3GPP TSG-RAN WG4 Meeting #97-e R4-2014030

Electronic Meeting, 2 - 13 November 2020

**Source:** Huawei, HiSilicon

**Title:** TP to TR 37.717.11-11: Addition of DC configuration for DC\_8\_n2

**Agenda item:** 10.3.2

**Document for:** Approval

# Background

This contribution provides text proposal on the EN-DC configuration DC\_8A\_n2A as defined in WID on Dual Connectivity of 1 band LTE (1DL/1UL) and 1 NR band (1DL/1UL) [1].

# Text Proposal

##### ---Start of changes---

6.1.x DC\_8\_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\_8A\_n2A | DC\_8A\_n2A | Yes |

6.1.x.2 Maximum output power for DC

**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\_8A\_n2A | 23 | +2/-3 |

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

**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\_8\_n2A | E-UTRA Band 2, 8, 28, 50, 51, 74 | FDL\_low  | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 41, 42, 43 | 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 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) | 1850 | 1910 | 880 | 915 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz)  | 3700 | 3820 | 1760 | 1830 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 2640 | 2745 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 3520 | 3660 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 4400 | 4575 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1030 | 935 | 2730 | 2825 |
| 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) | 2785 | 2940 | 150 | 20 |
| 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) | 4580 | 4735 | 3610 | 3740 |
| 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) | 4635 | 4850 | 730 | 895 |
| 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) | 6430 | 6645 | 4490 | 4655 |
| 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) | 1870 | 2060 | 5460 | 5650 |
| 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) | 1810 | 1610 | 6760 | 6485 |
| 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) | 955 | 1180 | 3970 | 3720 |
| 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) | 5370 | 5570 | 8280 | 8555 |
| 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) | 6340 | 6565 | 7310 | 7560 |
| UL frequency (MHz) | 1850 | 1910 | 880 | 915 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz)  | 3700 | 3820 | 1760 | 1830 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |

Based on Table 6.1.x.4-1, it can be seen that:

* 2nd order IMD products may fall into own Rx frequencies of band 8
* 4th order IMD products may fall into own Rx frequencies of band n2
* 2nd order harmonic may fall into Rx frequencies of bands 3, 6, 43, n77 and n78.
* 3rd order harmonic may fall into Rx frequencies of bands 7, 41 and 46 .
* 3rd order IMD products may fall into Rx frequencies of bands 6, 43 n77, n78 and n79.
* 4th order IMD products may fall into Rx frequencies of bands 3, 5, 9, 12, 13, 14, 17, 18, 19, 20, 25, 26, 27, 28, 33, 34, 35, 36, 37, 39, 42, 44, 46, 67, 68, 70 and n79.
* 5th order IMD products may fall into Rx frequencies of band 3, 6, 43, 46, n77 and n78.

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. Table 6.1.x.4-2 lists up to 7th order harmonics and IMD up to 5th order falls into one of these receiving bands.

**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 |  |  |
| 2400 | - | 2494 | No |  |  |
| ISM band (5GHz) | 5150 | - | 5925 | Yes | US | 4th, 5th IMD3rd harmonics |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | Yes | 3rd harmonics |
| 5150 | - | 5825 | Yes | Asia | 4th, 5th IMD3rd harmonics |
| 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

For DC\_8\_n2, the ΔTIB,c and ΔRIB,c values are reused from DC\_2\_n5 and 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\_8\_n2 | 8 | 0.3 |
| n2 | 0.3 |

**Table 6.1.x.5-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_8\_n2 | 8 | 0 |
| n2 | 0 |

6.1.x.6 MSD

Based on the co-existence studies MSD due to IMD2/4 is required. The MSD values can be reused from DC\_3-n5.

Table 6.1.x.6-1: Reference sensitivity exceptions for PCell due to dual uplink operation for EN-DC in NR FR1 (two bands)

|  |
| --- |
| NR or E-UTRA Band / Channel bandwidth / NRB / MSD |
| EN-DCConfiguration | EUTRA or NR band | UL Fc (MHz) | UL/DL BW (MHz) | UL LCRB | DL Fc (MHz) | MSD (dB) | Duplex mode | IMD order |
| DC\_8\_n2 | n2 | 1860 | 5 | 25 | 1940 | 4 | FDD | IMD4 |
| 8 | 890 | 5 | 25 | 935 | N/A | N/A |
| n2 | 1865 | 5 | 25 | 1945 | N/A | FDD | N/A |
| 8 | 910 | 5 | 25 | 955 | 24 | IMD2 |

##### ---End of changes---

# Reference

[1] RP-201553, “Revised WID on Dual Connectivity of 1 band LTE (1DL/1UL) and 1 NR band (1DL/1UL)”, CHTTL, RAN#89-e