**3GPP TSG-RAN WG4 Meeting #97-e R4-2015245 Online, 2nd Nov. 2020 – 13th Nov. 2020**

**Source:** Nokia, T-mobile

**Title:** TP for 37.717-11-11 to introduce DC\_71A\_n71A

**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\_71A\_n71A.

# 2 Text Proposal

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

6.1.x DC\_71\_n71

6.1.x.1 Configuration for DC

The configuration to be specified in Table 5.5B.3-1 of 38.101-3 is as follows:

**Table 5.5B.3-1: Intra-band non-contiguous EN-DC configurations**

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | Single UL allowed |
| --- | --- | --- |
| DC\_71A\_n71A3 | DC\_71A\_n71A5 | Yes5 |
| NOTE 3: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers.  NOTE 5: Only single switched UL is supported. | | |

6.1.x.2 Maximum output power for DC

The maximum output power for the uplink EN-DC configuration in Table 6.2B.1.2-1 of 38.101-3 is given as.

**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 1.5  (dBm) | Tolerance  (dB) | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| DC\_71A\_n71A4 |  |  |  |  | 23 | +2/-3 |
| NOTE 4: Only single switched UL is supported | | | | | | |

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

The requirements for the EN-DC configuration for DC\_71\_n71, to be specified in TS 38.101-3 Table 6.5B.3.3.2-1 is given in following table.

**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\_71\_n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 29, 30, 48, 53, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25, 41, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| 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. | | | | | | | |

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] | 663 | 698 | 663 | 698 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1326 | 1396 | 1326 | 1396 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 1989 | 2094 | 1989 | 2094 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2652 | 2792 | 2652 | 2792 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3315 | 3490 | 3315 | 3490 |
| 6th harmonics frequency limits | 6\*fx\_low | 6\*fx\_high | 6\* fy\_low | 6\* fy\_high |
| 6th harmonics frequency limits (MHz) | 3978 | 4188 | 3978 | 4188 |
| 7th harmonics frequency limits | 7\*fx\_low | 7\*fx\_high | 7\* fy\_low | 7\* fy\_high |
| 7th harmonics frequency limits (MHz) | 4641 | 4886 | 4641 | 4886 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 35 | 35 | 1326 | 1396 |
| 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) | 628 | 733 | 628 | 733 |
| 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) | 1989 | 2094 | 1989 | 2094 |
| 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) | 1291 | 1431 | 1291 | 1431 |
| 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) | 70 | 70 | 2652 | 2792 |
| 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) | 2652 | 2792 | 2652 | 2792 |
| 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) | 2129 | 1954 | 2129 | 1954 |
| 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) | 768 | 593 | 768 | 593 |
| 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) | 3315 | 3490 | 3315 | 3490 |
| 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) | 3315 | 3490 | 3315 | 3490 |

Based on Table 6.1.x.4-1, it can be seen that 3rd and 5th order IMD can fall in the Rx frequency of band 71.

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 | No | US |  |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | No | Asia |  |
| 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

Not applicable for DC\_71\_n71.

6.1.x.6 Self-interference analysis



Based on the co-existence studies for DC\_71\_n71 it is found that a Wgap exception is needed defined due to the configuration having 2DL carriers (1NR and 1LTE) in the DL of band 71 with an UL NR carrier. This is to be defined in Table 7.3B.3.2-2 of 38.101-3.

Table 7.3B.3.2-2: Intra-band non-contiguous EN-DC with one uplink configuration on NR for reference sensitivity (NR carrier is higher than the E-UTRA carrier)

| DC configuration | Aggregated bandwidth | | Wgap / (MHz) | UL NR allocation | ΔRIBNC (dB) | Duplex mode |
| --- | --- | --- | --- | --- | --- | --- |
| NR | E-UTRA |
| DC\_71A\_n71A | 5 MHz | 5 MHz | 5 < Wgap ≤ 25 | 5 | 4.0 | FDD |
| 0 < Wgap ≤ 5 | 20 | 0 |
| 10 MHz | 5 MHz | 5 < Wgap ≤ 20 | 51 | 4.6 |
| 0 < Wgap ≤ 5 | 201 | 2.3 |
| 10 MHz | 10 MHz | 5 < Wgap ≤ 15 | 51 | 4.3 |
| 0 < Wgap ≤ 5 | 201 | 3.2 |
| 15 MHz | 10 MHz | 5 < Wgap ≤ 10 | 52 | 22.2 |
| 0 < Wgap ≤ 5 | 203 | 5.2 |
| NOTE 1: Uplink resource block starts at RB position 9 for SCS=15KHz.  NOTE 2: Uplink resource block starts at RB position 2 for SCS=15KHz.  NOTE 3: Uplink resource block starts at RB position 19 for SCS=15KHz. | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of the TP \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# 3 References