**3GPP TSG-RAN WG4 Meeting #110bis R4-2406109**

**Changsha, China, April 15 – April 19, 2024**

**Title:** Way Forward for [110bis][315] NR\_NTN\_Ph3

**Agenda Item:** 9.15.4

**Source: THALES**

**Document for:** Approval

# Introduction

This WF at RAN4#110bis meeting is for [110bis][315] NR\_NTN\_Ph3 (R4-2405835).

# Way forward

**Issue 1-1-1: RedCap**

**Agreement:** No SAN RF requirements impact due to introduction of Redcap.

**Issue 1-2-1: Figures for regenerative payload**

**Agreement:** Reuse current diagrams, clarifications may be needed.

**Issue 1-2-2: Regenerative payload specification in RAN4**

**Agreement:** There is some impact to the specification on definitions, diagrams, and scope, but there would not be RF requirements work. Some differentiation between regenerative and transparent definition might be required.

**Issue 1-2-3: CU/DU split**

**Agreement:** For the time being, if feeder link is part of the SAN seen as a black box, is not needed to consider the CU/DU split, and it is not necessary for RAN4 to define any requirements between CU/DU. Moreover, the split is a topic for RAN3, and CU/DU split for NTN is not part of the current WID.

**DL coverage enhancements for FR1-NTN or FR2-NTN**

**Issue 1-3-1: Cell DTX**

**Issue 1-3-2: RF requirements enhancements for spatial domain techniques**

**Encourage companies** to provide more inputs with beam switching delay and scenarios for deployment (switch pattern, RAN1 simulation assumption scenarios, etc.).

Consider e.g. analog/digital FR2/FR1 implementation.

# Annex with discussions at RAN4#110bis for [110bis][315] NR\_NTN\_Ph3

**Issue 1-1-1: RedCap**

* Proposals:
	+ **Start** the **RedCap UE RF requirement work** in this meeting. (P4/[R4-2404869](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404869.zip))
	+ **No RAN4 SAN RF requirements impact** foreseen for Rel-19 NTN Phase-3 WI Objectives 5 (RedCap) (O2/R4-2405317)

Samsung: UE RF already discussed in main session. For previous Redcap, we have not seen BS impact so we don’t expect any SAN impact.

No concerns were raised to the claim that no SAN RF requirements impact due to introduction of Redcap.

**Issue 1-2-1: Figures for regenerative payload**

ZTE: We use option 2 in current BS specification. High layer functionality is not included in the figure, but just the interfacing for conformance testing. Feeder link is out of scope, might be in another band altogether.

Huawei: Agree on proposal 1 that is not fully compliant.

Samsung: SAN definition includes the gateway and gNB before. Now that we transfer gNB functionality to the satellite, we need to update the figure. Moderator proposal of combining the two proposals sounds reasonable.

Ericsson: Satellite, feeder link, gateway was agreed to be a black box. Should not have impact to RF requirements.

Thales: We cannot collapse the SAN to a single box as it would not correctly reflect the definition of the SAN. The gNB functionality needs to be moved from GW to satellite.

ZTE: With regenerative payload, the satellite can self generate its baseband signal and high layer configuration without assistance from the GW. This should be ok with existing BS diagrams.

Thales: The entire BS is in the satellite, it cannot be broken apart.

**Issue 1-2-2: Regenerative payload specification in RAN4**

ZTE: There is some impact to the specification on definitions, diagrams, and scope, but there would not be RF requirements work.

Huawei: The definition is general enough already and covers both regenerative and transparent.

**Issue 1-2-3: CU/DU split**

ZTE: CU/DU split is not related to RF requirement definition. Even for TN, we didn’t have any RF requirements impact.

Nokia: If we regard feeder link as black box, we would not need to consider the CU/DU split.

ZTE: We don’t think it’s necessary for RAN4 to define any requirement between CU/DU. The split is a topic for RAN3.

**DL coverage enhancements for FR1-NTN or FR2-NTN**

**Issue 1-3-1: Cell DTX**

Ericsson: Cell DTx should be based on NES Rel-18 WI. For Rel-19 RF impact is related to beam switching delay. There may be RF impact with transient time due to beam switching.

ZTE: We did not have any Cell DTx core requirements for NES. The conformance part is still under discussion. Most likely there will be RRM impact, but very limited RF impact.

Samsung: The beam switching is assumed to happen during on/off transient time, so no impact is expected.

Ericsson: Is the on/off transient time long enough to accommodate beam switching delay?

ZTE: For FR2, beam switching time is 50 – 100 ns while transient time is 3 – 5 us for FR2 and 10 us for FR1 which is far longer than analog beam switching time.

Ericsson: We also need to consider the beam switching from on to on, not just off/on. We need further discussion to align common understanding.

Thales: We also need to differentiate between FR1 and FR2 as well as discuss implementation of digital or analog beamforming.

**Issue 1-3-2: RF requirements enhancements for spatial domain techniques**

Ericsson: RAN1 currently uses 0 delay which is not reasonable. RAN4 should determine what is the beam switching delay.

Huawei: RAN1 usually does not consider RF impairments. In RAN4, we can consider non-zero delay, but not clear what response we could expect from RAN1. This is RAN4 work.

ZTE: Agree with Ericsson. Even with non-zero ranges, we don’t expect either RAN4 impact or RAN1 activity.

Ericsson: We need to evaluate the impact of ranges. System capacity could be impacted, larger overhead, if switching delays are large.

Huawei: This parameter is only for simulation purposes. Other values are not precluded.

# Issues from Topic Summary not discussed at RAN4#110bis for [110bis][315] NR\_NTN\_Ph3

**Issue 1-3-3: Network energy saving**

**Proposal 1:**

* Network energy saving feature in Rel-18 can be starting point for RF impact analysis for Rel-19 NTN DL coverage enhancement objective. (P1/[R4-2404869](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404869.zip))
* No need to consider the spatial and power domain in Rel-18 NES impact on NTN RF for now. (P3/[R4-2404871](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404871.zip))

**Proposal 2:**

* It’s FFS whether any SAN Tx power requirements for objective 1 with power sharing between satellite beams or different satellite beam patterns/size (i.e. wide or narrow) across the satellite footprint. (O1/R4-2405317)

**UL capacity/throughput Enhancements for FR1-NTN**

**Issue 1-4-1: OCC**

**Proposals:**

* **Wait RAN1 reach conclusions on OCC** feature before RAN4 start to evaluate the RF impact. (P2/[R4-2404869](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404869.zip))
* **RAN4 waits for further progress on RAN1 work items** to identify the RF requirement enhancements needed for NR NTN phase 3 for objective 2 (UL capacity/throughput Enhancements). (P2/[R4-2405082](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405082.zip))
* No **RAN4 SAN RF requirements** impact foreseen for Rel-19 NTN Phase-3 WI Objectives 2 (UL capacity/throughput Enhancements) (O2/R4-2405317)

**Broadcast service**

**Issue 1-5-1:** **RAN4 SAN RF impact**

**Proposals:**

* **No RAN4 SAN RF requirements impact** foreseen for Rel-19 NTN Phase-3 WI **Objectives 3 broadcast service)** (O2/R4-2405317)