3GPP RAN WG2 Meeting #123bis R2-23xxxxx

Xiamen, China, October 9th – 13th, 2023

Agenda Item: 7.7.1

Source: InterDigital

Title: Remaining MAC open issues in NTN

Document for: Discussion, Decision

# Introduction

As noted in a WI rapporteurs summary on open issues, there are several MAC-specific open issues to be addressed, such as TAT handling during unchanged PCI switch and various aspects of the RACH-less HO procedure. This contribution discusses these issues and other details of the running NTN MAC CR

\***Note**: Aspects related to LCID extension for MSG4 HARQ ACK are not included as they will be addressed in a general section. NTN specific aspects may be discussed later, if identified.

# Remaining MAC open issues in Rel-18 NTN

## Unchanged PCI switch scenario

**Open issue 1: *timeAlignmentTimer* handling during RACH-less unchanged PCI switch**

In RAN2#123 [1], the following was agreed regarding TAT handling during unchanged PCI switch:

* *In the unchanged PCI case, the UE considers UL synchronization timer expired at t-Service (current cell stop time) to stop any UL operation. FFS on timeAlignmentTimer handling.*

The unchanged PCI scenario requires UL/DL re-synchronization due to a switch of serving satellite. UL synchronization timer expiry only affects UL transmission, however, expiry of *timeAlignmentTimer* has additional impacts to MAC including flushing HARQ buffers, releasing PUCCH and SRS, clearing configured downlink assignments, configured uplink grants and PUSCH resources for semi-persistent CSI reporting.

RAN2 should conclude the preferred *timeAlignmentTimer* handling during an unchanged PCI switch (i.e., trigger TAT expiry, or TAT handling be left unchanged with no spec impact).

**Open issue 2:** **Impacts of unchanged PCI switch on MAC**

Post meeting email discussion [POST123bis][312][NR-NTN Enh] [2] has discussed several impacts of unchanged PCI switch to UE operation. Some of these aspects (e.g., SSB indication for target satellite, PHR reporting, failure detection, RACH-less satellite switching) may impact MAC specification.

Pending conclusion of the email discussion (and in coordination with RRC running CR) RAN2 needs to determine the impact of the unchanged PCI switch on MAC specification.

## RACH-less HO procedure

**Open issue 3: *timeAlignmentTimer* handling during RACH-less HO procedure**

The current version of the MAC running CR specifies the following regarding beam indication for dynamic grant during RACH-less HO [3]:

|  |
| --- |
| 1> else:  2> if *tci-StateID* is configured in *rach-lessHO*:  3> indicate to lower layers the TCI state information included in *tci-StateID*.  2> monitor the PDCCH as specified in TS 38.213 [6]. |

Which is an implementation of the following agreement from RAN2#123 [1]:

* *Single beam can be indicated in HO command to monitor target cell PDCCH for dynamic grant for initial UL transmission*

The following two comments have been raised in the running CR review, which based on the above agreement are currently unclear:

1. Whether a beam is mandatorily included in the HO command for dynamic grant case (currently it is specified as optional)
2. Whether the “single beam” is an SSB index (currently it is generally captured in RRC as *tci-StateID*).

RAN2 to conclude on the above details regarding beam indication in the RACH-less HO command for dynamic grant case.

**Open issue 4: Whether UE can trigger RACH when SR is triggered and *rach-lessHO* is configured**

During running CR review it was suggested to clarify whether the UE can trigger RACH when SR is triggered if *rach-lessHO* is configured. This clarification is in line with text captured in LTE [4]:

|  |
| --- |
| As long as one SR is pending, the MAC entity shall for each TTI:  - if no UL-SCH resources are available for a transmission in this TTI:  - Except for NB-IoT:  - if the MAC entity has no valid PUCCH nor valid SPUCCH resource for SR configured in any TTI:  - if the MAC entity is a MCG MAC entity and *rach-Skip* is not configured; or  - if the MAC entity is a SCG MAC entity and *rach-SkipSCG* is not configured:  - initiate a Random Access procedure (see clause 5.1) on the corresponding SpCell and cancel all pending SRs; |

RAN2 to confirm whether similar text be included in NR specification to clarify whether UE can trigger RACH when SR is triggered and *rach-lessHO* is configured.

**Open issue 5: Release of CG after completion of RACH-less HO**

During running CR review it was suggested to clarify UE behaviour regarding CG handling upon RACH-less handover completion if network does not release the CG.

In RAN2#123bis, the mobility session agreed to the following [5]:

* *RAN2 to define the UE behaviour on the R18 CG for RACH-less LTM, if it is not released by NW after LTM completion:* 
  + *Option 1: UE stops using those CG (FFS on the spec impact/wording details)*

RAN2 to confirm whether NTN should follow LTM agreement regarding UE behaviour when CG is not released by NW after RACH-less HO completion.

# References

1. R2-2309401 – RAN2#123 Meeting Report
2. [POST123bis][312][NR-NTN enh] Unchanged PCI (CMCC, Apple)
3. [POST123bis][308][NR-NTN enh] MAC Running CR (InterDigital)
4. 3GPP TS 36.321 v17.6.0
5. Draft\_R2\_123bis\_meeting\_report\_v1