 | 7710 | 9900 | 12600 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 730 | 1700 | 5800 | 6770 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 800 | 1840 | 4030 | 5900 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8300 | 9340 | 9100 | 10970 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 3300 | 4410 | 7330 | 10100 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 10800 | 11910 | 12400 | 15170 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 3400 | 1460 | 11600 | 13540 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 14300 | 10630 | 6980 | 5800 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15700 | 19370 | 13300 | 14480 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 7600 | 4760 | 1110 | 900 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 14900 | 17740 | 14100 | 16110 |

For UE coexistence study of Band 25 + Band n77, 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 for DC\_25\_n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1850 | 1915 | 3300 | 4200 |
| 2nd harmonic  | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3700 | 3830 | 6600 | 8400 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5550 | 5745 | 9900 | 12600 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1385 | 2350 | 5150 | 6115 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 500 | 530 | 4685 | 6550 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 7000 | 8030 | 8450 | 10315 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1350 | 2445 | 7985 | 10750 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8850 | 9945 | 11750 | 14515 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 4700 | 2770 | 10300 | 12230 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 14950 | 11285 | 4360 | 3200 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15050 | 18715 | 10700 | 11860 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 8900 | 6070 | 855 | 2850 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13600 | 16430 | 12150 | 14145 |

Based on co-existence study as presented in the table 5.X.2-1 and 5.X.2-2, own Rx impact is shown in the following.

* The 4th order IMD generated by dual uplink of Band 7 + Band n77 may fall into own Rx of band 25 and n77
* The 2nd harmonic of Band 25 uplink may fall into own Rx of band n77
* The 2nd, 4th and 5th order IMD generated by dual uplink of Band 25 + Band n77 may fall into own Rx of band 25
* The 5th order IMD generated by dual uplink of Band 25 + Band n77 may fall into own Rx of band 7
* The 4th and 5th order IMD generated by dual uplink of Band 25 + Band n77 may fall into own Rx of Band n77

### 5.X.3 ∆TIB and ∆RIB values

The same relaxation values as DC\_2-7\_n77 is used.

Table 5.X.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-25\_n77DC\_7-7-25\_n77DC\_7-25-25\_n77DC\_7-7-25-25\_n77 | 7 | 0.5 |
| 25 | 0.6 |
| n77 | 0.8 |

**Table 5.X.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-25\_n77DC\_7-7-25\_n77DC\_7-25-25\_n77DC\_7-7-25-25\_n77 | 7 | 0.5 |
| 25 | 0.2 |
| n77 | 0.5 |

### 5.X.4 Reference sensitivity exceptions

The IMD issues specifc to 3DL/2UL is the 4th order IMD for 25+n77 falling into band 25 and the 5th order IMD falling into band 7. This issue is similar to DC\_2-7\_n77 and the same MSD is used.

**Table 5.X.4-1: MSD for the DC configuration due to IMD issue (three bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** |
| --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc (MHz)** | **UL/DL BW (MHz)** | **UL****LCRB** | **DL Fc (MHz)** | **MSD (dB)** | **IMD order** |
| DC\_7A-25A\_n77ADC\_7A-7A-25A\_n77ADC\_7C-25A\_n77ADC\_7C-25A-25A\_n77ADC\_7A-25A-25A\_n77ADC\_7A-7A-25A-25A\_n77A | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
| 25 | 1870 | 5 | 25 | 1950 | 8.6 | IMD4 |
| n77 | 3525 | 10 | 50 | 3525 | N/A | N/A |
| 7 | 2540 | 5 | 25 | 2660 | 3.4 | IMD5 |
| 25 | 1860 | 5 | 25 | 1940 | N/A | N/A |
| n77 | 4120 | 10 | 50 | 4120 | N/A | N/A |