**3GPP TSG-RAN WG4 Meeting # 110-bis R4-24xxxxx**

**China, Changsha, April 15 – April 19, 2024**

**Title: TP to TR 37.718-11-11: Addition of DC\_28A\_n105A**

**Source: Nokia, Spark**

**Agenda item: x.x**

**Document for: Approval**

# 1 Introduction

This is a TP to TR 37.718-11-11 to add DC\_28A\_n105A. All fallbacks have been analysed.

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

#### 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 (NOTE 1) | Single UL allowed |
| --- | --- | --- |
| DC\_28A\_n105A | DC\_28A\_n105A | No |

#### 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

| DC configuration | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- |
| DC\_28A\_n105A | 23 | +2/-3 |

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

Referring to the spurious emission band UE-to-UE co-existence requirements for DC\_28\_n105 specified in clause 6.5B.3.3.2 of TS 38.101-3 V18.2.0, This clause specifies the requirements for EN-DC coexistence with protected bands. When both constituent bands (LTE band 28 and NR band n105) have common coexistence band protection requirements as specified in clause 6.5.3.2 of TS 38.101-1 and clause 6.6.3.2 of 36.101, the requirements are also applied to the EN-DC configuration. The additional protected frequency ranges are shown in Table 6.1.x.3-1.

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Spurious emission | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| DC\_28\_n105 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 54, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25, 41, 70,  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
|  | E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| 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 (2MHz + N x LCRB x 180kHz), 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 15: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. | | | | | | | |

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

For 2UL/2DL UE coexistence study 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 6.1.x.4-1.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 663 | 703 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1406 | 1496 | 1326 | 1406 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 1989 | 2109 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 2652 | 2812 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 3315 | 3515 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 85 | 0 | 1366 | 1451 |
| 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) | 703 | 833 | 578 | 703 |
| 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) | 2069 | 2199 | 2029 | 2154 |
| 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) | 1406 | 1581 | 1241 | 1406 |
| 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) | 0 | 170 | 2732 | 2902 |
| 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) | 2772 | 2947 | 2692 | 2857 |
| 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) | 2109 | 1904 | 2329 | 2109 |
| 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) | 703 | 493 | 918 | 703 |
| 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) | 3355 | 3560 | 3475 | 3695 |
| 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) | 3395 | 3605 | 3435 | 3650 |

There is MSD issue for DC\_28\_n105 for IMD3 and IMD5.

There is no harmonic issue for DC\_28\_n105.

There is cross-band interference in both n105 (>ACLR2) and band 28 (ACLR2)

The requirement to intermodulation is proposed in the table below.

Table 6.1.x4-2: MSD test points for PCell due to dual uplink operation for PC3 EN-DC in NR FR1 (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | | |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode | IMD order |
| DC\_28A\_n105A | 28 | 725 | 5 | 25 | 780 | [25] | FDD | IMD33 |
| n105 | 670 | 5 | 25 | 619 | N/A | FDD | N/A |
| DC\_28A\_n105A | 28 | 721 | 5 | 25 | 776 | N/A | FDD | N/A |
| n105 | 670 | 5 | 25 | 619 | [25] | FDD | IMD33 |
| NOTE 3: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

#### 6.1.x.5 ∆TIB and ∆RIB values

For DC\_28\_n105, ΔTIB,c and ΔRIB,c values will be the same as for CA\_n28-n105 in 38.101-1. The ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 6.1.x.5-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_28\_n105 | 28 | 1.0 |
| n5 | 1.0 |

Table 6.1.x.5-2: ΔRIB,c

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_28\_n105 | 28 | 0.7 |
| n5 | 0.7 |

#### 6.1.x.6 self-interference analysis

The requirements to cross-band isolation are taken from CA\_n28-n105A and are shown in the table below.

Table 6.1.x.6-1: Reference sensitivity exceptions (MSD) due to cross band isolation for PC3 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference** | |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | **source** | |
| 28 | n105 | 718 | 30 | 15 | 25 (RBstart=0) | 649.5 | 5 | 12.1 | ACLR2 |
| n105 | 28 | 693 | 20 | 15 | 20 (RBstart=86) | 760.5 | 5 | 6.9 | >ACLR2 |

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# References