**3GPP TSG-RAN WG4 Meeting #116 draft R4-2512554**

**Bengaluru, India, August 25th – 29th, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.108** | **CR** |  | **rev** | **1** | **Current version:** | **19.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](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:*** | Draft CR to TS 36.108: General sections and suffix structure for introduction of the LTE-based 5G broadcast operation over geosynchronous satellite | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_band\_5G\_bcast\_GSO-Core | | | | |  |  | | | 2025-08-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *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:*** | | In this Draft CR we provide inputs to the general sections, as well as the framework for suffix C introduction for BOG feature. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduction of necessary correction to genearl parts.  Introduction of the suffix framework. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Implementation of the LTE-based 5G broadcast operation over geosynchronous satellite would not be complete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1, 2, 3, 4.6, 4.7, 5.2C | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*------------------------------ Modified section ------------------------------*

# 1 Scope

The present document establishes the minimum RF characteristics and minimum performance requirements of Satellite Access Node (SAN) supporting:

* standalone NB-IoT operation, or
* E-UTRA, or
* NB-IoT operation in NTN NR in-band, or
* LTE-based 5G broadcast operation over geosynchronous satellite.

NOTE: Minimum requirements for NB-IoT operation in NTN NR guardband are not specified and guardband operation is SAN implementation specific.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".

[3] 3GPP TS 36.181: "Evolved Universal Terrestrial Radio Access (E-UTRA); Satellite Access Node conformance testing; Satellite Node conformance testing".

[4] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".

[5] ITU-R Recommendation SM.328: "Spectra and bandwidth of emissions".

[6] ITU-R Recommendation SM.1541-6: "Unwanted emissions in the out-of-band domain".

[7] 3GPP TS 38.108: “Satellite Access Node radio transmission and reception”.

[8] void

[9] 3GPP TS 36.211: Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation”

[10] 3GPP TR 38 811: "Study on New Radio (NR) to support non-terrestrial networks".

[11] 3GPP TS 36 102: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception for satellite access".

[12] WRC-19 Resolution 761, Coexistence of International Mobile Telecommunications and the broadcasting-satellite service (sound) in the frequency band 1452-1492 MHz in Regions 1 and 3, WRC-19, https://www.itu.int/dms\_pub/itu-r/oth/0C/0A/R0C0A00000F00162PDFE.pdf

# 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.

**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 E-UTRA 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.

**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 utilizes the resource block(s) within a normal NTN NR carrier.

**NB-IoT operation in NTN NR guard band:** NB-IoT is operating in guard band when it utilizes the unused resource block(s) within a NTN NR carrier's guard-band.

**NB-IoT standalone operation:** NTN NB-IoT is operating standalone when it utilizes its own spectrum.

**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.

**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.

**operating band:** frequency range in which E-UTRA 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 E-UTRA SAN requirement's set as defined for *SAN type 1-H*, *SAN type 1-O.*

**SAN channel bandwidth**: RF bandwidth supporting a single E-UTRA 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 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.

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

**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 E-UTRA user plane and control plane protocol terminations towards NTN Satellite capable UE, and connected via the S1 interface to the EPC. It encompass a transparent NTN payload on board a NTN platform, a gateway and eNB functions, or a regenerative payload on board an NTN platform and a satellite gateway.

**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.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

 Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel.

BeWθ,REFSENS Beamwidth equivalent to the *OTA REFSENS RoAoA* in the θ-axis in degrees. Applicable for FR1 only.

BeWφ,REFSENS Beamwidth equivalent to the *OTA REFSENS RoAoA* in the φ-axis in degrees. Applicable for FR1 only.

BWChannel *SAN channel bandwidth.*

BWConfig *Transmission bandwidth configuration*, where BWConfig = *E-UTRA*B x SCS x 12.

BWSAN The *SAN transponder bandwidth*Δf Separation between the *channel edge* frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency.

Δfmax f\_offsetmax minus half of the bandwidth of the measuring filter.

ΔfOOB Maximum offset of the out-of-band boundary from the uplink *operating band* edge.

ΔminSENS Difference between conducted reference sensitivity and minSENS.

ΔOTAREFSENS Difference between conducted reference sensitivity and OTA REFSENS.

EISminSENS The EIS declared for the *minSENS RoAoA.*

EISREFSENS OTA REFSENS EIS value.

FC *RF reference frequency* on the channel raster, given in table 5.4.

FC,low The Fc of the *lowest carrier*, expressed in MHz.

FC,high The Fc of the *highest carrier*, expressed in MHz.

FDL,low The lowest frequency of the downlink *operating band.*

FDL,high The highest frequency of the downlink *operating band.*

Ffilter Filter centre frequency.

Foffset,high Frequency offset from FC,high to the upper *SAN RF Bandwidth edge.*

Foffset,low Frequency offset from FC,low to the lower *SAN RF Bandwidth edge.*

f\_offset Separation between the *channel edge* frequency and the centre of the measuring.

FUL,low The lowest frequency of the uplink *operating band.*

FUL,high The highest frequency of the uplink *operating band.*

GBChannel Minimum guard band defined in clause 5.3.

 Physical resource block number.

MDL Offset of NB-IoT Downlink channel number to Downlink EARFCN

MUL Offset of NB-IoT Uplink channel number to Uplink EARFCN

NDL Downlink EARFCN

NOffs-DL Offset used for calculating downlink EARFCN

NOffs-UL Offset used for calculating uplink EARFCN

NRB *Transmission bandwidth configuration*, expressed in resource blocks.

NUL Uplink EARFCN

PEIRP,N EIRP level for channel N.

Pmax,c,TABC The *maximum carrier output power per TAB connector.*

Pmax,c**,**TRP*Maximum carrier TRP output power* measuredat the RIB(s), and corresponding to the declared *rated carrier TRP output power* (Prated,c,TRP).

Pmax,c,EIRP The maximum carrier EIRPwhen the SAN is configured at the maximum rated carrier output TRP (Prated,c,TRP).

Prated,c,sys Prated,c,sys,GEO for SAN GEO class or Prated,c,sys,LEO for SAN LEO class.

Prated,c,TRP *Rated carrier TRP output power* declaredper RIB.

Prated,c,sys,GEO The sum of Prated,c,TABC for all *TAB connectors* for a single carrier of the SAN GEO class.

Prated,c,sys,LEO The sum of Prated,c,TABC for all *TAB connectors* for a single carrier of the SAN LEO class.

Prated,c,TABC Prated,c,TABC,GEO for SAN GEO class or Prated,c,TABC,LEO for SAN LEO class.

Prated,c,TABC,GEO The *rated carrier output power per TAB connector* of the SAN GEO class*.*

Prated,c,TABC,LEO The *rated carrier output power per TAB connector* of the SAN LEO class*.*

Prated,t,TABC The *rated total output power* declared at *TAB connector.*

Prated,c,TRP *Rated carrier TRP output power* declaredper RIB.

Prated,t,TRP *Rated total TRP output power* declaredper RIB.

PREFSENS Conducted Reference Sensitivity power level.

Prated,t,sys The sum of Prated,t,TABC for all *TAB connectors.*

## 3.3 Abbreviations

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

AA Antenna Array

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

AoA Angle of Arrival

AWGN Additive White Gaussian Noise

BOG LTE-based 5G Broadcast over Geosynchronous Satellite

BW Bandwidth

CA Carrier Aggregation

CP-OFDM Cyclic Prefix-OFDM

CW Continuous Wave

DFT-s-OFDM Discrete Fourier Transform-spread-OFDM

EARFCN E-UTRA Absolute Radio Frequency Channel Number

EIRP Equivalent Isotropic Radiated Power

EIS Equivalent Isotropic Sensitivity

EVM Error Vector Magnitude

E-UTRA Evolved UTRA

FR Frequency Range

FRC Fixed Reference Channel

GEO Geostationary Earth Orbiting

GSO Geosynchronous Orbit

ICS In-Channel Selectivity

LEO Low Earth Orbiting

MCS Modulation and Coding Scheme

NB-IoT Narrowband – Internet of Things

NTN Non-Terrestrial Network

OOB Out-of-band

OOBE Out-of-band Emissions

OSDD OTA Sensitivity Directions Declaration

OTA Over-The-Air

PRB Physical Resource Block

QAM Quadrature Amplitude Modulation

RB Resource Block

RDN Radio Distribution Network

RE Resource Element

REFSENS Reference Sensitivity

RF Radio Frequency

RIB Radiated Interface Boundary

RMS Root Mean Square (value)

RoAoA Range of Angles of Arrival

RX Receiver

SAN Satellite Access Node

SCS Sub-Carrier Spacing

SDO Standalone Downlink Only

TAB Transceiver Array Boundary

TRP Total Radiated Power

TX Transmitter

# 4 General

## 4.1 Relationship with other core specifications

The present document is a single-RAT specification for a SAN, covering RF characteristics and minimum performance requirements. Conducted and radiated core requirements are defined for the SAN architectures and SAN types defined in clause 4.3.

The applicability of each requirement is described in clause 4.6.

## 4.2 Relationship between minimum requirements and test requirements

Conformance to the present specification is demonstrated by fulfilling the test requirements specified in the conformance specification TS 36.181 [3].

The minimum requirements given in this specification make no allowance for measurement uncertainty. The test specifications TS 36.181 [3] define test tolerances. These test tolerances are individually calculated for each test. The test tolerances are used to relax the minimum requirements in this specification to create test requirements. For some requirements, including regulatory requirements, the test tolerance is set to zero.

The measurement results returned by the test system are compared - without any modification - against the test requirements as defined by the shared risk principle.

The shared risk principle is defined in recommendation ITU‑R M.1545 [4].

## 4.3 Requirement reference points

### 4.3.1 SAN type 1-H

For *SAN type 1-H*, the requirements are defined for two points of reference, signified by radiated requirements and conducted requirements.

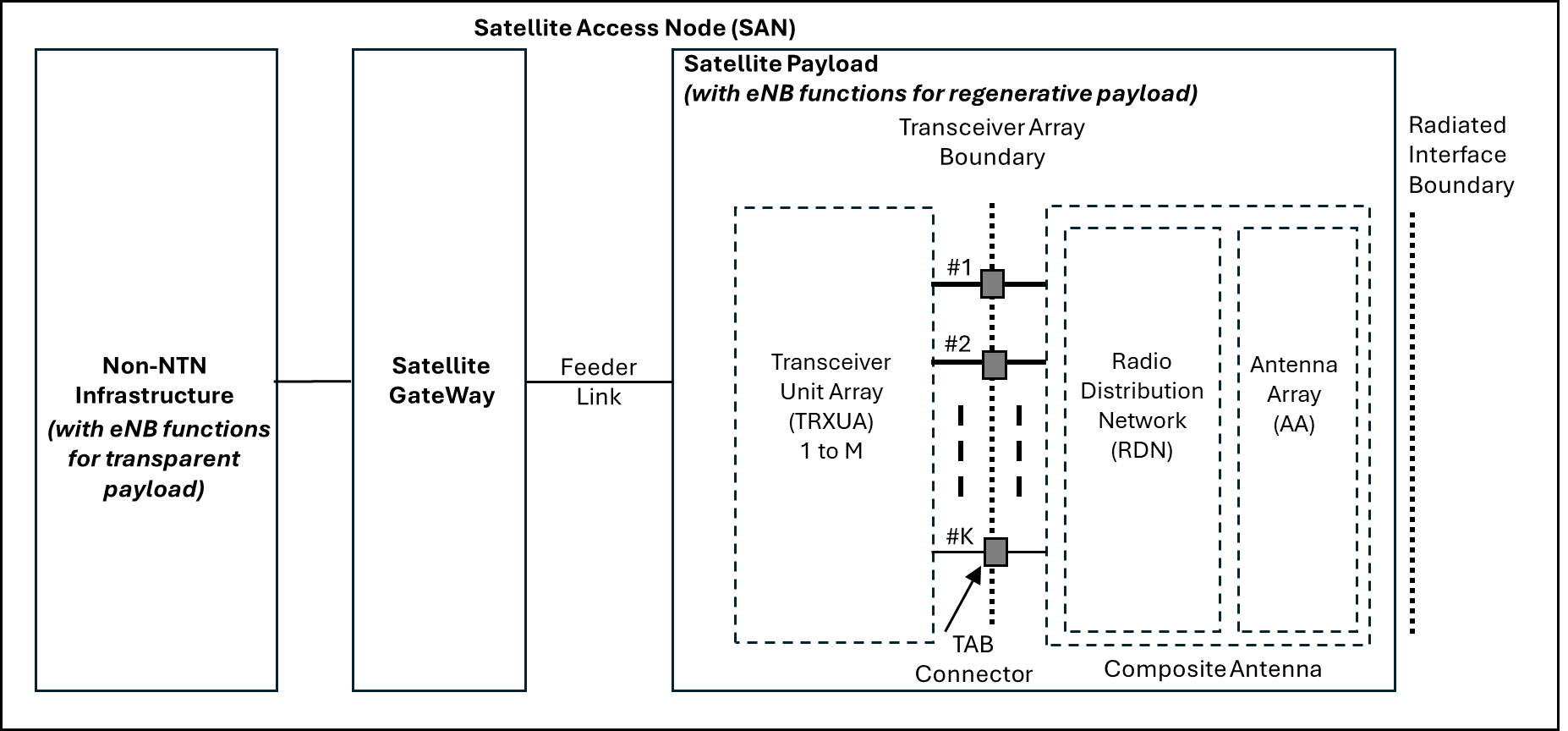


Figure 4.3.1-1: Radiated and conducted reference points for *SAN type 1-H*

Radiated characteristics are defined over the air (OTA), where the radiated interface is referred to as the *Radiated Interface Boundary* (RIB). Radiated requirements are also referred to as OTA requirements. The (spatial) characteristics in which the OTA requirements apply are detailed for each requirement.

Conducted characteristics are defined at individual or groups of *TAB connectors* at the *transceiver array boundary*, which is the conducted interface between the transceiver unit array and the composite antenna.

The transceiver unit array is part of the composite transceiver functionality receiving and transmitting modulated signal to ensure radio links with users.

The RF part of the satellite payload is composed of a transceiver unit array and a composite antenna array. The transceiver unit array contains an implementation specific number of transmitter units and an implementation specific number of receiver units.

The composite antenna contains a radio distribution network (RDN) and an antenna array. The RDN is a linear passive network which distributes the RF power generated by the transceiver unit array to the antenna array, and/or distributes the radio signals collected by the antenna array to the transceiver unit array, in an implementation specific way.

How a conducted requirement is applied to the *transceiver array boundary* is detailed in the respective requirement clause.

### 4.3.2 SAN type 1-O

For *SAN type 1-O*, the radiated characteristics are defined over the air (OTA), where the *operating band* specific radiated interface is referred to as the *Radiated Interface Boundary* (RIB). Radiated requirements are also referred to as OTA requirements. The (spatial) characteristics in which the OTA requirements apply are detailed for each requirement.

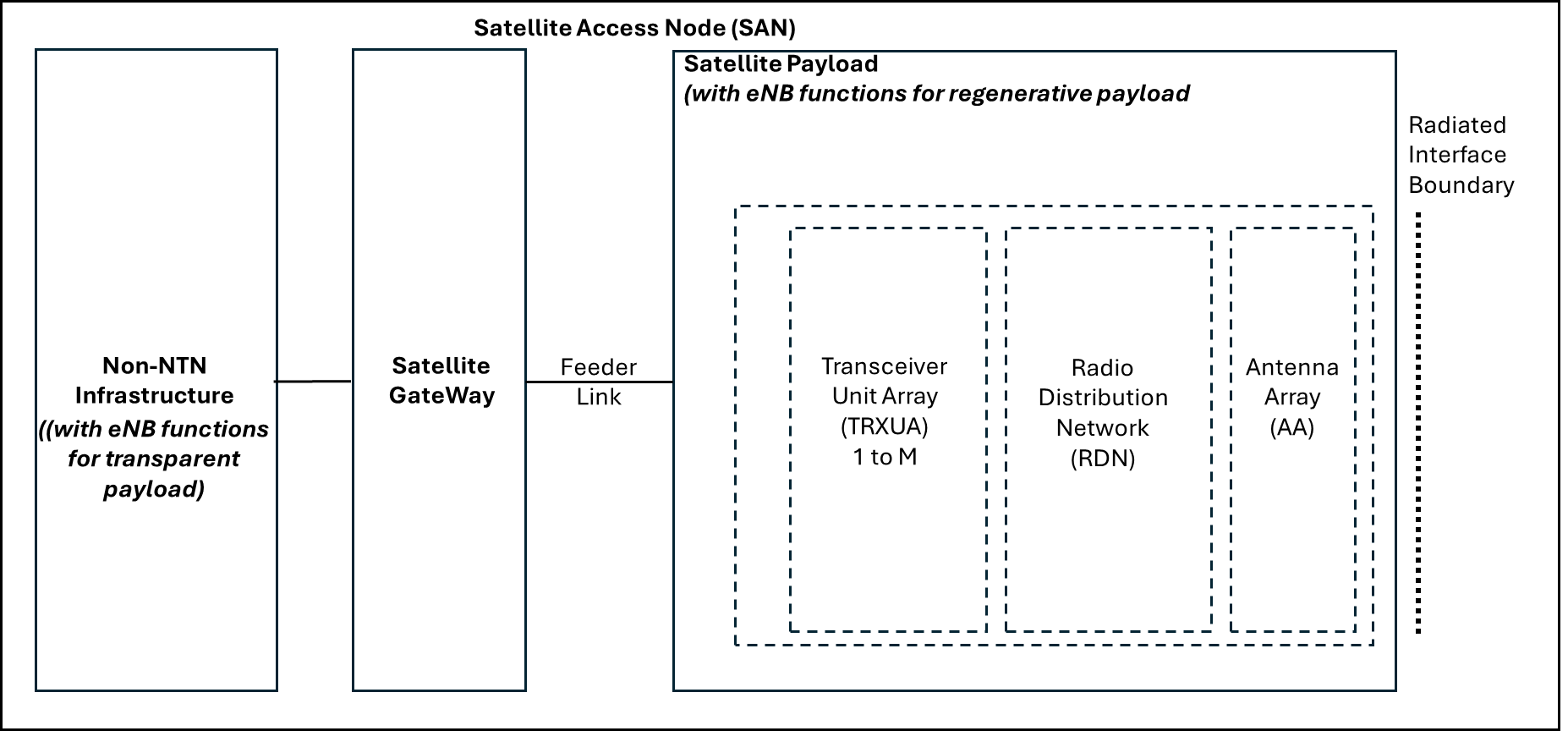


Figure 4.3.2-1: Radiated reference points for *SAN type 1-O*

## 4.4 Satellite Access Node classes

The requirements in this specification apply to Satellite Access Node unless otherwise stated. The associated deployment scenarios are exactly the same for SAN with and without connectors.

For SAN *type 1-O* and SAN *type 1-H*, two SAN classes (LEO and GEO) are defined in table 4.4-1.

Table 4.4-1 SAN classes

|  |  |
| --- | --- |
| SAN class | Satellite constellation |
| GEO class | GEO satellite |
| LEO class | LEO 600 km satellite  LEO 1200 km satellite |

## 4.5 Regional requirements

Some requirements in the present document may only apply in certain regions either as optional requirements, or as mandatory requirements set by local and regional regulation. It is normally not stated in the 3GPP specifications under what exact circumstances the regional requirements apply, since this is defined by local or regional regulation.

Table 4.5-1 lists all requirements in the present specification that may be applied differently in different regions.

Table 4.5-1: List of regional requirements

| Clause number | Requirement | Comments |
| --- | --- | --- |
| 5.2 | *Operating bands* | Satellite *operating bands* may be applied regionally. |
| 6.6.4,  9.7.4 | Out-of-band emissions  OTA out-of-band emissions | For band 252 and 255 operation in US, Limits in FCC Title 47 apply. |
| 6.6.5  9.7.5 | Tx spurious emissions,  OTA Tx spurious emissions | For band 252 and 255 operation in US, Limits in FCC Title 47 apply. |

## 4.6 Applicability of minimum requirements

In table 4.6-1, the requirement applicability for each *requirement set* is defined. For each requirement, the applicable requirement clause in the specification is identified. Requirements not included in a *requirement set* is marked not applicable (NA).

Further information on the feature-specific requirements applicability is provided in clause 4.7.

Table 4.6-1: Requirement set applicability

|  |  |  |
| --- | --- | --- |
| Requirement | Requirement set | |
|  | *SAN type 1-H* | *SAN type 1-O* |
| SAN output power | 6.2 |  |
| Output power dynamics | 6.3 |  |
| Transmit ON/OFF power | NA |  |
| Frequency error | 6.5.1 |  |
| Modulation quality | 6.5.2 |  |
| Time alignment error | NA |  |
| Occupied bandwidth | 6.6.2 |  |
| ACLR | 6.6.3 |  |
| Out-of-band emissions | 6.6.4 |  |
| Transmitter spurious emissions | 6.6.5 |  |
| Transmitter intermodulation | NA | NA |
| Reference sensitivity level | 7.2 |  |
| Dynamic range | 7.3 |  |
| ACS | 7.4.1 |  |
| In-band blocking | NA |  |
| Out-of-band blocking | 7.5 |  |
| Receiver spurious emissions | NA |  |
| Receiver intermodulation | NA |  |
| In-channel selectivity | 7.8 |  |
| Performance requirements | 8 |  |
| Radiated transmit power | 9.2 | 9.2 |
| OTA SAN output power |  | 9.3 |
| OTA output power dynamics |  | 9.4 |
| OTA transmit ON/OFF power |  | NA |
| OTA frequency error |  | 9.6.1 |
| OTA modulation quality |  | 9.6.2 |
| OTA time alignment error |  | NA |
| OTA occupied bandwidth |  | 9.7.2 |
| OTA ACLR | NA | 9.7.3 |
| OTA out-of-band emission |  | 9.7.4 |
| OTA transmitter spurious emission |  | 9.7.5 |
| OTA transmitter intermodulation |  | NA |
| OTA sensitivity | 10.2 | 10.2 |
| OTA reference sensitivity level |  | 10.3 |
| OTA dynamic range |  | 10.4 |
| OTA ACS |  | 10.5.1 |
| OTA in-band blocking |  | NA |
| OTA out-of-band blocking | NA | 10.6 |
| OTA receiver spurious emission |  | NA |
| OTA receiver intermodulation |  | NA |
| OTA in-channel selectivity |  | 10.9 |
| Radiated performance requirements |  | 11 |

NOTE: Co-location requirements are not applicable to SAN.

## 4.7 Specification suffix information

The following suffixes are defined at 2nd level for clauses 5, 6, 7, 9, 10, as shown in Table 4.7-1.

Table 4.7-1: Definition of suffixes

|  |  |
| --- | --- |
| Clause suffix | Feature |
|  |  |
|  |  |
| C | LTE-based 5G Broadcast over Geosynchronous Satellite |

c) For LTE-based 5G Broadcast over Geosynchronous Satellite, the applicable minimum requirements in clauses 5, 6, 9 are specified in the suffix C subclause, where they differ from the requirements in the main subclause. Where suffix C does not exist for a requirement, the minimum requirement in the main subclause shall apply.

# 5 Operating bands and channel arrangement

## 5.1 General

The channel arrangements presented in this clause are based on the operating bands and channel bandwidths defined in the present release of specifications.

NOTE: Other operating bands and channel bandwidths may be considered in future releases.

## 5.2 Operating bands

EUTRA SAN is designed to operate in the operating bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA operating bands for satellite access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| E‑UTRA Operating Band | Uplink (UL) operating band SAN receive UE transmit | | | Downlink (DL) operating band SAN transmit  UE receive | | | Duplex Mode |
| FUL\_low – FUL\_high | | | FDL\_low – FDL\_high | | |
| 256 | 1980 MHz | – | 2010 MHz | 2170 MHz | – | 2200 MHz | FDD |
| 255 | 1626.5 MHz | – | 1660.5 MHz | 1525 MHz | – | 1559 MHz | FDD |
| 254 | 1610 MHz | – | 1626.5 MHz | 2483.5 MHz | – | 2500 MHz | FDD |
| 253 | 1668 MHz | – | 1675 MHz | 1518 MHz | – | 1525 MHz | FDD |
| 252 | 2000 MHz | – | 2020 MHz | 2180 MHz | – | 2200 MHz | FDD |
| 246 (NOTE 2) |  | N/A |  | 1467 MHz | – | 1492 MHz | SDO |
| NOTE 1: Satellite bands are numbered in descending order from 256.  NOTE 2: Band 246 only applies for LTE-based 5G Broadcast over Geosynchronous Satellite in region 3 [12]. | | | | | | | |

## 5.2A Operating bands for UE category M1

UE category M1 is designed to operate in the E-UTRA satellite access operating bands defined in Table 5.2-1 in both half duplex FDD mode and full-duplex FDD mode.

## 5.2B Operating bands for category NB1 and NB2

Category NB1 and NB2 UE are designed to operate in the E-UTRA satellite access operating bands defined in Table 5.2-1.

Category NB1 and NB2 UE operate in HD-FDD duplex mode.

## 5.2C Operating bands for LTE-based 5G Broadcast over Geosynchronous Satellite

LTE-based 5G Broadcast over Geosynchronous Satellite (BOG) is designed to operate in Standalone Downlink Only (SDO) operating band 246, as defined in Table 5.2-1.

## 5.3 Satellite Access Node channel bandwidth

*------------------------------ End of modified section -------------------------*