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Source: ZTE Corporation

Title: TP for TS 38.108 OTA Rx requirements(10.3, 10.4,10.6 and 10.9)

Agenda Item: 10.13.3.2

Document for: Approval

# **Introduction**

In terms of the work split in the approved WF[1]. This contribution provides a text proposal to TS38.108 [2] on:

* Subclause 10.3: OTA reference sensitivity level
* Subclause 10.4: OTA dynamic range
* Subclause 10.6: OTA out-of-blocking
* Subclause 10.9: OTA in-channel selectivity

# **Reference**

[1] R4-2203080, Way Forward on NTN\_solutions\_Part1, THALES

[2] R4-2203086, Draft skeleton for TS 38.101-8, THALES

# Text Proposal

**----- Start of TP -----**

## 10.3 OTA reference sensitivity level

### 10.3.1 General

The OTA REFSENS requirement is a *directional requirement* and is intended to ensure the minimum OTA reference sensitivity level for a declared *OTA REFSENS RoAoA*. The OTA reference sensitivity power level EISREFSENS is the minimum mean power received at the RIB at which a reference performance requirement shall be met for a specified reference measurement channel.

The OTA REFSENS requirement shall apply to each supported polarization, under the assumption of *polarization match*.

### 10.3.2 Minimum requirement for *SAN type 1-O*

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in the corresponding table and annex A.1 when the OTA test signal is at the corresponding EISREFSENS level and arrives from any direction within the *OTA REFSENS RoAoA.*

Table 10.3.2-1: GEO SAN reference sensitivity levels

|  |  |  |  |
| --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Sub-carrier spacing (kHz) | Reference measurement channel | OTA reference sensitivity level, EISREFSENS(dBm) |
| 5, 10, 15 | 15 | G-FR1-A1-1 | -99.3 - ΔOTAREFSENS |
| 10, 15  | 30 | G-FR1-A1-2 | -99.4 - ΔOTAREFSENS |
| 10, 15 | 60 | G-FR1-A1-3 |  -96.5 - ΔOTAREFSENS |
| 20  | 15 | G-FR1-A1-4 |  -92.9 - ΔOTAREFSENS |
| 20 | 30 | G-FR1-A1-5 | -93.2 - ΔOTAREFSENS |
| 20  | 60 | G-FR1-A1-6 | -93.3 - ΔOTAREFSENS |
| NOTE: EISREFSENS is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *SAN channel bandwidth*. |

Table 10.3.2-1: LEO 600 and 1200 SAN reference sensitivity levels

|  |  |  |  |
| --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Sub-carrier spacing (kHz) | Reference measurement channel | OTA reference sensitivity level, EISREFSENS(dBm) |
| 5, 10, 15 | 15 | G-FR1-A1-1 | -102.4 - ΔOTAREFSENS |
| 10, 15  | 30 | G-FR1-A1-2 | -102.5 - ΔOTAREFSENS |
| 10, 15 | 60 | G-FR1-A1-3 | -99.6 - ΔOTAREFSENS |
| 20  | 15 | G-FR1-A1-4 | -96.0 - ΔOTAREFSENS |
| 20  | 30 | G-FR1-A1-5 | -96.3 - ΔOTAREFSENS |
| 20 | 60 | G-FR1-A1-6 | -96.4 - ΔOTAREFSENS |
| NOTE: EISREFSENS is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *SAN channel bandwidth*. |

## 10.4 OTA dynamic range

### 10.4.1 General

The OTA dynamic range is a measure of the capability of the receiver unit to receive a wanted signal in the presence of an interfering signal inside the received *SAN channel bandwidth*.

The requirement shall apply at the RIB when the AoA of the incident wave of a received signal and the interfering signal are from the same direction and are within the *OTA REFSENS RoAoA.*

The wanted and interfering signals apply to each supported polarization, under the assumption of *polarization match*.

### 10.4.2 Minimum requirement for *SAN type 1-O*

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in annex A.2 with parameters specified in table 10.4.2-1 for LEO1200 SAN, in table 10.4.2-2 for LEO600 SAN.

Table 10.4.2-1: LEO1200 SAN dynamic range

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Subcarrier spacing (kHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | 15 | G-FR1-A2-1 | -79.4- ΔOTAREFSENS  | -91.2- ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-A2-2  | -80.1- ΔOTAREFSENS  |  |  |
| 10 | 15 | G-FR1-A2-1 | -79.4- ΔOTAREFSENS  | -88- ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-A2-2  | -80.1- ΔOTAREFSENS  |  |  |
|  | 60 | G-FR1-A2-3  | -77.1- ΔOTAREFSENS  |  |  |
| 15 | 15 | G-FR1-A2-1 | -79.4- ΔOTAREFSENS  | -86.2- ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-A2-2  | -80.1- ΔOTAREFSENS  |  |  |
|  | 60 | G-FR1-A2-3 | -77.1- ΔOTAREFSENS  |  |  |
| 20 | 15 | G-FR1-A2-4 | -73.2- ΔOTAREFSENS  | -84.9- ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-A2-5 | -73.2- ΔOTAREFSENS  |  |  |
|  | 60 | G-FR1-A2-6 | -73.5- ΔOTAREFSENS  |  |  |
| NOTE: The wanted signal mean power is the power level of a single instance of the corresponding reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *SAN channel bandwidth*. |

Table 10.4.2-2: LEO600 SAN dynamic range

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Subcarrier spacing (kHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | 15 | G-FR1-A2-1 | -73.4- ΔOTAREFSENS  | -85.2- ΔOTAREFSENS  | AWGN |
|  | 30 | G-FR1-A2-2  | -74.1- ΔOTAREFSENS  |  |  |
| 10 | 15 | G-FR1-A2-1 | -73.4- ΔOTAREFSENS  | -82.0- ΔOTAREFSENS  | AWGN |
|  | 30 | G-FR1-A2-2  | -74.1- ΔOTAREFSENS  |  |  |
|  | 60 | G-FR1-A2-3  | -71.1- ΔOTAREFSENS  |  |  |
| 15 | 15 | G-FR1-A2-1 | -73.4- ΔOTAREFSENS  | -80.2- ΔOTAREFSENS  | AWGN |
|  | 30 | G-FR1-A2-2  | -74.1- ΔOTAREFSENS  |  |  |
|  | 60 | G-FR1-A2-3 | -71.1- ΔOTAREFSENS  |  |  |
| 20 | 15 | G-FR1-A2-4 | -67.2- ΔOTAREFSENS  | -78.9- ΔOTAREFSENS  | AWGN |
|  | 30 | G-FR1-A2-5 | -67.2- ΔOTAREFSENS  |  |  |
|  | 60 | G-FR1-A2-6 | -67.5- ΔOTAREFSENS  |  |  |
| NOTE: The wanted signal mean power is the power level of a single instance of the corresponding reference measurement channel. This requirement shall be met for each consecutive application of a single instance of the reference measurement channel mapped to disjoint frequency ranges with a width corresponding to the number of resource blocks of the reference measurement channel each, except for one instance that might overlap one other instance to cover the full *SAN channel bandwidth*. |

*<Next changes>*

## 10.6 OTA out-of-band blocking

### 10.6.1 General

The OTA out-of-band blocking characteristics are a measure of the receiver unit ability to receive a wanted signal at the *RIB* at its assigned channel in the presence of an unwanted interferer.

### 10.6.2 Minimum requirement for *SAN type 1-O*

#### 10.6.2.1 General minimum requirement

The requirement shall apply at the RIBwhen the AoA of the incident wave of the received signal and the interfering signal are from the same direction and are within the *minSENS RoAoA*.

The wanted signal applies to each supported polarization, under the assumption of *polarization match.* The interferer shall be *polarization matched* in-band and the polarization maintained for out-of-band frequencies.

For OTA wanted and OTA interfering signals provided at the RIB using the parameters in table 10.6.2.1-1, the following requirements shall be met:

- The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel. The reference measurement channel for the OTA wanted signal is identified in clause 10.3.2 for each *SAN channel bandwidth* and further specified in annex A.1.

For *SAN type 1-O* the OTA out-of-band blocking requirement apply from 30 MHz to FUL,low - ΔfOOB and from FUL,high + ΔfOOB up to 12750 MHz, including the downlink frequency range of the FDD *operating band* for SAN. The ΔfOOB for *SAN type 1-O* is defined in table 10.5.2.2-0.

Table 10.6.2.1-1: OTA out-of-band blocking performance requirement

|  |  |  |
| --- | --- | --- |
| Wanted signal mean power (dBm) | Interfering signal RMS field-strength (V/m) | Type of interfering Signal |
| EISminSENS + 6 dB (Note 1) | 0.36 | CW carrier |
| NOTE 1: EISminSENS depends on the *channel bandwidth* as specified in clause 10.2.NOTE 2: The RMS field-strength level in V/m is related to the interferer EIRP level at a distance described as , where EIRP is in W and r is in m; for example, 0.36 V/m is equivalent to 36 dBm at fixed distance of 30 m. |

*<Next changes>*

## 10.9 OTA in-channel selectivity

### 10.9.1 General

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations in the presence of an interfering signal received at a larger power spectral density. In this condition a throughput requirement shall be met for a specified reference measurement channel. The interfering signal shall be an NR signal as specified in annex A.1 and shall be time aligned with the wanted signal.

### 10.9.2 Minimum requirement for *SAN type 1-O*

The requirement shall apply at the RIBwhen the AoA of the incident wave of the received signal and the interfering signal are the same direction and are within the *minSENS RoAoA*

The wanted and interfering signals applies to each supported polarization, under the assumption of *polarization match.*

For a wanted and an interfering signal coupled to the RIB, the following requirements shall be met:

- For *SAN type 1-O*, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in annex A.1 with parameters specified in table 10.9.2-1 for GEO SAN, in table 10.9.2-2 for LEO1200 SAN and in table 10.9.2-3 for LEO600 SAN. The characteristics of the interfering signal is further specified in annex D.

Table 10.9.2-1: GEO SAN ICS requirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Subcarrier spacing (kHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) | Type of interfering signal |
| 5 | 15 | G-FR1-A1-7 | -98.2  | -95.0  | DFT-s-OFDM NR signal, 15 kHz SCS,10 RBs |
| 10,15,20 | 15 | G-FR1-A1-1 | -96.3  | -91.1  | DFT-s-OFDM NR signal, 15 kHz SCS,25 RBs |
| 5 | 30 | G-FR1-A1-8 | -98.9  | -95.0  | DFT-s-OFDM NR signal, 30 kHz SCS,5 RBs |
| 10,15,20 | 30 | G-FR1-A1-2 | -96.4  | -92.0  | DFT-s-OFDM NR signal, 30 kHz SCS,10 RBs |
| 10,15,20 | 60 | G-FR1-A1-9 | -95.8  | -92.0  | DFT-s-OFDM NR signal, 60 kHz SCS,5 RBs |
| NOTE: Wanted and interfering signal are placed adjacently around Fc, where the Fc is defined for *SAN channel bandwidth* ofthe wanted signalaccording to the table 5.4.2.2-1. The aggregated wanted and interferer signal shall be centred in the *SAN channel bandwidth* of the wanted signal. |

Table 10.9.2-2: LEO1200 SAN ICS requirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Subcarrier spacing (kHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) | Type of interfering signal |
| 5 | 15 | G-FR1-A1-7 | -101.3  | -86.1  | DFT-s-OFDM NR signal, 15 kHz SCS,10 RBs |
| 10,15,20 | 15 | G-FR1-A1-1 | -99.4  | -82.2  | DFT-s-OFDM NR signal, 15 kHz SCS,25 RBs |
| 5 | 30 | G-FR1-A1-8 | -102.0  | -86.1  | DFT-s-OFDM NR signal, 30 kHz SCS,5 RBs |
| 10,15,20 | 30 | G-FR1-A1-2 | -99.5  | -83.1  | DFT-s-OFDM NR signal, 30 kHz SCS,10 RBs |
| 10,15,20 | 60 | G-FR1-A1-9 | -98.9  | -83.1  | DFT-s-OFDM NR signal, 60 kHz SCS,5 RBs |
| NOTE: Wanted and interfering signal are placed adjacently around Fc, where the Fc is defined for *SAN channel bandwidth* ofthe wanted signalaccording to the table 5.4.2.2-1. The aggregated wanted and interferer signal shall be centred in the *SAN channel bandwidth* of the wanted signal. |

Table 10.9.2-3: LEO600 SAN ICS requirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Subcarrier spacing (kHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) | Type of interfering signal |
| 5 | 15 | G-FR1-A1-7 | -101.3  | -80.1  | DFT-s-OFDM NR signal, 15 kHz SCS,10 RBs |
| 10,15,20 | 15 | G-FR1-A1-1 | -99.4  | -76.2  | DFT-s-OFDM NR signal, 15 kHz SCS,25 RBs |
| 5 | 30 | G-FR1-A1-8 | -102.0  | -80.1  | DFT-s-OFDM NR signal, 30 kHz SCS,5 RBs |
| 10,15,20 | 30 | G-FR1-A1-2 | -99.5  | -77.1  | DFT-s-OFDM NR signal, 30 kHz SCS,10 RBs |
| 10,15,20 | 60 | G-FR1-A1-9 | -98.9  | -77.1  | DFT-s-OFDM NR signal, 60 kHz SCS,5 RBs |
| NOTE: Wanted and interfering signal are placed adjacently around Fc, where the Fc is defined for *SAN channel bandwidth* ofthe wanted signalaccording to the table 5.4.2.2-1. The aggregated wanted and interferer signal shall be centred in the *SAN channel bandwidth* of the wanted signal. |

**----- End of TP -----**