**3GPP TSG-WG RAN4 Meeting #98-e*****rev R4-2100732***

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

**Title:** TP to TR 37.717-11-11 DC\_25\_n77

**Agenda Item:** 9.3.2 [DC\_R17\_1BLTE\_1BNR\_2DL2UL]

**Document for:** Approval

# Introduction

In this contribution, a text proposal to complete 2DL/2UL EN-DC configurations, DC\_25A\_n77A and DC\_25A-25A\_n77A, is provided.

# TP to TR 37.717-11-11

### 6.1.X DC\_25\_n77

#### 6.1.X1 Configuration for DC

**Table 6.1.X.1-1: Inter-band EN-DC configurations of 1 LTE band + 1 NR band**

| EN-DC  configuration | Uplink EN-DC  configuration | Single UL allowed |
| --- | --- | --- |
| DC\_25A\_n77A | DC\_25A\_n77A | YES |
| DC\_25A-25A\_n77A | DC\_25A\_n77A | YES |

#### 6.1.X.2 Maximum output power for DC

**Table 6.1.X.2-1:** **Maximum output power for inter-band EN-DC of 1 LTE band + 1 NR band**

| EN-DC configuration | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- |
| DC\_25A\_n77A | 23 | +2/-3 |

#### 6.1.X.3 Spurious emission band UE co-existence for DC

**Table 6.1.X.3-1: Spurious emissions for inter-band EN-DC of 1 LTE band + 1 NR band**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC CA combination | Spurious emission | | | | | | |
| Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| DC\_25\_n77 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 25, 26, 29, 30, 41, 65, 66, 70, 71 | FDL\_low | - | FDL\_high | -50 | 1 |  |

#### 6.1.X.4 MSD analysis for DC

For study of 2UL/2DL, Table 6.1.X.4-1 lists up to 5th order harmonics and intermodulation products for DC\_25A\_n77A.

**Table 6.1.X.4-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 |

**Table 6.1.X.4-2: Band 25 and Band n77 UL harmonic mixing products**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | |
| Band | UL Low Band Edge | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| 25 | 1850 | 1915 | 1930 | 1995 | 3860 | 3990 | 5790 | 5985 | 7720 | 7980 | 9650 | 9975 |
| n77 | 3300 | 4200 | 3300 | 4200 | 6600 | 8400 | 9900 | 12600 | 13200 | 16800 | 16500 | 21000 |

Based on co-existence study as presented in the table 6.1.X.4-1 and 6.1.X.4-2, own Rx impact is shown in the following.

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

The same MSD as CA\_n25-n77 in TS 38.101-1 can be applied to DC\_25\_n77 as specified in Table 6.1.X.4-3 and 6.1.X.4-4 for the harmonic issue.

**Table 6.1.X.4-3: MSD due to harmonic issue for DC\_25A\_n77A**

| MSD due to harmonic exception for the DL band | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30 MHz (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 70 MHz  (dB) | | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| 25 | n772, 4 |  | 23.9 | 22.1 | 20.9 | 19.8 | 19.0 | 17.9 | 16.8 | 16.0 | 15.5 | 14.8 | | 14.3 | 13.8 |
| n773 |  | 1.1 | 0.8 | 0.3 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| NOTE 2: The requirements should be verified for UL EARFCN or NR ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 3: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at  MHz offset from  in the victim (higher band) with , where andare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  NOTE 4: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band. | | | | | | | | | | | | | | | |

**Table 6.1.X.4-4 Uplink configuration due to UL harmonic interference**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | NR Band / Channel bandwidth of the affected DL band / UL RB allocation of the aggressor band | | | | | | | | | | | | |
| UL band | DL band | 5  MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 30 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 70 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| 25 | n77 |  | 25 | 36 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

The same MSD as CA\_n25-n77 in TS 38.101-1 can be applied to DC\_25\_n77 as specified in Table 6.1.X.4-5 and 6.1.X.4-6 for the harmonic mixing issue.

Table 6.1.X.4-5: MSD due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | | |
| UL band | DL band | 5  MHz (dB) | 10  MHz (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 70 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n77 | 25 | 6.1 | 5.0 | 4.0 | 3.7 |  |  |  |  |  |  |  |  |

Table 6.1.X.4-6: Uplink configuration due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the aggressor band | | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 70 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n77 | 25 | 15 | 25 | 50 | 75 | 100 |  |  |  |  |  |  |  |  |

The same MSD as CA\_n25-n77 in TS 38.101-1 can be applied to DC\_25\_n77 as specified in Table 6.1.X.4-7 for the IMD issues.

Table 6.1.X.4-7: MSD due to IMD issue

|  | Operating band/ Channel bandwidth / NRB / Duplex mode | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC CA  Configuration | Operating band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode | IMD order |
| DC\_25A\_n77A  DC\_25A-25A\_n77A | 25 | 1855 | 5 | 25 | 1935 | 26 | FDD | IMD2 |
| n77 | 3790 | 10 | 50 | 3790 | N/A | TDD | N/A |
| 25 | 1885 | 5 | 25 | 1965 | 8 | FDD | IMD4 |
| n77 | 3690 | 10 | 50 | 3690 | N/A | TDD | N/A |
| 25 | 1885 | 5 | 25 | 1965 | 5 | FDD | IMD5 |
| n77 | 3810 | 10 | 50 | 3810 | N/A | TDD | N/A |

#### 6.1.X.5 ∆TIB and ∆RIB values

For DC\_25\_n77, the ΔTIB,c and ΔRIB,c values are given the same as CA\_n25-n77 in the tables below.

**Table 6.1.X.5-1: ΔTIB,c**

| Inter-band CA Configuration | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_25\_n77  DC\_25-25\_n77 | 25 | 0.6 |
| n77 | 0.8 |

**Table 6.1.X.5-2: ΔRIB,c**

| Inter-band CA Configuration | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_25\_n77  DC\_25-25\_n77 | 25 | 0.2 |
| n77 | 0.5 |