**3GPP TSG-RAN WG4 Meeting #98-e R4-2101909**

**Electronic Meeting, 25 January – 5 February 2021**

**Source:** Ericsson, Rogers

**Title:** TP for TR 37.717-11-11: DC\_71\_n41

**Agenda item:** 9.3.2

**Document for:** Approval

# 1. Introduction

Rel-17 LTE-NR DC combinations LTE 1 band + NR 1 band combination are defined in the WID [1]. This contribution is a text proposal for TR 37.717-11-11 to include DC\_71\_n41.

# 2. Text Proposal

# ---Start of changes---

6.1.x DC\_71A\_n41A

6.1.x.1 Operating bands for DC

**Table 6.1.x.1-1: DC band combination of 1 LTE band + 1 NR band**

| EN-DC band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_71\_n41 | 71 | n41 | No |

6.1.x.2 Configuration for DC

**Table 6.x.2.2-1: Inter-band EN-DC configurations of 1 LTE band + 1 NR band**

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_71A\_n41A | DC\_71A\_n41A | 71A | n41A |

6.1.x.3 Maximum output power for DC

**Table 6.1.x.3-1:** **Maximum output power for inter-band EN-DC of 1 LTE band + 1 NR band**

| DC configuration | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- |
| DC\_71A\_n41A | 23 | +2/-3 |

6.1.x.4 Spurious emission band UE co-existence for DC

**Table 6.1.x.4-1: 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\_71A\_n41A | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA band 2, 25, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 5 |
| 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. | | | | | | | |

6.1.x.5 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.5-1

**Table 6.1.x.5-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 663 | 698 | 2496 | 2690 |
| 2nd harmonics frequency limits | 2\* fy\_low | 2\* fy\_high | 2\*fx\_low | 2\*fx\_high |
| 2nd harmonics frequency limits (MHz) | 1326 | 1396 | 4992 | 5380 |
| 3rd harmonics frequency limits | 3\* fy\_low | 3\* fy\_high | 3\*fx\_low | 3\*fx\_high |
| 3rd harmonics frequency limits (MHz) | 1989 | 2094 | 7488 | 8070 |
| 4th harmonics frequency limits | 4\* fy\_low | 4\* fy\_high | 4\*fx\_low | 4\*fx\_high |
| 4th harmonics frequency limits (MHz) | 2652 | 2792 | 9984 | 10760 |
| 5th harmonics frequency limits | 5\* fy\_low | 5\* fy\_high | 5\*fx\_low | 5\*fx\_high |
| 5th harmonics frequency limits (MHz) | 3315 | 3490 | 12480 | 13450 |
| 6th harmonics frequency limits | 6\* fy\_low | 6\* fy\_high | 6\*fx\_low | 6\*fx\_high |
| 6th harmonics frequency limits (MHz) | 3978 | 4188 | 14976 | 16140 |
| 7th harmonics frequency limits | 7\* fy\_low | 7\* fy\_high | 7\*fx\_low | 7\*fx\_high |
| 7th harmonics frequency limits (MHz) | 4641 | 4886 | 17472 | 18830 |
| 2nd order IMD products | |fy\_high – fx\_low| | |fy\_low – fx\_high| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2027 | 1798 | 3159 | 3388 |
| 3rd order IMD products | |fy\_high – 2\*fx\_low| | |fy\_low – 2\*fx\_high| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1364 | 1100 | 4294 | 4717 |
| 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) | 3822 | 4086 | 5655 | 6078 |
| 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) | 4054 | 3596 | 6318 | 6776 |
| 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) | 701 | 402 | 6790 | 7407 |
| 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) | 4485 | 4784 | 8151 | 8768 |
| 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) | 10097 | 9286 | 296 | 38 |
| 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) | 10647 | 11458 | 5148 | 5482 |
| 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) | 6744 | 6092 | 2898 | 3391 |
| 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) | 8814 | 9466 | 6981 | 7474 |

Based on Table 6.1.X.5-1, it can be seen that

* 4th order IMD products may fall into own Rx frequencies of band 71.
* 4th harmonics may fall into Rx frequencies of band n41

6.1.x.6 ∆TIB and ∆RIB values

For DC\_71\_n41, the ΔTIB,c and ΔRIB,c values are reused from CA\_n41-n71 and DC\_7\_n71 and are given in the tables below.

**Table 6.1.x.6-1: ΔTIB,c**

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_71\_n41 | 71 | 0.6 |
| n41 | 0.3 |

**Table 6.1.x.6-2: ΔRIB,c**

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_71\_n41 | 71 | 0.2 |
| n41 | 0 |

6.1.x.7 MSD

Co-existence studies shows that MSD need to be defined for IMD4 falling into own Rx frequencies of band 71. MSD value same as in CA\_n41-n71.

Table 6.1.x.7-1: Reference sensitivity exceptions due to dual uplink operation for 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) | IMD order |
| DC\_71A\_n41A | 71 | 666 | 5 | 25 | 620 | 11 | IMD4 |
| n41 | 2618 | 5 | 25 | 2618 | N/A | N/A |

Reference exception due to 4th harmonics into DL n41 need to be defined as in tables below.

Table 6.1.x.7-1: Reference sensitivity exceptions (MSD) due to UL harmonic for EN-DC in NR FR1

| E-UTRA or 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) | 30 MHz (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 70 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| 71 | n416,7 |  | 10.8 | 9.1 | 8.0 |  | 6.1 | 5.1 | 4.2 | 3.5 | 2.7 | 2.3 | 2.1 | 1.4 |
| NOTE 6: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.  NOTE 7: The requirements should be verified for UL EARFCN 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. | | | | | | | | | | | | | | |

Table 6.1.x.7-2: Uplink configuration for reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / UL RB allocation of the agressor 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) | 30 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 70 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| 71 | n41 | 15 |  | 16 | 25 | 25 |  | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |

---End of changes---

# Reference

[1] RP-202545, Rel-17 Dual Connectivity (DC) of 1 band LTE (1DL/1UL) and 1 NR band (1DL/1UL), CHTTL