**3GPP TSG-SA5 Meeting #154 *S5-242114***

Changsha, China, 15 - 19 April 2024

**Source: Huawei**

**Title: pCR TR 28.874 New Use Case on NTN neighbour cell management**

**Document for: Approval**

**Agenda Item: 6.19.15**

# 1 Decision/action requested

***Approval***

# 2 References

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

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

# 3 Rationale

According to the SP-231733 Study on Management Aspects of NTN Phase 2 [2], one of the study item objectives is:

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*WT-4: Management enhancement for NTN-TN and NTN-NTN mobility coordination and better service continuity.*

*"*

It is proposed to add a new use case on NTN neighbour cell management to enhance NTN-TN mobility coordination and better service continuity. The reasons are:

1. NTN cell is much larger than a TN cell

2. NTN neighbour cell changes as NTN cell moving

# 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".

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

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

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

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| **Next change** |

# 5 Use cases

## 5.X Use case#<X>: NTN neighbour cell management

### 5.X.1 Description

As defined in TS 38.423[2] clause 9.2.2.13, the maximum number of neighbour cells associated to a served cell is 1024. In TN scenario the limitation on the number of neighbour cells is acceptable, but in NTN scenario the number of neighbour cells may overwhelm for two reasons:

* **NTN cell footprint is larger than a TN cell**

The typical beam footprint size of an NTN cell ranges from 100 km to 3500 km according to TR 38.821 [z], while for a TN cell the size is generally less than 10 km.

* **NTN neighbour cell changes as NTN cell moving**.



**Figure 5.x.1-2: NTN neighbour cell changes in LEO earth-moving scenario**

There are three types of service links described in TS 38.300 [y], one of the types is Earth-moving, which means the coverage area of earth-moving beam(s) slides over the Earth surface. In this scenario, NTN neighbour cell changes as NTN cell moving. Figure 5.x.1-2 shows the NTN neighbour cell changes in LEO earth-moving scenario. The NTN cell coverage is geographical area #1 at 10:00. At that moment, the neighbour cells are NTN cells and TN cells whose coverage are overlapping with geographical area #1. When the satellite moves to geographical area #2 at 10:15, the TN cells that overlap with an NTN cell changes, which means the neighbour cells of an NTN cell are not the ones in geographical area #1 at 10:00. In this case, if the cell recognized as neighbour cell in geographical area #1 still remains as neighbour cell at geographical area #2 and the information of the cell is sent to UE for handover, the performance of mobility could be worse since this cell is invalid at geographical area #2.

Overall, simply enlarging the limit of maximum number of neighbour cells leads two drawbacks in NTN:

1. As satellite moving, the number of neighbour cells passed by could be extremely large resulting in high storage demand in RAN.

2. As satellite moving, plenty of neighbour cells lose validity.

Therefore, to provide better mobility coordination and service continuity, how to manage NTN neighbour cells becomes a problem to be solved.

### 5.X.2 Potential requirements

**REQ-NTN-FUN-0X** The 3GPP management system shall have the capability to manage NTN neighbour cells considering the satellite movement.

### 5.X.3 Potential solutions

#### 5.X.3.i Potential solution #<i>: <Potential Solution i Title>

### 5.X.4 Evaluation of potential solutions

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| **End of change** |