**3GPP TSG-RAN WG4 Meeting#98-bis-e R4-2106598**

**E-meeting,12th April– 20th April, 2021**

**Agenda item: 5.3.2.4.1**

**Source: ZTE Corporation**

**Title: TP to TS 38.176-2: TX IMD requirements**

**Document for:** **Approval**

1. Introduction

In the past RAN4#98e meetings, work split has been agreed among companies, therefore in this contribution, we want to share the draft TP for section 6.7 Tx IMD requirements test for further discussion.

1. Reference
2. R4-2103856 WF on IAB conformance specification work split and drafting guidelines, approved.
3. Annex

<Start of TP>

## 6.8 OTA transmitter intermodulation

### 6.8.1 Definition and applicability

The OTA transmitter intermodulation requirement is a measure of the capability of the transmitter unit to inhibit the generation of signals in its non-linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter unit via the RDN and antenna array from a co-located base station. The requirement applies during the *transmitter ON period* and the *transmitter transient period*.

The requirement applies at each RIB supporting transmission in the operating band.

The transmitter intermodulation level is the total radiated power of the intermodulation products when an interfering signal is injected into the CLTA.

For *IAB type 1-O*, the transmitter intermodulation requirement is captured by the co-location transmitter intermodulation scenario case, in which the interfering signal is injected into the CLTA.

### 6.8.2 Minimum requirement

The minimum requirement for *IAB -DU type 1-O* and *IAB -MT type 1-O* is defined in TS 38.174 [x], clause 9.8.2.

The OTA transmitter intermodulation requirement is not applicable for *IAB type 2-O*.

### 6.8.3 Test purpose

The test purpose is to verify the ability of the transmitter units associated with the *RIB* under test to restrict the generation of intermodulation products in its nonlinear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter unit via the RDN and antenna array from a co-located base station to below specified levels.

### 6.8.4 Method of test

#### 6.8.4.1 Initial conditions

Test environment: normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

*IAB RF Bandwidth* positions to be tested for multi-carrier:

- MRFBW in *single-band RIB*, see clause 4.9.1;

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in *multi-band RIB*, see clause 4.9.1.

In addition, for *multi-band RIB*:

- For BRFBW\_T'RFBW, emission testing above the highest operating band may be omitted.

- For B'RFBW\_TRFBW, emission testing below the lowest operating band may be omitted.

Directions to be tested: The FR1 requirement is specified as co-location requirement. For general description of co-location requirements, refer to clause 4.12.

#### 6.8.4.2 Procedure

1) Select a CLTA according to the description in clause 4.12 and parameters given in table 4.12.2.2-1.

2) Place the CLTA according to the description in clause 4.12 and parameters given in table 4.12.2.3-1.

3) The test antenna(s) shall be dual (or single) polarized covering the same frequency range as the IAB and the emission frequencies.

4) Several test antennas are required to cover both the IABand the whole emission frequency range.

5) Connect test antenna and CLTA to the measurement equipment as shown in annex E.1.5.

6) During the OTA emission measurements at the test antenna conducted output(s), both IAB and CLTA are rotated around same axis.

7) The OTA emission measurement method shall be TRP, according to the procedure described in annex I.

8) The measurement device (signal analyzer) characteristics shall be:

- Detection mode: True RMS.

9) Set the IAB node to transmit:

For IAB-DU:

- Set the IAB-DUto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the IAB-DU declared to be capable of multi-carrier and/or CA operation, set the IAB-DU to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test models on all carriers configured.

For IAB-MT:- Set the IAB-MTto transmit maximum power according to the applicable test configuration in clause 4.X using the corresponding test models or set of physical channels in clause 4.9.x.

- For the IAB-MT declared to be capable of multi-carrier and/or CA operation, set the IAB-MT to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.X.X and 4.X using the corresponding test models on all carriers configured.

10) Generate the interfering signal for *IAB node* via the CLTA. The CLTA is fed with a power level equal to declared Prated,t,TRP, divided over all the supported polarizations, from the same signal generator source:

For IAB-DU:

- using test model as defined in clause 4.9.2 for IAB-DU, at a centre frequency offset according to the conditions in table 9.8.2-1 in TS 38.174 [x], but exclude interfering frequencies that are outside of the allocated downlink operating band or interfering frequencies that are not completely within the sub-block gap or within the *Inter RF Bandwidth gap*.

For IAB-MT:

- using test model as defined in clause 4.9.x for IAB-MT, at a centre frequency offset according to the conditions in table 9.8.2-1 in TS 38.174 [x], but exclude interfering frequencies that are outside of the allocated downlink operating band or interfering frequencies that are not completely within the sub-block gap or within the *Inter RF Bandwidth gap*.

11) Adjust the interfering signal level at the CLTA conducted input(s) as defined in:

- transmitter intermodulation table 9.8.2-1 in TS 38.174 [x].

12) If the interferer signal is applicable according to clause 4.7, perform the unwanted emission tests specified in clauses 6.7.3 (OTA ACLR) and 6.7.4 (OTA OBUE) for all third and fifth order intermodulation products which appear in the frequency ranges defined in clauses 6.7.3 and 6.7.4 (Note 2). The width of the intermodulation products shall be taken into account.

13) If the interferer signal is applicable according to clause 4.7, perform the Transmitter spurious emissions test as specified in clause 6.7.5 (OTA spurious emission), except OTA co-location spurious emission, for all third and fifth order intermodulation products which appear in the frequency ranges defined in clause 6.7.5 (Note 2). The width of the intermodulation products shall be taken into account.

14) Verify that the emission level does not exceed the required level in clause 6.8.5 (Test requirements) with the exception of interfering signal frequencies.

15) Repeat the test for the remaining interfering signal centre frequency offsets according to the conditions of:

- transmitter intermodulation table 9.8.2-1 in TS 38.174 [2].

16) Repeat the test for the remaining interfering signals defined in clause 4.7 for requirements 6.7.3 (OTA ACLR), 6.7.4 (OTA OBUE) and 6.7.5 (OTA spurious emission), except OTA co-location spurious emission.

In addition, for *multi-band RIB,* the following steps shall apply:

17) For *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

NOTE 1: The third order intermodulation products are centred at 2F1±F2 and 2F2±F1. The fifth order intermodulation products are centred at 3F1±2F2, 3F2±2F1, 4F1±F2, and 4F2±F1 where F1 represents the test signal centre frequency or centre frequency of each sub-block and F2 represents the interfering signal centre frequency. The widths of intermodulation products are:

- (n\*BWF1 + m\* BWF2) for the nF1±mF2 products;

- (n\* BWF2 + m\* BWF1) for the nF2±mF1 products;

 where BWF1 represents the test wanted signal RF bandwidth or channel bandwidth in case of single carrier, or sub-block bandwidth and BWF2 represents the interfering signal channel bandwidth.

NOTE 2: During the conformance test the interferer signal can be applied on one side of the wanted signal, while the transmitter intermodulation emission is measured only on the opposite side of the wanted signal. This applies for intermodulation products which are within the operating band or OBUE region.

### 6.8.5 Test requirements

#### 6.8.5.1 Requirement for IAB-DU and IAB-MT type 1-O

The transmitter intermodulation level shall not exceed the TRP unwanted emission limits specified for OTA transmitter spurious emission in clause 6.7.5 (except co-location with other base stations), OTA out-of-band emissions in clause 6.7.4 and OTA ACLR in clause 6.7.3 in the presence of a wanted signal and an interfering signal, defined in table 6.8.5.1-1.

The requirement is applicable outside the *IAB RF Bandwidth edges*. The interfering signal offset is defined relative to the *IAB RF Bandwidth* *edges* or *Radio Bandwidth* edges.

For RIBs supporting operation in *non-contiguous spectrum*, the requirement is also applicable inside a *sub-block gap* for interfering signal offsets where the interfering signal falls completely within the *sub-block gap*. The interfering signal offset is defined relative to the *sub-block* edges.

For RIBs supporting operation in multiple *operating bands*, the requirement shall apply relative to the *IAB RF Bandwidth* *edges* of each *operating band*. In case the inter *RF Bandwidth* gap is less than 3\*BWChannel MHz (where BWChannel is the minimal *IAB channel bandwidth* of the band), the requirement in the gap shall apply only for interfering signal offsets where the interfering signal falls completely within the inter *RF Bandwidth* gap.

Table 6.8.5.1-1: Interfering and wanted signals for the OTA transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal | NR single or multi-carrier, or multiple intra-band contiguously or non-contiguously aggregated carriers |
| Interfering signal type | NR signal the minimum *IAB-DU channel bandwidth* (BWChannel) or *IAB-MT channel bandwidth* (BWChannel) with 15 kHz SCS of the band defined in clause 5.3.5 |
| Interfering signal level | The interfering signal level is the same power level as the IAB (Prated,t,TRP) fed into a *co-location reference antenna*.. |
| Interfering signal centre frequency offset from the lower (upper) edge of the wanted signal or edge of *sub-block* inside a gap | , for n=1, 2 and 3 |
| NOTE 1: Interfering signal positions that are partially or completely outside of any downlink *operating band* of the IAB are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink *operating bands* in the same geographical area.NOTE 2: In Japan, note 1 is not applied in Band n77, n78, n79.NOTE 3: The Prated,t,TRP is split between supported polarizations at the CLTA input ports. |

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