**3GPP TSG-RAN WG4 Meeting # 116 *R4-250xxxx***

**Bengaluru, IN, 25th – 29th Aug, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.108** | **CR** | **0124** | **rev** | **1** | **Current version:** | **18.7.0** |  |
|  | | | | | | | | |
| *For* ***HE******LP*** *on using this form: comprehensive instructions can be found at  http://www.3gpp.org/Change-Requests.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | (TEI18) CR for 38.108, Correction on SAN channel bandwidth [NTNNBIoT\_inbandNTNNR] | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI18 | | | | |  | ***Date:*** | | | 2025-08-18 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | To correct the SAN channel bandwidth for NB-IoT operation in NTN NR in-band, since all channel bandwidth are incorrectly written as BS channel bandwidth, not SAN channel bandwidth. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | To correct the SAN channel bandwidth for NB-IoT operation in NTN NR in-band in Clause 3, 6.3, 7.3, 7.5, 7.8, 9.4, 10.4, 10.9 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The SAN channel bandwidth for NB-IoT operation in NTN NR in-band would be incorrect. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3, 6.3, 7.3, 7.5, 7.8, 9.4, 10.4, 10.9 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revised from R4-2509365 | | | | | | | | |

<Start of Change>

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**basic limit:** emissions limit relating to the power supplied by a single transmitter to a single antenna transmission line in ITU-R SM.329 [2] used for the formulation of unwanted emission requirements for FR1-NTN.

**beam:** beam (of the antenna) is the main lobe of the radiation pattern of an *antenna array.*

NOTE: For certain *antenna array*, there may be more than one beam.

**beam centre direction:** direction equal to the geometric centre of the half-power contour of the beam.

**beam direction pair:** data set consisting of the *beam centre direction* and the related *beam peak direction.*

**beam peak direction:** direction where the maximum EIRP is found.

**beamwidth:** beam which has a half-power contour that is essentially elliptical, the half-power beamwidths in the two pattern cuts that respectively contain the major and minor axis of the ellipse.

**Channel edge:** lowest or highest frequency of the NR carrier, separated by the *SAN channel bandwidth*.

**directional requirement:** requirement which is applied in a specific direction within the *OTA coverage range* for the Tx and when the AoA of the incident wave of a received signal is within the *OTA REFSENS RoAoA* or the *minSENS RoAoA* as appropriate for the receiver.

**Enhanced channel raster**: channel raster with a 10 kHz granularity in bands with a 100 kHz channel raster.

**equivalent isotropic radiated power:** equivalent power radiated from an isotropic directivity device producing the same field intensity at a point of observation as the field intensity radiated in the direction of the same point of observation by the discussed device.

NOTE: Isotropic directivity is equal in all directions (i.e. 0 dBi).

**equivalent isotropic sensitivity:** sensitivity for an isotropic directivity device equivalent to the sensitivity of the discussed device exposed to an incoming wave from a defined AoA.

NOTE 1: The sensitivity is the minimum received power level at which specific requirement is met.

NOTE 2: Isotropic directivity is equal in all directions (i.e. 0 dBi).

**feeder link:** Wireless link between satellite-gateway and satellite.

**Geostationary Earth Orbit:** Circular orbit at 35,786 km above the Earth's equator and following the direction of the Earth's rotation. An object in such an orbit has an orbital period equal to the Earth's rotational period and thus appears motionless, at a fixed position in the sky, to ground observers.

**Low Earth Orbit:** Orbit around the Earth with an altitude between 300 km, and 1500 km.

**Highest Carrier:** The carrier with the highest carrier frequency transmitted/received in a specified frequency band.

**Lowest Carrier:** The carrier with the lowest carrier frequency transmitted/received in a specified frequency band.

**maximum carrier output power:** mean power level measured per carrier at the indicated interface, during the *transmitter ON period* in a specified reference condition.

**maximum carrier TRP output power:** mean power level measured perRIB during the *transmitter ON period* for a specific carrier in a specified reference condition and corresponding to the declared *rated carrier TRP output* power (Prated,c,TRP).

**maximum total output power:** mean power level measured within the *operating band* at the indicated interface, during the *transmitter ON period* in a specified reference condition.

**maximum total TRP output power:** mean power level measured perRIB during the *transmitter ON period* in a specified reference condition and corresponding to the declared *rated total TRP output* power (Prated,t,TRP).

**measurement bandwidth**: RF bandwidth in which an emission level is specified.

**minSENS:** the lowest declared EIS value for the OSDD's declared for OTA sensitivity requirement.

**minSENS RoAoA:** The *reference RoAoA* associated with the OSDD with the lowest declared EIS.

**minimum elevation angle**: Minimum angle under which the satellite can be seen by a UE.

**NB-IoT operation in NTN NR in-band:** NB-IoT is operating in-band when it is located within a NR transmission bandwidth configuration plus 15 kHz at each edge but not within the NR minimum guard band GBChannel.

**NB-IoT operation in NTN NR guard band:** NB-IoT is operating in guard band when it is located within a NR SAN channel bandwidth but is not NB-IoT operation in NTN NR in-band.

**necessary bandwidth:** The width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

**non-terrestrial networks:** Networks, or segments of networks, using an airborne or space-borne vehicle to embark a transmission equipment relay node or SAN.

**operating band:** frequency range in which NR operates (paired or unpaired), that is defined with a specific set of technical requirements.

NOTE: The *operating band*(s) for a SAN is declared by the manufacturer according to the designations in tables 5.2-1 and 5.2-2.

**OTA coverage range**: a common range of directions within which TX OTA requirements that are neither specified in the *OTA peak directions sets* nor as *TRP requirement* are intended to be met.

**OTA peak directions set:** set(s) of *beam peak directions* within which certain TX OTA requirements are intended to be met, where all *OTA peak directions set(s)* are subsets of the *OTA coverage range.*

NOTE:     The *beam peak directions* are related to a corresponding contiguous range or discrete list of *beam centre directions*by the *beam direction pairs* included in the set.

**OTA REFSENS RoAoA:** the RoAoA determined by the contour defined by the points at which the achieved EIS is 3dB higher than the achieved EIS in the reference direction assuming that for any AoA, the receiver gain is optimized for that AoA.

NOTE: This contour will be related to the average element/sub-array radiation pattern 3dB beamwidth.

**OTA sensitivity directions declaration:** set of manufacturer declarations comprising at least one set of declared minimum EIS values (with *SAN channel bandwidth*), and related directions over which the EIS applies.

NOTE: All the directions apply to all the EIS values in an OSDD.

**polarization match:** condition that exists when a plane wave, incident upon an antenna from a given direction, has a polarization that is the same as the receiving polarization of the antenna in that direction.

**radiated interface boundary**: *operating band* specific radiated requirements reference where the radiated requirements apply.

NOTE: For requirements based on EIRP/EIS, the *radiated interface boundary* is associated to the far-field region.

**Radio Bandwidth:** frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier.

**rated beam EIRP:** For a declared beam and *beam direction pair*, the *rated beam EIRP* level is the maximum power that the SAN is declared to radiate at the associated *beam peak direction* during the *transmitter ON period.*

**rated carrier output power:** mean power level associated with a particular carrier the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition.

**rated carrier TRP output power:** mean power level declared by the manufacturer per carrier, for SAN operating in single carrier, multi-carrier, or carrier aggregation configurations that the manufacturer has declared to be available at the RIB during the *transmitter ON period.*

**rated total output power:** mean power level associated with a particular *operating band* the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition.

**rated total TRP output power:** mean power level declared by the manufacturer, that the manufacturer has declared to be available at the RIB during the *transmitter ON period.*

**reference beam direction pair:** declared *beam direction pair*, including reference *beam centre direction* and reference *beam peak direction* where the reference *beam peak direction* is the direction for the intended maximum EIRP within the *OTA peak directions set.*

**receiver target:** AoA in which reception is performedby *SAN types 1-H* or *SAN type 1-O.*

**receiver target redirection range:** union of all the *sensitivity RoAoA* achievable through redirecting the *receiver target* related to particular OSDD.

**receiver target reference direction:** direction inside the *OTA sensitivity directions declaration* declared by the manufacturer for conformance testing. For an OSDD without *receiver target redirection range*, this is a direction inside the *sensitivity RoAoA.*

**reference RoAoA**: the *sensitivity RoAoA* associated with the *receiver target reference direction* for each OSDD.

**requirement set:** one of the NR SAN requirement's set as defined for *SAN type 1-H*, *SAN type 1-O.*

**SAN channel bandwidth**: RF bandwidth supporting a single NR RF carrier with the *transmission bandwidth* configured in the uplink or downlink.

NOTE 1: The *SAN channel bandwidth* is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

NOTE 2: It is possible for the SAN to transmit to and/or receive from one or more satellite UE bandwidth parts that are smaller than or equal to the *SAN transmission bandwidth configuration*, in any part of the *SAN transmission bandwidth configuration*.

**SAN RF Bandwidth**: RF bandwidth in which a SAN transmits and/or receives single or multiple carrier(s) within a supported *operating band.*

NOTE: In single carrier operation, the *SAN RF Bandwidth* is equal to the *SAN channel bandwidth*.

**SAN RF Bandwidth edge:** frequency of one of the edges of the *SAN RF Bandwidth*.

**SAN transmission bandwidth configuration**: set of resource blocks located within the *SAN channel bandwidth* which may be used for transmitting or receiving by the SAN.

**SAN type 1-H:** Satellite Access Node operating at FR1-NTN with a requirement set consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB.

**SAN type 1-O:** Satellite Access Node operating at FR1-NTN with a requirement set consisting only of OTA requirements defined at the RIB.

**SAN type 2-O:** Satellite Access Node operating at FR2-NTN with a requirement set consisting only of OTA requirements defined at the RIB.

**SAN total assigned bandwidth:** Bandwidth of the total assigned band (frequencies range) as defined in SM.1541-6 [9].

**SAN transponder bandwidth:** Total bandwidth of the carrier(s) in operation by one SAN transponder.

NOTE: When the SAN transponder operates one carrier only, the SAN transponder bandwidth is equal to the SAN channel bandwidth of this carrier.

**SAN transponder:** part of the SAN permitting to receive, channelize and transmit signals within an allocated bandwidth.

**satellite:** A space-borne vehicle embarking a transparent payload, or a regenerative payload telecommunication transmitter, placed into Low-Earth Orbit (LEO) or Geostationary Earth Orbit (GEO).

**Satellite Access Node**: node providing NR user plane and control plane protocol terminations towards NTN satellite capable UE, and connected via the NG interface to the 5GC. It encompasses a transparent payload on board a NTN platform, with satellite-gateway and gNB functions.

**satellite-gateway:** An earth station or gateway is located at the surface of Earth, and providing sufficient RF power and RF sensitivity for accessing to the satellite.

**sensitivity RoAoA:** RoAoA within the *OTA sensitivity directions declaration*, within which the declared EIS(s) of an OSDD is intended to be achieved at any instance of time for a specific SAN direction setting.

**TAB connector:** *transceiver array boundary* connector.

**total radiated power:** is the total power radiated by the antenna.

NOTE: The *total radiated power* is the power radiating in all direction for two orthogonal polarizations. *Total radiated power* is defined in both the near-field region and the far-field region.

**transceiver array boundary:** conducted interface between the transceiver unit array and the composite antenna.

**transmission bandwidth:** RF Bandwidth of an instantaneous transmission from a satellite UE or SAN, measured in resource block units.

<Next Change>

### 6.3.4 NB-IoT RB power dynamic range for NB-IoT operation in NTN NR in-band

#### 6.3.4.1 General

The NB-IoT RB power dynamic range (or NB-IoT power boosting) is the difference between the average power of NB-IoT REs (which occupy certain REs within a NR transmission bandwidth configuration plus 15 kHz at each edge but not within the NR minimum guard band GBChannel) and the average power over all REs (from both NB-IoT and the NR carrier containing the NB-IoT REs).

#### 6.3.4.2 Minimum Requirement

NB-IoT RB power dynamic range for NB-IoT operation in NTN NR in-band shall be larger than or equal to the level specified in Table 6.3.4.2-1. This power dynamic range level is only required for one NB-IoT RB.

Table 6.3.4.2-1: NB-IoT RB power dynamic range for NB-IoT operation in NTN NR in-band

|  |  |  |
| --- | --- | --- |
| SAN channel bandwidth (MHz) | NB-IoT RB frequency position | NB-IoT RB power dynamic range (dB) |
| 5, 10 | Any | +6 |
| 15 | Within center 77\*180kHz+15kHz at each edge | +6 |
|  | Other | +3 |
| 20 | Within center 102\*180kHz+15kHz at each edge | +6 |
|  | Other | +3 |
| 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | Within center 90% of SAN channel bandwidth | +6 |
|  | Other | +3 |

<Next Change>

## 7.3 Dynamic range

### 7.3.1 General

The dynamic range is specified as a measure of the capability of the receiver to receive a wanted signal in the presence of an interfering signal at the *TAB connector* for *SAN type 1-H* inside the received SAN channel bandwidth. In this condition, a throughput requirement shall be met for a specified reference measurement channel. The interfering signal for the dynamic range requirement is an AWGN signal.

### 7.3.2 Minimum requirements for *SAN type 1-H*

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 7.3.2-1 for LEO.

For NB-IoT operation in NTN NR in-band, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A of TS 36.108 [17] with parameters specified in table 7.3.1-1a for LEO SAN.

Table 7.3.2-1: SAN LEO class 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-NTN-A2-1 | -76.4 | -88.2 | AWGN |
|  | 30 | G-FR1-NTN-A2-2 | -77.1 |  |  |
| 10 | 15 | G-FR1-NTN-A2-1 | -76.4 | -85.0 | AWGN |
|  | 30 | G-FR1-NTN-A2-2 | -77.1 |  |  |
|  | 60 | G-FR1-NTN-A2-3 | -74.1 |  |  |
| 15 | 15 | G-FR1-NTN-A2-1 | -76.4 | -83.2 | AWGN |
|  | 30 | G-FR1-NTN-A2-2 | -77.1 |  |  |
|  | 60 | G-FR1-NTN-A2-3 | -74.1 |  |  |
| 20 | 15 | G-FR1-NTN-A2-4 | -70.2 | -81.9 | AWGN |
|  | 30 | G-FR1-NTN-A2-5 | -70.2 |  |  |
|  | 60 | G-FR1-NTN-A2-6 | -70.5 |  |  |
| 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 7.3.1-1a: LEO SAN dynamic range for NB-IoT operation in NTN NR in-band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | FRC A15-1 in Annex A.15 in TS 36.108 [17] | -89.4 | -88.2 | AWGN |
| 10 | -85.0 |
| 15 | -83.2 |
| 20 | -81.9 |
| 5 | FRC A15-2 in Annex A.15 in TS 36.108 [17] | -95.3 | -88.2 | AWGN |
| 10 | -85.0 |
| 15 | -83.2 |
| 20 | -81.9 |

<Next Change>

## 7.5 Out-of-band blocking

### 7.5.1 General

The out-of-band blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel at the *TAB connector* for *SAN type 1-H* in the presence of an unwanted interferer out of the *operating band*, which is a CW signal for out-of-band blocking.

### 7.5.2 Minimum requirements for *SAN type 1-H*

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted and an interfering signal coupled to *SAN type 1-H* *TAB connector* using the parameters in table 7.5.2-1.

The reference measurement channel for the wanted signal is identified in clause 7.2.2 for each *SAN channel bandwidth* and further specified in annex A.1.

The out-of-band blocking requirement apply from 1 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-H* is defined in table 7.5.2-2.

For NB-IoT operation in NTN NR in-band, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted and an interfering signal coupled to *SAN type 1-H* *TAB connector* using the parameters in table 7.5.2-1. The reference measurement channel for the NB-IoT wanted signal is identified in clause 7.2.2 of TS 36.108 [17].

Minimum conducted requirement is defined at the *TAB connector* for *SAN type 1-H.*

Table 7.5.2-1: Out-of-band blocking requirement for NR

|  |  |  |
| --- | --- | --- |
| Wanted signal mean power (dBm) | Interfering signal mean power (dBm) | Type of interfering signal |
| PREFSENS +6 dB (NOTE 1, 2, 3) | -44 | CW carrier |
| NOTE 1: PREFSENS depends on the *SAN channel bandwidth*.  NOTE 2: PREFSENS depends on the RAT. For NR, PREFSENS depends also on the *SAN channel bandwidth* as specified in Table 7.2.2-1, 7.2.2-2, and 7.2.2-3. For NB-IoT, PREFSENS depends also on the *sub-carrier spacing* as specified in tables 7.2.2-3, 7.2.2-4 of TS 36.108 [17].  NOTE 3: For NB-IoT, up to 24 exceptions are allowed for spurious response frequencies in each wanted signal frequency when measured using a 1MHz step size. For these exceptions the above throughput requirement shall be met when the blocking signal is set to a level of -46 dBm for 3.75 kHz subcarrier spacing. In addition, each group of exceptions shall not exceed three contiguous measurements using a 1MHz step size. | | |

Table 7.5.2-2: ΔfOOB offset for NR *operating bands*

|  |  |  |
| --- | --- | --- |
| SAN type | *Operating band* characteristics | ΔfOOB (MHz) |
| *SAN type 1-H* | FUL,high – FUL,low < 100 MHz | 20 |

<Next Change>

## 7.8 In-channel selectivity

### 7.8.1 General

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations at *TAB connector* for *SAN type 1-H* 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 which is time aligned with the wanted signal.

### 7.8.2 Minimum requirements for *SAN type 1-H*

For *SAN type* *1-H*, 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 7.8.2-1 for GEO SAN, in table 7.8.2-2 for LEO SAN. The characteristics of the interfering signal is further specified in annex C.

For NB-IoT operation in NTN NR in-band, the throughput shall be ≥ 95% of the maximum throughput of the NB-IoT reference measurement channel as specified in Annex A of TS 36.108 [17] with parameters specified in table 7.8.2-1a for SAN GEO and in table 7.8.2-2a for SAN LEO.

Table 7.8.2-1: SAN GEO class 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-NTN-A1-7 | -98.2 | -92.0 | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10,15,20 | 15 | G-FR1-NTN-A1-1 | -96.3 | -88.1 | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | 30 | G-FR1-NTN-A1-8 | -98.9 | -92.0 | DFT-s-OFDM NR signal, 30 kHz SCS,  5 RBs |
| 10,15,20 | 30 | G-FR1-NTN-A1-2 | -96.4 | -89.0 | DFT-s-OFDM NR signal, 30 kHz SCS,  10 RBs |
| 10,15,20 | 60 | G-FR1-NTN-A1-9 | -95.8 | -89.0 | 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 7.8.2-1a: SAN GEO in-channel selectivity for NB-IoT operation in NTN NR in-band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | FRC A14-1 in Annex A.14 in TS 36.108 [17] | -121.9 | -92.0 | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -88.1 | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | FRC A14-2 in Annex A.14 in TS 36.108 [17] | -127.9 | -92.0 | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -88.1 | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| NOTE: Interfering signal is placed in one side of the Fc, while the NB-IoT PRB is placed on the other side. Both interfering signal and NB-IoT PRB are placed at the middle of the available PRB locations. The wanted NB-IoT tone is placed at the centre of this NB-IoT PRB. | | | | |

Table 7.8.2-2: SAN LEO class 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-NTN-A1-7 | -101.3 | -83.1 | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10,15,20 | 15 | G-FR1-NTN-A1-1 | -99.4 | -79.2 | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | 30 | G-FR1-NTN-A1-8 | -102.0 | -83.1 | DFT-s-OFDM NR signal, 30 kHz SCS,  5 RBs |
| 10,15,20 | 30 | G-FR1-NTN-A1-2 | -99.5 | -80.1 | DFT-s-OFDM NR signal, 30 kHz SCS,  10 RBs |
| 10,15,20 | 60 | G-FR1-NTN-A1-9 | -98.9 | -80.1 | 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 7.8.2-2a: SAN LEO in-channel selectivity for NB-IoT operation in NTN NR in-band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | FRC A14-1 in Annex A.14 in TS 36.108 [17] | -125.0 | -83.1 | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -79.2 | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | FRC A14-1 in Annex A.14 in TS 36.108 [17] | -131.0 | -83.1 | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -79.2 | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| NOTE: Interfering signal is placed in one side of the Fc, while the NB-IoT PRB is placed on the other side. Both interfering signal and NB-IoT PRB are placed at the middle of the available PRB locations. The wanted NB-IoT tone is placed at the centre of this NB-IoT PRB. | | | | |

<Next Change>

### 9.4.4 NB-IoT RB power dynamic range for NB-IoT operation in NTN NR in-band

#### 9.4.4.1 General

The NB-IoT RB power dynamic range (or NB-IoT power boosting) is the difference between the average power of NB-IoT REs (which occupy certain REs within a NR transmission bandwidth configuration plus 15 kHz at each edge but not within the NR minimum guard band GBChannel) and the average power over all REs (from both NB-IoT and the NR carrier containing the NB-IoT REs).

#### 9.4.4.2 Minimum Requirement

NB-IoT RB power dynamic range for NB-IoT operation in NTN NR in-band shall be larger than or equal to the level specified in Table 6.3.4.2-1. This power dynamic range level is only required for one NB-IoT RB.

Table 9.4.4.2-1: NB-IoT RB power dynamic range for NB-IoT operation in NTN NR in-band

|  |  |  |
| --- | --- | --- |
| SAN channel bandwidth (MHz) | NB-IoT RB frequency position | NB-IoT RB power dynamic range (dB) |
| 5, 10 | Any | +6 |
| 15 | Within center 77\*180kHz+15kHz at each edge | +6 |
|  | Other | +3 |
| 20 | Within center 102\*180kHz+15kHz at each edge | +6 |
|  | Other | +3 |
| 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | Within center 90% of SAN channel bandwidth | +6 |
|  | Other | +3 |

<Next Change>

## 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 LEO SAN.

For NB-IoT operation in NTN NR in-band, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A of TS 36.108 [17] with parameters specified in table 10.4.2-1a for LEO SAN.

Table 10.4.2-1: SAN LEO class 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-NTN-A2-1 | -76.4 - ΔOTAREFSENS | -88.2 - ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-NTN-A2-2 | -77.1 - ΔOTAREFSENS |  |  |
| 10 | 15 | G-FR1-NTN-A2-1 | -76.4 - ΔOTAREFSENS | -85.0 - ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-NTN-A2-2 | -77.1 - ΔOTAREFSENS |  |  |
|  | 60 | G-FR1-NTN-A2-3 | -74.1- ΔOTAREFSENS |  |  |
| 15 | 15 | G-FR1-NTN-A2-1 | -76.4- ΔOTAREFSENS | -83.2 - ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-NTN-A2-2 | -77.1 - ΔOTAREFSENS |  |  |
|  | 60 | G-FR1-NTN-A2-3 | -74.1 - ΔOTAREFSENS |  |  |
| 20 | 15 | G-FR1-NTN-A2-4 | -70.2 - ΔOTAREFSENS | -81.9 - ΔOTAREFSENS | AWGN |
|  | 30 | G-FR1-NTN-A2-5 | -70.2 - ΔOTAREFSENS |  |  |
|  | 60 | G-FR1-NTN-A2-6 | -70.5 - 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 10.4.2-1a: LEO SAN dynamic range for NB-IoT operation in NTN NR in-band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | FRC A15-1 in Annex A.15 in TS 36.108 [17] | -89.4 - ΔOTAREFSENS | -88.2 - ΔOTAREFSENS | AWGN |
| 10 | -85.0 - ΔOTAREFSENS |
| 15 | -83.2 - ΔOTAREFSENS |
| 20 | -81.9 - ΔOTAREFSENS |
| 5 | FRC A15-2 in Annex A.15 in TS 36.108 [17] | -95.3 - ΔOTAREFSENS | -88.2 - ΔOTAREFSENS | AWGN |
| 10 | -85.0 - ΔOTAREFSENS |
| 15 | -83.2 - ΔOTAREFSENS |
| 20 | -81.9 - 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 Change>

## 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 LEO SAN. The characteristics of the interfering signal is further specified in annex C.

For NB-IoT operation in NTN NR in-band, the throughput shall be ≥ 95% of the maximum throughput of the NB-IoT reference measurement channel as specified in Annex A of TS 36.108 [17] with parameters specified in table 10.9.2-1a for SAN GEO and in table 10.9.2-2a for SAN LEO.

Table 10.9.2-1: SAN GEO classICS 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-NTN-A1-7 | -98.2 - ΔminSENS | -92.0 - ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10,15,20 | 15 | G-FR1-NTN-A1-1 | -96.3 - ΔminSENS | -88.1 - ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | 30 | G-FR1-NTN-A1-8 | -98.9 - ΔminSENS | -92.0 - ΔminSENS | DFT-s-OFDM NR signal, 30 kHz SCS,  5 RBs |
| 10,15,20 | 30 | G-FR1-NTN-A1-2 | -96.4 - ΔminSENS | -89.0 - ΔminSENS | DFT-s-OFDM NR signal, 30 kHz SCS,  10 RBs |
| 10,15,20 | 60 | G-FR1-NTN-A1-9 | -95.8 - ΔminSENS | -89.0 - ΔminSENS | 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 10.9.2-1a: SAN GEO in-channel selectivity for NB-IoT operation in NTN NR in-band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | FRC A14-1 in Annex A.14 in TS 36.108 [17] | -121.9- ΔminSENS | -92.0 - ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -88.1- ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | FRC A14-2 in Annex A.14 in TS 36.108 [17] | -127.9- ΔminSENS | -92.0- ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -88.1 - ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| NOTE: Interfering signal is placed in one side of the Fc, while the NB-IoT PRB is placed on the other side. Both interfering signal and NB-IoT PRB are placed at the middle of the available PRB locations. The wanted NB-IoT tone is placed at the centre of this NB-IoT PRB. | | | | |

Table 10.9.2-2: SAN LEO class 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-NTN-A1-7 | -101.3 - ΔminSENS | -83.1 - ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10,15,20 | 15 | G-FR1-NTN-A1-1 | -99.4 - ΔminSENS | -79.2 - ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | 30 | G-FR1-NTN-A1-8 | -102.0 - ΔminSENS | -83.1 - ΔminSENS | DFT-s-OFDM NR signal, 30 kHz SCS,  5 RBs |
| 10,15,20 | 30 | G-FR1-NTN-A1-2 | -99.5 - ΔminSENS | -80.1 - ΔminSENS | DFT-s-OFDM NR signal, 30 kHz SCS,  10 RBs |
| 10,15,20 | 60 | G-FR1-NTN-A1-9 | -98.9 - ΔminSENS | -80.1 - ΔminSENS | 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 10.9.2-2a: SAN LEO in-channel selectivity for NB-IoT operation in NTN NR in-band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *SAN channel bandwidth* (MHz) | Reference measurement channel | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) / BWConfig | Type of interfering signal |
| 5 | FRC A14-1 in Annex A.14 in TS 36.108 [17] | -125.0- ΔminSENS | -83.1- ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -79.2- ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| 5 | FRC A14-1 in Annex A.14 in TS 36.108 [17] | -131.0- ΔminSENS | -83.1- ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  10 RBs |
| 10, 15, 20 |  |  | -79.2- ΔminSENS | DFT-s-OFDM NR signal, 15 kHz SCS,  25 RBs |
| NOTE: Interfering signal is placed in one side of the Fc, while the NB-IoT PRB is placed on the other side. Both interfering signal and NB-IoT PRB are placed at the middle of the available PRB locations. The wanted NB-IoT tone is placed at the centre of this NB-IoT PRB. | | | | |

<End of Change>