**3GPP TSG-SA5 Meeting #156 *S5-244260***

**Maastricht, NetherLands, 19 - 23 Aug 2024**

**Source: CATT**

**Title: Rel-19 pCR TR 28.874 Add solution on NTN Tracking area management**

**Document for: Approval**

**Agenda Item: 6.19.15**

# 1 Decision/action requested

***Approval***

# 2 References

[1] 3GPP TR 28.874-020: " Study on management aspects of NTN – Phase 2"

[2] SP-231733: "New SID: Study on Management Aspects of NTN Phase 2"

# 3 Rationale

It is proposed to add a potential solution on NTN Tracking area management.

# 4 Detailed proposal

This contribution proposes to make the following changes in [1].

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| **1st change** |

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] 3GPP TS 38.423: "Technical Specification Group Radio Access Network; NG-RAN; Xn application protocol (XnAP) "

[3] 3GPP TS 38.300: "Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2"

[4] 3GPP TR 38.821: "Technical Specification Group Radio Access Network; Solutions for NR to support non-terrestrial networks (NTN) "

[5] 3GPP TR 22.865: “Study on satellite access Phase 3”

[6] 3GPP TS 23.501: “System architecture for the 5G System (5GS)”

[7] 3GPP TS 23.401: “General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access”

[8] 3GPP TS 23.682: “Architecture enhancements to facilitate communications with packet data networks and applications”

[9] 3GPP TS 28.530: “Management and orchestration; Concepts, use cases and requirements”

[10] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[11] 3GPP TS 22.261: "Service requirements for the 5G system; Stage 1".

[12] 3GPP TR 23.700-29: " Study on integration of satellite components in the 5G architecture; Stage 3".

[x] 3GPP TS 28.541: "Management and orchestration of 5G networks; Network Resource Model (NRM); Stage 2 and stage 3".

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| **Next change** |

5.2.2.1 Description

Tracking areas (TAs) and cell identities (cell IDs) represents a fixed geographic area within the network where a mobile device can move without requiring an update of its location information. The respective mapping is generally assigned and planned in advance by the operator and configured in the RAN and CN by 3GPP management system. The typical beam footprint size of an NTN cell is much larger compared to usual TN cell, therefore, the coverage of one cell in NTN may cover multiple TAs, the relationship between Cell and TA in NT and NTN is illustrated by Figure 5.2.2.1-1.



**Figure 5.2.2.1-1: Cell-TA relationship in TN and NTN**

The NTN can support Earth-fixed cell, quasi-Earth-fixed cell or Earth-moving cell. To avoid Tracking Area Codes (TAC) fluctuations in the NTN earth-moving cells case, the network may broadcast multiple Tracking Area Codes per PLMN ID in an NR NTN cell (see TS 38.300 [3] clause 16.14.3.1). As illustrated in Figure 5.2.2.1-2, the tracking area is designed to be fixed on ground, when cells sweep on the ground, the tracking area code (i.e. TAC) broadcasted is changed when the cell arrives to the area of next planned earth fixed tracking area location. This implies that the TAC or a list of TACs configuration on gNB needs to be frequently updates by 3GPP management system.



**Figure 5.2.2.1-2: An example of updating TACs in LEO earth-moving scenario**

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| **Next change** |

5.2.2.3 Potential solutions

5.2.2.3.1 Potential solution #<1>: Timing window based TAList update

In Rel-17, RAN has defined that NTN cell should broadcast multiple TAIs per PLMN ID, trackingAreaList has been introduced in PLMN-IdentityInfoList information element (see TS 38.331 [10]). It also requires that the field is only present in an NTN cell, network does not configure trackingAreaCode if this field is present.

For non-terrestrial network, RAN has also introduced SIB19 (System Information Block 19) which contains NTN-specific parameters (e.g. ephemeris information) for serving cell and optionally NTN-specific parameters for neighbour cells.

Considering the related TAIs broadcast in each cell change frequently with a foot print moving on earth, may be predictable, e.g. based on the satellite ephemeris information, position of the ground gateways, NTN beam information etc., time windows per TAList, which define the specific period during that the satellite coverage will be available for this location, can be derived and configured when NTN cell sweep over earth.

Following are the proposed solutions to support above requirements for Earth-moving cell scenario based on existing NRM fragment in TS 28.541 [x].

* Attribute "nTNTAClist" per PLMN ID can be defined under NRCellDU IOC (currently only configure gNB level TAClist for NTN), to indicate multiple tracking areas per each NTN cell covers. Moreover, ephemeris information for each satellite should also be referred to the cell when sending SIB19.
* Attribute "availableTimeWindows" as a list of "TimeWindow<<datatype>> " per nTNTAClist can be defined to indicator which time period the coverage will be available for the location.
* NTN neighbour cell might also be configured for each cell, solution under clause 5.2.1.3 could be reused.

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| **End of change** |