**3GPP TSG-RAN WG4 Meeting #112 draftR4-241xxxx**

**Maastricht, Netherlands, 19th – 23rd August, 2024**

**Source:** Ad-hoc chair (Samsung)

**Title:** Ad-hoc miniutes for [206] Rel-18 NR\_NTN\_enh

**Agenda item:** 5.23.9

**Document for:** Discussion and Approval

# 1 Introduction

This t-doc captures the ad-hoc discussion outcome on [206] Rel-18 NR\_NTN\_enh covering below topics:

* Issue 5-2
* Issue 6-2-2
* Issue 3-5
* Issue 5-2-S

Ad-hoc place and time:

* Thursday @RAN4 ad-hoc room from 8:30 to 9:30

# 2 Discussion

## **Issue 5-2: NTN to NTN Satellite switching without PCI change**

**Views from companies**

* (Huawei) RAN4 to clarify that the ending point of satellite switch with re-sync is the time point when UE is ready to receive DL channels/signals or transmit UL channels/signals from/to the target satellite, and to remove TIU in the delay/interruption time.

**Moderator’s WF:**

* RAN4 to clarify that the ending point of satellite switch with re-sync is the time point when UE is ready to receive DL channels/signals ~~or/~~and transmit UL channels/signals from/to the target satellite, and to remove TIU in the delay/interruption time.

**Ad-hoc discussion:**

Nokia: After checking with RAN2, we general ok with some update one wording.

**Agreement:**

* RAN4 to clarify that the ending point of satellite switch with re-sync is the time point when UE is ready to receive DL channels/signals and transmit UL channels/signals from/to the target satellite, and to remove TIU in the delay/interruption time.

## **Issue 6-2-2: (FR2-NTN) Rx beam gain**

**Views from companies**

* For the minimum SSB\_RP condition for electronic steering antenna,
	+ RAN4 to confirm Y (gain difference between fine and rough beams) = 0
		- Apple, Samsung, Huawei
* (Apple) Remove the bracket for the following 1dB relaxation:
	+ The existing absolute measurement accuracy requirement and relative measurement accuracy requirement of TN FR2 (including intra-frequency and inter-frequency) can be applied for NTN UE above 10GHz with 1dB relaxation
* Gmin FR2-NTN
	+ Samsung:
		- 27.3dBi for NTN VSAT type 3
		- 33.7dBi for other VSAT types
	+ Huawei
		- 25dB for VSAT type 3
		- 33dB for other VSAT types
* Gmax FR2-NTN
	+ Samsung: depends on typical implementation of antennas
	+ Huawei: 50dB for all VSAT types
* (Apple) The lower bound of Rx beam gain
	+ 30dB for NTN VSAT type 3
	+ 41dB for other VSAT types
	+ VSAT vendor to claim the upper bound of the Rx beam gain
* (Huawei) For RLM for FR2-NTN, RAN4 to discuss the following options
	+ Option 1: update core requirements (PDCCH parameters, evaluation period) as for R17 RedCap
	+ Option 2: update the SNR levels in TCs with new Qout/Qin and measurement accuracy
* For RLM for FR2-NTN, RAN4 to discuss the following options
	+ Option 1: update core requirements (PDCCH parameters, evaluation period) as for R17 RedCap, or,
	+ Option 2: update the SNR levels in TCs with new Qout/Qin and measurement accuracy

 **Discussion:**

QC: Either option is fine for us.

Huawei: Option 2 may require additional simulation work.

  **Agreement:** option 1 agreed.

* Gmin
	+ Option 1:
		- 27.3dBi for NTN VSAT type 3
		- 33.7dBi for other VSAT types

Discussion:

Samsung: For Gmin, we follow reuse the approach in last RAN4 meeting compared to PC3 considering the difference only including REFSENS and NF).

Huawei: We made similar calculation with different assumption on NF. Our assumption on NF comes from RF assumption.

Apple: Not sure whether we can reuse the approach by comparing PC3. We suggest to the value from TS 38.101-5 to replace the parameters in 38.863.

Ad-hoc agreement:

* Further offline on the detailed parameter assumptions to be aligned with core specification TS 38.101-5 and TR 38.863.
* Separate values will be introduced for NTN VSAT Type 3 and other VSAT types.
	+ Option 2:
		- 25dB for VSAT type 3
		- 33dB for other VSAT types
	+ Option 3:
		- 30dB for NTN VSAT type 3
		- 41dB for other VSAT types
* Gmax
	+ Option 1: depends on typical implementation of antennas
	+ Option 2: 50dB for all VSAT types

**Discussion:**

Samsung: Gmax is strongly depending on VSAT implementation. Either based on declaration or we can fix some typical values.

Huawei: We are also fine to be declaration basis.

Nokia: Do we have any range in mind for possible Gmax value?

**Agreement:**

Gmax leave to be declaration basis.

* Note: FFS whether RAN4 needs to specify the possible range for Gmax
* Note: If anything above inconsistent with RF requirement is identified, RAN4 to make updates to those aspects accordingly.
* Note: NTN FR2 VSAT classes specified in table 9.2.1.0-1 of TS38.101-5
	+ NTN VSAT type 1: Fixed VSAT communicating with GSO and LEO with mechanical steering antenna
	+ NTN VSAT type 2: Fixed VSAT communicating with GSO and LEO with electronic steering antenna
	+ NTN VSAT type 3: Fixed VSAT communicating only with LEO with electronic steering antenna
	+ NTN VSAT type 4: Mobile VSAT communicating with GSO with mechanical steering antenna
	+ NTN VSAT type 5: Mobile VSAT communicating with GSO with electronic steering antenna

## **Issue 3-5: Other impact on RRM**

**Views from companies**

* RAN4 to clarify that UE is only required to measure PRS from the serving cell for PRS measurement for NW verified location.
	+ Huawei

**Agreement**:

* RAN4 to clarify that UE is only required to measure PRS from the serving cell for PRS measurement for NW verified location.

## **Issue 5-2-S: Soft’ Satellite switch**

**Views from companies**

* (Apple) Not consider PDD reporting between serving and target satellites involved in the satellite switching without PCI change.
* (Apple) To enhance scheduling restriction in soft satellite switching, consider modifying the capability rule such that: if UE indicates to support soft satellite switching without PCI change, it also means UE supports both simultaneousRxDataSSB-DiffNumerology and parallelMeasurementWithoutRestriction-r17

**Moderator’s WF: The below seems to be already confirmed/agreed by RAN2**

* RAN4 to not consider PDD reporting between serving and target satellites involved in the satellite switching without PCI change.

**Moderator’s WF: Further discussion**

* To enhance scheduling restriction in soft satellite switching, consider modifying the capability rule such that: if UE indicates to support soft satellite switching without PCI change, it also means UE supports both simultaneousRxDataSSB-DiffNumerology and parallelMeasurementWithoutRestriction-r17.

**Discussion:**

CMCC: For proposal 1, we already have agreement in RAN2 on this, no need to repeat again in RAN4. On proposal 2 from Apple, It’s already discussed in RAN2.

CATT: For proposal 2, we don’t think the enhancement needed.

Nokia: For proposal 1, we are fine for either way. For proposal 2, we share similar view as Apple.

Apple: Network no information propagation delay between satellites and network no information when UE starts to sync with new satellite. The issue is also identified and discussed in RAN2.

MTK: We have concern on proposal 2. We understand UE may also need to support parallelMeasurementWithoutRestriction-r17 as well, but for “simultaneousRxDataSSB-DiffNumerology”, we don’t think it’s really necessary.

Huawei: For proposal 1 fine for us. For proposal 2, we have concern to put much restriction on UE capability.

Ericsson: Similar view from Huawei. It can leave to network scheduling.

Apple: We do see the benefits to enhance scheduling restriction in soft satellite switching.

QC: For proposal 1, we shall wait for RAN2 decision. For proposal 2, we have similar view as MTK.

Proposal 2 from Apple:

* Supporting: Apple, Nokia
* Against: CMCC, CATT, Huawei, Ericsson

## **Issue 4-1: TN to NTN cell reselection**

**Discussion:**

* For TN to NTN cell re-selection requirement when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, if UE is configured by network to have at least one high priority carrier which contains NTN cells, the requirements for GNSS ON shall be applied (Apple, Nokia, CMCC, Samsung)

**Ad-hoc discussion:**

QC: We prefer to leave it to UE implementation.

CMCC: We think the scenario is not typical case, and we can accept to leave it to UE implementation if UE vendors have strong concern.

MTK: We share similar view as QC.

Vivo: We share similar view as MTK.

Nokia: The proposal not mandate GNSS on just the requirements for GNSS ON shall be applied.

Apple: We can leave the details to UE implementation on GNSS on/off. We can use the information from configured high priority carrier.

* Supporting by: Nokia, Samsung, Apple, CMCC (preferred, but willing to compromise)
* Against by: MTK, vivo, QC, Huawei

# 3 Summary

## **Issue 5-2: NTN to NTN Satellite switching without PCI change**

**Agreement:**

* RAN4 to clarify that the ending point of satellite switch with re-sync is the time point when UE is ready to receive DL channels/signals and transmit UL channels/signals from/to the target satellite, and to remove TIU in the delay/interruption time.

## **Issue 6-2-2: (FR2-NTN) Rx beam gain**

**For RLM for FR2-NTN, RAN4 to discuss the following options**

**Agreement:** Option 1: update core requirements (PDCCH parameters, evaluation period) as for R17 RedCap

**Gmin**

**Agreement:**

* Further offline on the detailed parameter assumptions to be aligned with core specification TS 38.101-5 and TR 38.863.
* Separate values will be introduced for NTN VSAT Type 3 and other VSAT types.

**Gmax**

**Agreement:** Gmax leave to be declaration basis.

* Note: FFS whether RAN4 needs to specify the possible range for Gmax

## **Issue 3-5: Other impact on RRM**

**Agreement**:

* RAN4 to clarify that UE is only required to measure PRS from the serving cell for PRS measurement for NW verified location.

# Reference

[1] R4-2411801 Topic summary for [112][206] NR\_NTN\_enh, Moderator (Qualcomm)