**3GPP TSG-RAN WG4 Meeting #104-bis-e *R4-221xxxx***

 **eLocation, 10th – 19th October 2022 (revision of R4-2215336)**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.108** | **CR** | **0012** | **rev** | **1** | **Current version:** | **17.1.0** |  |
|  |
| *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:***  | Corrections to SAN TS 38.108 |
|  |  |
| ***Source to WG:*** | Thales |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_NTN\_solutions-core |  | ***Date:*** | 2022-09-28 |
|  |  |  |  |  |
| ***Category:*** | **F**  |  | ***Release:*** | Rel-17 |
|  | *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 canbe 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Correct some typos, symbols, remove symbols not used, correct definitions, correct BWchannel, and align text/fonts.  |
|  |  |
| ***Summary of change:*** | Correct typos, symbols, remove symbols not used, correct definitions, correct BWchannel and align text/fonts. |
|  |  |
| ***Consequences if not approved:*** | Typos will propagate through other specifications/documents. |
|  |  |
| ***Clauses affected:*** | 3.2, 5.4, 6.6, 6.6.4, 9.7 |
|  |  |
|  | **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:*** | Rev0: CR creation |

<<<<<<<<<<<<<<<<<<<< 1st Change Begins >>>>>>>>>>>>>>>>>>>>

## 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 = *N*RB x SCS x 12.

BWGB,low The minimum guard band defined in clause 5.3.3 for lowest assigned component carrier.

BWGB,high The minimum guard band defined in clause 5.3.3 for highest assigned component carrier.

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

ΔFGlobal Global frequency raster granularity.

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

ΔfOBUE Maximum offset of the *operating band* unwanted emissions mask from the downlink *operating band* edge (i.e. below the lowest frequency of each supported downlink operating band; above the highest frequency of each supported downlink operating band).

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.

ΔFRaster Channel raster granularity.

EISminSENS The EIS declared for the *minSENS RoAoA.*

EISREFSENS OTA REFSENS EIS value.

FC *RF reference frequency* on the channel raster, given in table 5.4.2.2-1.

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.

f\_offsetmax The offset to the frequency ΔfOBUE outside the downlink *operating band.*

FREF RF reference frequency.

FREF-Offs Offset used for calculating FREF.

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 5.3.3.

 Physical resource block number.

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

NREF NR Absolute Radio Frequency Channel Number (NR-ARFCN).

NREF-Offs Offset used for calculating NREF scaling per cell, as calculated in clause 6.1.

PEIRP,N EIRP level for channel N.

Pmax,c,AC*Maximum carrier output power* measuredper *antenna connector.*

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,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.

SSREF SS block reference frequency position.

<<<<<<<<<<<<<<<<<<<< End 1st Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<<<< 2nd Change Begins >>>>>>>>>>>>>>>>>>>>

## 5.4 Channel arrangement

### 5.4.1 Channel spacing

#### 5.4.1.1 Channel spacing for adjacent carriers

The spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the *SAN channel bandwidths*. The nominal channel spacing between two adjacent SAN carriers is defined as following:

- For SAN FR1 *operating bands* with 100 kHz channel raster,

 Nominal Channel spacing = (BWChannel(1) + BWChannel(2))/2

where BWChannel(1) and BWChannel(2) are the *SAN channel bandwidths* of the two respective SAN carriers. The channel spacing can be adjusted depending on the channel raster to optimize performance in a particular deployment scenario.

<<<<<<<<<<<<<<<<<<<< End 2nd Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<<<< 3rd Change Begins >>>>>>>>>>>>>>>>>>>>

## 6.6 Unwanted emissions

### 6.6.1 General

Unwanted emissions consist of out-of-band emissions and spurious emissions according to ITU definitions [2]. In ITU terminology, out of band emissions are unwanted emissions immediately outside the *SAN channel bandwidth* resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The out-of-band emissions requirement for the SAN transmitter is specified both in terms of Adjacent Channel Leakage power Ratio (ACLR) and *operating band* unwanted emissions (OBUE).

The maximum offset of the *operating band* unwanted emissions mask from the *operating band* edge is ΔfOBUE. The Operating band unwanted emissions define all unwanted emissions in each supported downlink *operating band* plus the frequency ranges ΔfOBUE above and ΔfOBUE below each band. Unwanted emissions outside of this frequency range are limited by a spurious emissions requirement.

The values of ΔfOBUE are defined in table 6.6.1-1 for the SAN *operating bands*.

Table 6.6.1-1: Maximum offset of OBUE outside the downlink *operating band*

|  |  |  |
| --- | --- | --- |
| SAN type | *Operating band* characteristics | ΔfOBUE (MHz) |
| *SAN type 1-H* | FDL,high – FDL,low < 100 MHz  | 2×BWChannel |

For *SAN type 1-H* the unwanted emission requirements are applied per the *TAB connector TX min cell groups* for all the configurations supported by the SAN.

There is in addition a requirement for occupied bandwidth.

<<<<<<<<<<<<<<<<<<<< End 3rd Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<<<< 4th Change Begins >>>>>>>>>>>>>>>>>>>>

### 6.6.4 Operating band unwanted emissions

#### 6.6.4.1 General

Unless otherwise stated, the operating band unwanted emission (OBUE) limits for SAN in FR1 are defined from channel edge up to frequencies separated from the channel edge by 200% of the necessary bandwidth.

The requirements shall apply whatever the type of transmitter considered and for all transmission modes foreseen by the manufacturer’s specification.

*Basic limits* are specified in the tables below, where:

- Δf is the separation between the *channel edge* frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency.

- f\_offset is the separation between the *channel edge* frequency and the centre of the measuring filter.

- PSDChannel [dBm/4kHz] represents the Power Spectral Density of the channel for a given channel bandwidth.

- BWChannel [MHz] is the considered NR *channel bandwidth* or SAN total *RF bandwidth* for a given *operating band*.

- $Δ\_{Sat\\_Class}\left[dB\right]$ is the *SAN class parameter* in dB identified to characterize different SAN classes.

For a multi-carrier *single-band connector* the definitions above apply to the lower edge of the carrier transmitted at the *lowest carrier* frequency and the upper edge of the carrier transmitted at the *highest carrier* frequency within a specified frequency band.

- The operating band unwanted emission *basic limits* of the band where there are carriers transmitted, as defined in the tables of the present clause for the largest frequency offset (Δfmax), shall apply from channel edge up to frequencies separated from the channel edge by 200% of the necessary bandwidth.

6.6.4.2 Minimum requirements for *SAN type 1-H*

For SAN operating in Bands n256, n255, the requirements are specified in table 6.6.4.2-1 for GEO and LEO class respectively, in line with Annex 5 of ITU recommendation SM.1541-6 [9].

The SAN Operating Band Unwanted Emissions (OBUE) requirements for GEO and LEO classes are therefore defined as described in Table 6.6.4.2‑1 below.

Table 6.6.4.2-1: SAN LEO and GEO Classes OBUE basic limits

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Basic limits(dBm) | Measurement bandwidth |
| 0 MHz ≤ Δf < 2× BWChannel | 0.002 MHz ≤ f\_offset < 2× BWChannel + 0.002 MHz | $$max\left(SE limit, PSD\_{channel} – Δ\_{Sat\\_Class}\left[dB\right]-40×log10\left(\frac{ f\_{\\_offset}-0.002}{BW\_{Channel}}×2+1\right)\right)dBm$$ | 4 kHz |
| NOTE 1: PSDChannel = Prated,c,sys – 10log10(BWChannel) – 24, unit dBm/4kHz.NOTE 2: SE limit is spurious emission limit specified in spurious emission clause 6.6.5.NOTE 3: PSD attenuation as in ITU-R SM.1541-6 [9], Annex 5 OoB domain emission limits for space services.NOTE 4: $Δ\_{Sat\\_Class}\left[dB\right]$=0 dB for GEO class and $Δ\_{Sat\\_Class}\left[dB\right]$=3 dB for LEO class. |

### 6.6.5 Transmitter spurious emissions

#### 6.6.5.1 General

The transmitter spurious emission limits shall apply from 30 MHz to the fifth harmonic of the upper frequency edge of the DL operating band, excluding the frequency range from ΔfOBUE below the lowest frequency of each supported downlink *operating band*, up to ΔfOBUE above the highest frequency of each supported downlink *operating band*, where the ΔfOBUE is defined in table 6.6.1-1. For some *operating bands*, the upper limit is higher than 12.75 GHz in order to comply with the 5th harmonic limit of the downlink *operating band*, as specified in ITU-R recommendation SM.329 [2].

The requirements shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

Unless otherwise stated, all requirements are measured as mean power (RMS).

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

##### 6.6.5.2.1 General transmitter spurious emissions requirements

The requirements in table 6.6.5.2.1-1 shall apply. The application of those limits shall be the same as for operating band unwanted emissions in clause 6.6.4.

Table 6.6.5.2.1-1: General SAN transmitter spurious emission limits in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Spurious frequency range | Prated,c,sys(dBm) | Basic limit(dBm) | Measurement bandwidth(kHz) | Notes |
| 30 MHz – 5th harmonic of the upper frequency edge of the DL operating band | ≤ 47 | -13 | 4 | NOTE 1, NOTE 2, NOTE 3 |
|  | > 47 | Prated,c,sys – 60dB |  |  |
| NOTE 1: *Measurement bandwidth*s as in ITU-R SM.329 [2], s4.1.NOTE 2: Upper frequency as in ITU-R SM.329 [2], s2.5 table 1.NOTE 3: The lower frequency limit is replaced by 0.7 times the waveguide cut-off frequency, according to ITU-R SM.329 [2], for systems having an integral antenna incorporating a waveguide section, or with an antenna connection in such form, and of unperturbed length equal to at least twice the cut-off. |

##### 6.6.5.2.2 Protection of the own Satellite Access Node receiver

This requirement shall be applied for NR FDD operation in order to prevent the receivers of the SAN being de-sensitized by emissions from its own SAN transmitter. It is measured at the *TAB connector* for *SAN type 1-H* for any type of SAN which has common or separate Tx/Rx *TAB connectors*.

The spurious emission *basic limits* are provided in table 6.6.5.2.2-1.

Table 6.6.5.2.2-1: SAN spurious emissions *basic limits* for protection of the SAN receiver

|  |  |  |
| --- | --- | --- |
| Frequency range | *Basic limits* | *Measurement bandwidth* |
| FUL,low – FUL,high | -96 dBm | 100 kHz |

##### 6.6.5.2.3 Additional spurious emissions requirements

The additional spurious emissions requirement is not applicable for SAN.

##### 6.6.5.2.4 Co-location with other Satellite Access Nodes

The co-location requirement is not applicable for SAN.

<<<<<<<<<<<<<<<<<<<< End 4th Change >>>>>>>>>>>>>>>>>>>>

<<<<<<<<<<<<<<<<<<<< 5th Change Begins >>>>>>>>>>>>>>>>>>>>

## 9.7 OTA unwanted emissions

### 9.7.1 General

Unwanted emissions consist of so-called out-of-band emissions and spurious emissions according to ITU definitions ITU-R SM.329 [2]. In ITU terminology, out of band emissions are unwanted emissions immediately outside the *SAN channel bandwidth* resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The OTA out-of-band emissions requirement for the *SAN type 1-O* is specified both in terms of Adjacent Channel Leakage power Ratio (ACLR) and operating band unwanted emissions (OBUE). The OTA Operating band unwanted emissions define all unwanted emissions in each supported downlink *operating band* plus the frequency ranges ΔfOBUE above and ΔfOBUE below each band. OTA Unwanted emissions outside of this frequency range are limited by an OTA spurious emissions requirement.

The maximum offset of the operating band unwanted emissions mask from the *operating band* edge is ΔfOBUE. The value of ΔfOBUE is defined in table 9.7.1-1 for *SAN type 1-O* for the SAN *operating bands*.

Table 9.7.1-1: Maximum offset ΔfOBUE outside the downlink *operating band*

|  |  |  |
| --- | --- | --- |
| SAN type | *Operating band* characteristics | ΔfOBUE (MHz) |
| *SAN type 1-O* | FDL,high – FDL,low < 100 MHz | 2×BWChannel |

The unwanted emission requirements are applied per cell for all the configurations. Requirements for OTA unwanted emissions are captured using TRP, *directional requirements* or co-location requirements as described per requirement.

There is in addition a requirement for occupied bandwidth.

<<<<<<<<<<<<<<<<<<<< End 5th Change >>>>>>>>>>>>>>>>>>>>