**3GPP TSG-RAN WG4 Meeting #97-e Rev. 4 of 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 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

6.4.x DC\_71\_n71

6.4.x.1 Channel bandwidths per operating band for DC

**Table 6.4.x.1-1: Supported channel bandwidths per DC configuration**

|  |  |  |
| --- | --- | --- |
|  |  | **E-UTRA – NR configuration / Bandwidth combination set** |
| **Downlink****EN-DC configuration** | **Uplink EN-DC configurations** | **Component carriers in order of increasing carrier frequency** | **Maximum aggregated bandwidth (MHz)** | **BCS** |
| **Channel bandwidths for E-UTRA carrier (MHz)** | **Channel bandwidths NR for carrier (MHz)** | **Channel bandwidths for E-UTRA carrier (MHz)** |
| DC\_71A\_n71A | DC\_71A\_n71A2 | 15 | 5 |  | 20 | 0 |
| 10 | 5, 10 |  |
| 5 | 5, 10, 15 |  |
|  | 5 | 15 |
|  | 5, 10 | 10 |
|  | 5, 10, 15 | 5 |
| NOTE 2: Only single switched UL is supported. |

6.4.x.2 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-DCconfiguration | Uplink EN-DCconfiguration(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. |

6.4.x.3 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 6.4. x.3-1:** **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 |

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

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

Since single switched UL only – no need for defining spurious emissions

6.4.x.5 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 6.4.x.5-1: 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 6.4.x.5-1, it can be seen that 3rd and 5th order IMD can fall in the Rx frequency of band 71. However, this is not relevant for single switched UL only operation.

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 6.4.x.5-2: 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 |  |

6.4.x.6 ∆RIBNC values

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. |

6.1.x.7 MPR, AMPR requirements

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

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

, since it is defined as single switched UL only.

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

# 3 References