**3GPP TSG-RAN WG4 Meeting #111 R4-2408700**

**Fukuoka City, Fukuoka, Japan, 20 – 24 May, 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **8.101-5** | **CR** |  | **rev** |  | **Current version:** | **18.5.0** |  |
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| *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 | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Draft CR to TS 38.101-5 on top of the running CR R4-2405085: Tx requirements subclause 9.6 |
|  |  |
| ***Source to WG:*** | , Thales |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** | 2024-05-20 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* *Rel-20 (Release 20)* |
| ***7*** |  |
| ***Reason for change:*** | This draft CR further updates sub clause 9.6 on top of the endorsed running CR R4-2405085. |
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| ***Summary of change:*** | Fix all issues related to ETSI requirements on antenna performance.Fix the issues related to requirements applicability |
|  |  |
| ***Consequences if not approved:*** | The NTN Ka-band won’t be correctly supported |
|  |  |
| ***Clauses affected:*** | 9.6 |
|  |  |
|  | **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 ...  |
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| ***Other comments:*** | As this sub-clause was re-worded, the updates are not yellow highlighted to facilitate the reading of this draft CR. Still, the additional changes could be easily identified selectionning the right reviewer. |
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| ***This CR's revision history:*** |  |

*<Start of the change>*

## 9.6 Antenna pointing accuracy and performance

### 9.6.1 Antenna pointing accuracy

#### 9.6.1.1 Minimum requirements for NTN VSAT

##### 9.6.1.1.1 Applicability

Except if otherwise stated, the following requirements are applicable to NTN VSAT types 1, 2, 3, 4 or 5 operating in band n512.

##### 9.6.1.1.2 Pointing Accuracy

The manufacturer shall declare the peak pointing accuracy (δφ) and the associated statistical basis.

The antenna shall maintain the declared peak pointing accuracy (δφ), such that the off-axis EIRP emission density pattern projected onto the geostationary arc remains within the mask specified in clauses 9.2.2.2 and 9.2.2.3 when shifted by an angle of ±(δφ°), taking into account the following factors [17]:

- the worst case operational environmental conditions;

- maximum dynamics for Mobile VSAT (e.g. maximum movement of the platform e.g. airplane, boat, vehicle during the connectivity time); and

- the range of latitude, longitude and altitude relative to the satellite orbital position.

##### 9.6.1.1.3 On-axis cross polarization isolation

9.6.1.1.3.1 Linearly polarized NTN VSAT

This requirement is applicable to NTN VSAT type 1, 2, 4 and 5.

For linearly polarized NTN VSAT, the manufacturer shall declare the on-axis cross polarization isolation of the NTN VSAT [17, 18].

The polarization angle shall be continuously adjustable within the operational range as declared by the manufacturer.

It shall be possible to fix the transmit antenna polarization angle with an accuracy of at least 1°.

When linear polarization is used for both transmission and reception, the angle between the receive and corresponding transmit polarization planes shall not deviate by more than 1° from the nominal value declared by the manufacturer.

9.6.1.1.3.2 Circularly polarized NTN VSAT

For circularly polarized NTN VSAT, the manufacturershall declare the voltage axial ratio.

#### 9.6.1.2 Minimum requirement for Fixed VSAT types 1 or 2

##### 9.6.1.2.1 Applicability

The following requirements are applicable to Fixed VSAT types 1 or 2 operating in band n512 when connected to Geostationary Satellite Orbit (GSO) SAN.

##### 9.6.1.2.2 Pointing Stability

Under the condition of 100 km/h maximum wind speed, with gusts of 130 km/h lasting 3 seconds, the installation shall not show any sign of permanent distortion and shall not need repointing after the application of the wind load.

##### 9.6.1.2.3 Pointing Accuracy

9.6.1.2.3.1 General

The manufacturer shall declare the usage area in terms of the range of latitude and longitude relative to the satellite orbital position where the alignments specified below are possible.

9.6.1.2.3.2 Main beam pointing accuracy

The antenna sub-system alignment facilities shall enable the main beam axis to be adjusted and fixed with a pointing accuracy (δφ) of either:

- 1) 0,1º; or

- 2) a greater value declared by the applicant, subject to the following restrictions:

- the pointing accuracy (δφ) shall not exceed 30 % of the antenna transmit main beam half power beamwidth;

- the off-axis e.i.r.p. emission density pattern remains within the mask specified in clause 9.2.2.3 when shifted by an angle of ±(δφ – 0,1º).

9.6.1.2.3.3 Alignment with the geostationary satellite orbit

For antennas with asymmetric main beam, the antenna shall be capable of having the plane defined by the antenna main beam axis and its major axis aligned with the tangent to the geostationary orbit in accordance with the method declared by the manufacturer.

##### 9.6.1.2.4 Polarization angle alignment capability for linear polarization

Following conditions will apply:

- The polarization angle shall be continuously adjustable within the operational range as declared by the manufacturer.

- It shall be possible to fix the transmit antenna polarization angle with an accuracy of at least 1°.

- When linear polarization is used for both transmission and reception, the angle between the receive and corresponding transmit polarization planes shall not deviate by more than 1° from the nominal value declared by the manufacturer.

*<Next of the change>*

### 9.6.2 Antenna performance

The following requirements are applicable to NTN VSAT type 1, type 2, type 4 or type 5 operating in band n511 or in band n510 and communicating with Geostationary Satellite Orbit (GSO) SAN.

The co-polarization gain in the plane tangent to the GSO arc shall not exceed the levels specified in Table 9.6.2-1. This envelope may be exceeded by up to 3 dB in 10% of the range of θ angles from ±7–180°, and by up to 6 dB in the region of main reflector spillover energy.

**Table 9.6.2-1: Co-polarization gain limit in the plane tangent to the GSO arc**

|  |  |
| --- | --- |
| θ value | Co-polarization gain (dBi) |
| 2° ≤ θ ≤ 7° | 29 – 25log(θ) |
| 7° ≤ θ ≤ 9.2° | 8 |
| 9.2° ≤ θ ≤ 19.1° | 32 – 25log(θ) |
| 19.1° < θ ≤ 180° | 0 |

The co-polarization gain in the plane perpendicular to the GSO arc shall not exceed the levels specified in Table 9.6.2-2. This envelope may be exceeded by up to 3 dB in 10% of the range of θ angles from ±7–180°, and by up to 6 dB in the region of main reflector spillover energy.

**Table 9.6.2-2: Co-polarization gain limit in the plane perpendicular to the GSO arc**

|  |  |
| --- | --- |
| θ value | Co-polarization gain (dBi) |
| 3.5° ≤ θ ≤ 7° | 32 – 25log(θ) |
| 7° ≤ θ ≤ 9.2° | 10.9 |
| 9.2° ≤ θ ≤ 19.1° | 35 – 25log(θ) |
| 19.1° < θ ≤ 180° | 3 |

The off-axis cross-polarization gain in the plane tangent and in the plane perpendicular to the GSO arc shall not exceed the levels specified in Table 9.6.2-3.

**Table 9.6.2-3: Cross-polarization gain limit**

|  |  |
| --- | --- |
| θ value | Co-polarization gain (dBi) |
| 2° ≤ θ ≤ 7° | 19 – 25log(θ) |

*<End of the change>*