**3GPP TSG-RAN WG4 Meeting #97-e Rev. 2 of R4-2015221 Online, 2nd Nov. 2020 – 13th Nov. 2020**

**Source:** Nokia

**Title:** TP for 37.717-11-11 to introduce DC\_7\_n2A

**Agenda Item:**  10.3.2 [DC\_R17\_1BLTE\_1BNR\_2DL2UL-Core]

**Document for:** Approval

# 1 Introduction

This contribution is a TP for TR 37.717-11-11 to introduce DC\_7A\_n2A and DC\_7C\_n2A.

# 2 Text Proposal

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of the TP \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

6.1.x DC\_7\_n2

6.1.x.1 Configuration for DC

**Table 6.1.x.1-1: Inter-band EN-DC configurations within FR1 (two bands)**

| EN-DC  configuration | Uplink EN-DC  configuration | Single UL allowed |
| --- | --- | --- |
| DC\_7A\_n2A  DC\_7C\_n2A | DC\_7A\_n2A | No |

6.1.x.2 Maximum output power for DC

The maximum output power for the uplink EN-DC configurations is given as.

**Table 6.1. x.2-1:**

**Maximum output power for inter-band EN-DC (two bands)**

| DC configuration | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- |
| DC\_7A\_n2A | 23 | +2/-3 |

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

The requirements to be specified in TS 38.101-3 Table 6.5B.3.3.2-1 is given below.

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **E-UTRA and NR DC Configuration** | **Spurious emission** | | | | | | |
| **Protected band** | **Frequency range (MHz)** | | | **Maximum Level (dBm)** | **MBW (MHz)** | **NOTE** |
| DC\_7\_n2 | E-UTRA Band 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 28, 29, 30, 42, 50, 51, 66, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 43 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| ~~Frequency range~~ | ~~1880~~ |  | ~~1895~~ | ~~-40~~ | ~~1~~ | ~~5,16~~ |
| ~~Frequency range~~ | ~~1895~~ |  | ~~1915~~ | ~~-15.5~~ | ~~5~~ | ~~5, 7, 16~~ |
| Frequency range | 2570 | - | 2575 | 1.6 | 5 | 5, 6, 7 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 5, 6, 7 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 5, 6 |
| NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x 180 kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.  NOTE 6: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 7: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 15: Applicable when NS\_05 in clause 6.6.3.3.1 is signalled by the network.  NOTE 16: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. | | | | | | | |

6.1.x.4 MSD analysis for DC

For 2UL/2DL UE coexistence study 2nd, 3rd, 4th, 5th, 6th and 7th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented below.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 2500 | 2570 | 1850 | 1910 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 5000 | 5140 | 3700 | 3820 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 7500 | 7710 | 5550 | 5730 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 10000 | 10280 | 7400 | 7640 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 12500 | 12850 | 9250 | 9550 |
| 6th harmonics frequency limits | 6\*fx\_low | 6\*fx\_high | 6\* fy\_low | 6\* fy\_high |
| 6th harmonics frequency limits (MHz) | 15000 | 15420 | 11100 | 11460 |
| 7th harmonics frequency limits | 7\*fx\_low | 7\*fx\_high | 7\* fy\_low | 7\* fy\_high |
| 7th harmonics frequency limits (MHz) | 17500 | 17990 | 12950 | 13370 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 720 | 590 | 4350 | 4480 |
| 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) | 3090 | 3290 | 1130 | 1320 |
| 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) | 6850 | 7050 | 6200 | 6390 |
| 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) | 5590 | 5860 | 2980 | 3230 |
| 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) | 1180 | 1440 | 8700 | 8960 |
| 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) | 9350 | 9620 | 8050 | 8300 |
| 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) | 5140 | 4830 | 8430 | 8090 |
| 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) | 730 | 410 | 4010 | 3680 |
| 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) | 9900 | 10210 | 11850 | 12190 |
| 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) | 10550 | 10870 | 11200 | 11530 |

Based on Table 6.1.x.4-1, it can be seen that no harmonics or IMD products fall into own Rx frequencies.

When 2UL inter-band EN-DC UE is operating with other systems such as WiFi, Bluetooth and GNSS system, the harmonics and intermodulation products can have impact on these systems. A summary of this is given below.

**Table 6.1.x.4-2: Harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | YES | US | 2nd HAM, 4th IMD |
| 5150 | - | 5350 | YES | Europe | 2nd HAM, 4th IMD |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | YES | Asia | 2nd HAM, 4th IMD |
| 45GHz Unlicensed Bands | 42300 | - | 47000 | No | China |  |
| 47200 | - | 48400 | No | China |  |
| 60GHz Unlicensed Bands | 57000 | - | 66000 | No | Europe |  |
| 57050 | - | 64000 | No | USA Canada |  |
| 57000 | - | 64000 | No | South Korea |  |
| 59000 | - | 66000 | No | Japan |  |
| 59000 | - | 64000 | No | China |  |
| 59400 | - | 62900 | No | Australia |  |

6.1.x.5 ∆TIB and ∆RIB values

The ΔTIB,c and ΔRIB,c values are reused from CA\_2-7 as specified in TS 36.101.

**Table 6.1.x.5-1: ΔTIB,c**

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7\_n2 | 7 | 0.5 |
| n2 | 0.5 |

**Table 6.1.x.5-2: ΔRIB,c**

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_7\_n2 | 7 | 0 |
| n2 | 0 |

6.1.x.6 Self-interference analysis

Based on the co-existence studies no MSD is needed.

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# 3 References