3GPP TSG-RAN WG4 Meeting #116 R4-2512550

Bengaluru, India, August 25th – 29th 2025 (revision of R4-2509422)

**Title: LS Reply on precompensation for NB-IoT NTN TDD mode**

**Response to: LS R1-2503142 on precompensation for NB-IoT NTN TDD mode from RAN1**

**Release: Release 19**

**Work Item: Introduction of IoT-NTN TDD mode (IoT\_NTN\_TDD-Core)**

**Source: RAN4**

**To: RAN1**

**Cc: RAN2**

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**Send any reply LS to: 3GPP Liaisons Coordinator,** [**mailto:3GPPLiaison@etsi.org**](mailto:3GPPLiaison@etsi.org)

**Attachments: N/A**

# 1 Overall description

RAN4 received from RAN1 the following LS with the following RAN1 working assumptions:

**Working assumption**

For precompensation, from RAN1 perspective:

* The UE adjusts its time/frequency pre-compensation before the beginning of each set of consecutive 8 uplink subframes. No pre-compensation gap is needed before the beginning of each set of consecutive 8 uplink subframes.
  + FFS: Whether it is supported to perform segmented pre-compensation within the set of 8 consecutive uplink subframes, and whether in this case a pre-compensation gap is needed.
* FFS: whether spec impact is in RAN1, RAN4 or both

RAN4 would like to thank RAN1 for informing RAN4 about the agreement regarding UE behaviour in IoT NTN TDD system regarding the pre-compensation. RAN4 does not see any issues with the agreement and has agreed to incorporate the agreement in TS 36.102 clause 6.4B.1 as follows:

At the RAN4#116 meeting, RAN4 reached the following agreement:

* For frequency error requirement (TS 36.102):

“When a repetition period is configured on the uplink for which repetition period (R) >1, the UE shall not change Doppler pre-compensation during an ongoing repetition period, except in the transmission gaps as defined in clause 10.1.3.6 of TS 36.211[3] or except for band 249 in which UE is allowed to perform pre-compensation at the beginning of the uplink burst of 8 consecutive transmitted subframes, pre-compensation gap is not applicable for band 249.. When segmentation is applied, then the UE shall update pre-compensation at the beginning of each segment prior to segment transmission.”

**Note:** For TDD mode, the same TS 36.102 specification for NB-IoT NTN UE frequency error applies:

“Table 6.4B.1-1: Frequency error requirement for UE category NB1 and NB2

|  |  |
| --- | --- |
| Carrier frequency [GHz] | Frequency error [ppm] |
| ≤1 | ±0.2 |
| >1 | ±0.1 |

”

* For timing error requirement (TS 36.133):

For NB-IoT NTN TDD, UE may adjust its time at the beginning of the uplink burst of 8 consecutive transmitted subframes. Moreover, the time pre-compensation during the uplink burst of 8 consecutive transmitted sub-frames is considered up to UE implementation.

**Note:** For TDD mode, the same TS 36.133 specification for NB-IoT NTN UE timing error applies:

“Table 7.20A.2-1: Te Timing Error Limit

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 0.18 | 97\*TS |
| Note 1: TS is the basic timing unit defined in TS 36.211 | |

”

As a general assumption for both frequency error and timing error, no pre-compensation gap is needed before the beginning of each uplink burst of 8 consecutive transmitted subframes. However, when segmentation is applied (i.e. network configures the segmentation), UE pre-compensation gap may or may not be used for timing adjustment between 2 consecutive segments. UE is not pre-compensated after the first segment.Therefore, RAN4 estimates that the use of pre-compensation gaps on the UE side may be allowed but is optional depending on the UE implementation. RAN4 also considers that segmentation can be applied during the transmission of an uplink burst of 8 consecutive transmitted subframes.

# 2 Actions

**To RAN1**

**ACTION:** RAN4 asks RAN1 if the included TS change is in accordance with the RAN1 agreement; if it is, no action is needed from RAN1. If it is not, RAN4 respectfully asks for further guidance from RAN1.

# 3 Dates of next WG RAN4 meetings

RAN4#116-bis  2025-10-13- 2025-10-17  Prague, CZ