**3GPP TSG-RAN WG4 Meeting # 104bis-e R4-22xxxxx**

**Electronic Meeting, October 10 – October 19, 2022**

**Agenda item:** 4.2.8

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Email discussion summary: [104-bis-e][201] NR\_NTN\_solutions\_RRM\_1

**Document for:** Information

# Introduction

*The summary covers the contributions submitted under the following AIs*

* *4.2.5 RRM core requirement maintenance [NR\_NTN\_solutions-Core]*
	+ *4.2.5.1 Measurement procedure requirements [NR\_NTN\_solutions-Core]*
	+ *4.2.5.2 Others [NR\_NTN\_solutions-Core]*

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

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| --- | --- | --- |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Open issues

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Open issues summary and Companies views’ collection for 1st round

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

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| R4-2215448 | Xiaomi, CAICT | **Proposal 1: For fully overlapped case, gap sharing rule is applied during the collided gap occasions, and the scaling factor is 2.*** **It is applicable only to the case where both of the concurrent MGs have the longest MGRP, i.e. 160ms.**
 |
| R4-2215391 | CATT | **Proposal: It is proposed that RAN4 do not define requirements for fully overlapping concurrent MGs.** |
| R4-2215603 | Apple | **Proposal 1: For fully overlapped case, gap sharing rule is applied during the collided gap occasions, and the scaling factor is 2.*** **It is applicable only to the case where both of the concurrent MGs have the longest MGRP, i.e. 160ms.**

**Observation: in NTN RRM measurement, even though the SMTC periodicity < MGRP, it can still be a fully overlapping case between SMTC and MG if all the SMTCs meet the proximity distance from MG.****Proposal 2: Specify the following Kp definition for NTN intra-frequency measurement without MG and inter-frequency measurement without MG together with a definition of overlapping between SMTC and MG (based on agreement of proximity between SMTC and MG in RAN4 #104e),**

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| **Kp is the scaling factor for an SSB frequency layer to be measured without measurement gaps. Kp = Ntotal\_SAN / Navailable\_SAN, where Navailable\_SAN and Ntotal\_SAN are calculated as follows:****- For a window W of duration max(SMTC period, MGRP\_max), where** **- If UE supports parallelMeasurementGap-r17 and is configured with concurrent measurement gaps, MGRP max is the maximum MGRP across all configured per-UE measurement gap and/or per-FR measurement gap within the same FR as the SSB frequency layer. Otherwise, MGRP max is the MGRP of configured measurement gap.** **- Starting from the beginning of any SMTC occasion:** **- Ntotal\_SAN is the total number of SMTC occasions within the window, including those overlapped and non-overlapped with measurement gap occasions within the window, and****- Navailable\_SAN is the number of SMTC occasions that are not overlapped with any non-dropped MG occasion within the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1C.8.3.****Kp = 1 when Navailable\_SAN = 0.** |

**Proposal 3: RAN4 to send a follow-up LS to RAN2 for previous LS(R4-2210611) that,** **One frequency layer can be associated to both concurrent measurement gaps with the same gap type for SSB based RRM measurement. RAN4 has no discussion on CSI-RS L3 measurement requirement for NTN in R17.** |
| R4-2215751 | MediaTek inc. | Proposal 1: For fully overlapped case, gap sharing rule is applied during the collided gap occasions, and the scaling factor is 2 (Option 2).  |
| R4-2216315 | Huawei, HiSilicon | **Proposal 1: For fully overlapped MG case,** * **If MGRP is 160ms, gap sharing rule is applied during the collided gap occasions, and the scaling factor is 2. [RAN4 introduce a new UE capability supporting “fully overlapping concurrent MGs” which is limited to NTN-only.]**
* **If MGRP is not 160ms, no requirement applies.**
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| R4-2216472 | Nokia, Nokia Shanghai Bell | **Observation: Overruling the priority rule in favor of the scaling factor tries to remove hard limitations on the network side, but imposes another one: the network will not be capable of using the priority rule enhancement for multiple measurement gaps.** **Proposal 1: The priority rule to be adopted in NTN for the case of overlapping measurement gaps as a baseline, in order to not preclude NTN to use one of Rel-17 enhancements.** **Proposal 2: If there is no priority assigned to two overlapping measurement gaps, and if both concurrent measurement gaps are set to the longest MGRP, then the gap sharing rule is applied.**  |
| R4-2216504 | Ericsson | **Proposal 1: We can support Option 2A, and we’re open to other methods which can avoid scheduling resources on collided gap.****Proposal 2: As per UE capability supporting ‘fully overlapping concurrent MGs’, we have concerns on the usage. We suggest postponing the proposal until practical demand for the capability is available.** **Proposal 3: For collision between SMTC and MG:*** **If UE is configured with 2 MGPs all the SMTC and MG occasions collide with each other for each of the configured MGPs, the intra-frequency measurement shall apply sharing rule: only defining sharing ratio or explicitly indication of dropping.**
* **Otherwise, the intra-frequency measurement shall use scaling factor (update from Kp concept) to drop SMTC occasions colliding with MG occasions.**
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| R4-2216312 | Huawei, HiSilicon | **Proposal 1: Update the re-establishment requirements for the case with serving cell Es/Iot is < -8dB:*** **6400ms when LEO are searched on the target frequency, and**
* **800ms when GEO are searched on the target frequency**

**Proposal 2: Remove the requirements for UL spatial relation switch for NTN.** |
| R4-2216467 | Nokia, Nokia Shanghai Bell | **Observation 1: The application of downlink timing reference, NTA-**offset and**NTA is well defined in the timing advance requirements.** **Observation 2: The application of**$N\_{TA,adj}^{common}$**lacks the definition of the expected point of application.****Observation 3: The application of** $N\_{TA,adj}^{UE}$ **lacks the definition of the expected point of application.****Proposal 1: UE must update the values of** $N\_{TA,adj}^{UE}$ **using the ephemeris information and** $N\_{TA,adj}^{common}$ **using the common delay formula at the beginning of every uplink slot.****Proposal 2: RAN 4 to define the requirements for application of the UE autonomous components of the timing advance:*** **Option 1: UE considers the satellite movement. The timing advance components consider the common delay and UE-satellite distance at the moment the UL signal reaches the satellite**
* **Option 2: UE does not consider the satellite movement. The timing advance components consider the common delay and UE-satellite distance at the moment the UE is updating their values.**
* **Option 3: Asks RAN 1 to clarify the application of these components.**
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**Issue 1. Fully Overlapping Concurrent MGs**

Agreements (from RAN4#104)

* Option 1: Do not define requirements for fully overlapping concurrent MGs
* Option 2: For fully overlapped case, gap sharing rule is applied during the collided gap occasions, and the scaling factor is 2
	+ Option 2A:
		- It is applicable only to the case where both of the concurrent MGs have the longest MGRP, i.e. 160ms.
		- A MG with the lowest ID, i.e. 0, gets priority over the other, and the dropping rule starts from SFN=0, i.e. MG-ID#0 is selected and MG-ID#1 is dropped at the first collision instance after SFN=0, and it alternates afterwards.
		- [RAN4 introduce a new UE capability supporting “fully overlapping concurrent MGs” which is limited to NTN-only.]
	+ Option 2B:
		- It is applicable only to the case where both of the concurrent MGs have the longest MGRP, i.e. 160ms.
		- RAN4 introduce a new UE capability supporting “fully overlapping concurrent MGs” which is limited to NTN-only.
	+ Option 2C:
		- It is applicable only to the case where both of the concurrent MGs have the longest MGRP, i.e. 160ms.

**Proposals**

* Proposal 1: CATT (R4-2215391)
	+ Do not define requirements for fully overlapping concurrent MGs
* Proposal 2: For fully overlapped case, gap sharing rule is applied during the collided gap occasions only when both of the concurrent MGs have the longest MGRP, i.e. 160ms., and the scaling factor is 2.
	+ Proposal 2A: Xiaomi/CAICT (R4-2215448), Apple (R4-2215603), MediaTek (R4-2215751), Huawei/HiSilicon (R4-2216315), Nokia (R4-2216472)
		- A selection of measurement gap between the two is left to UE implementation, i.e. a union of the two measurement gaps including slots in between the two, if any, is considered as one measurement gap while the UE is not required to perform measurements using the both measurement gaps.
	+ Proposal 2B: Ericsson (R4-2216504)
		- A MG with the lowest ID, i.e. 0, gets priority over the other, and the dropping rule starts from SFN=0, i.e. MG-ID#0 is selected and MG-ID#1 is dropped at the first collision instance after SFN=0, and it alternates afterwards.

**Moderator’s suggestion (before 1st round GTW)**

* Further discussion

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| **Company** | **Comments** |
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**Issue 2: CSI-RS based L3 measurements**

**Proposals**

* Proposal 1: Apple (R4-2215603)
	+ RAN4 to send a follow-up LS to RAN2 for previous LS(R4-2210611) that,
		- One frequency layer can be associated to both concurrent measurement gaps with the same gap type for SSB based RRM measurement. RAN4 has no discussion on CSI-RS L3 measurement requirement for NTN in R17.

**Moderator’s suggestion (before 1st round GTW)**

* In RAN4#101-bis e-meeting, it was agreed that “CSI-RS based L3 measurements are not applicable in Rel-17” which is captured in Issue 1-7-1 of R4-2202637.
* Agree on Proposal 1 in Principle, and work on the details of LS wording. A draft of LS is prepared in R4-2215605.

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| **Company** | **Comments** |
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**Issue 3: Update of Re-establishment requirements for GEO**

**Proposals**

* Proposal 1: Huawei/HiSilicon (R4-2216312)
	+ Update the re-establishment requirements for the case with serving cell Es/Iot is < -8dB
		- 6400ms when LEO are searched on the target frequency
		- 800ms when GEO are searched on the target frequency

**Moderator’s suggestion (before 1st round GTW)**

* Further discussion

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| **Company** | **Comments** |
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**Issue 4: UL spatial relation switch requirements**

**Proposals**

* Proposal 1: Huawei/HiSilicon (R4-2216312)
	+ Remove the requirements for UL spatial relation switch for NTN

**Moderator’s suggestion (before 1st round GTW)**

* Agree on Proposal 1.

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| **Company** | **Comments** |
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**Issue 5: Measurement period scaling due to proximity between SMTC and MG**

**Proposals**

* Proposal 1: Apple (R4-2215603)
	+ Specify the following Kp definition for NTN intra-frequency measurement without MG and inter-frequency measurement without MG together with a definition of overlapping between SMTC and MG (based on agreement of proximity between SMTC and MG in RAN4 #104e)
		- Kp is the scaling factor for an SSB frequency layer to be measured without measurement gaps. Kp = Ntotal\_SAN / Navailable\_SAN, where Navailable\_SAN and Ntotal\_SAN are calculated as follows:
			* For a window W of duration max(SMTC period, MGRP\_max), where
				+ If UE supports *parallelMeasurementGap-r17* and is configured with concurrent measurement gaps, MGRP max is the maximum MGRP across all configured per-UE measurement gap and/or per-FR measurement gap within the same FR as the SSB frequency layer. Otherwise, MGRP max is the MGRP of configured measurement gap.
			* Starting from the beginning of any SMTC occasion:
				+ Ntotal\_SAN is the total number of SMTC occasions within the window, including those overlapped and non-overlapped with measurement gap occasions within the window, and
				+ Navailable\_SAN is the number of SMTC occasions that are not overlapped with any non-dropped MG occasion within the window W, after accounting for measurement gap collisions by applying the measurement gap collision rule in section 9.1C.8.3.
		- Kp = 1 when Navailable\_SAN = 0.
* Proposal 2: Ericsson (R4-2216504)
	+ For collision between SMTC and MG:
		- If UE is configured with 2 MGPs all the SMTC and MG occasions collide with each other for each of the configured MGPs, the intra-frequency measurement shall apply sharing rule: only defining sharing ratio or explicitly indication of dropping.
		- Otherwise, the intra-frequency measurement shall use scaling factor (update from Kp concept) to drop SMTC occasions colliding with MG occasions.

**Moderator’s suggestion (before 1st round GTW)**

* Further discussion.

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| **Company** | **Comments** |
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**Issue 6. UE Uplink Timing Requirements**

**Proposals**

* Proposal 1: Nokia (R4-2216467)
	+ UE must update the values of $N\_{TA,adj}^{UE}$ using the ephemeris information and $N\_{TA,adj}^{common}$ using the common delay formula at the beginning of every uplink slot.
	+ Define the requirements for application of the UE autonomous components of the timing advance:
		- Option 1: UE considers the satellite movement. The timing advance components consider the common delay and UE-satellite distance at the moment the UL signal reaches the satellite
		- Option 2: UE does not consider the satellite movement. The timing advance components consider the common delay and UE-satellite distance at the moment the UE is updating their values.
		- Option 3: Asks RAN 1 to clarify the application of these components.

**Moderator’s suggestion (before 1st round GTW)**

* It was agreed the no further clarification is needed in Core requirement, instead the clarification can be made during test case development phase.
* Please discuss the issue in the other thread of Rel-17 NR NTN.

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| **Company** | **Comments** |
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## Summary for 1st round

*TBD*

## Discussion on 2nd round

*TBD*

# draft CRs and LSs

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Open issues summary and Companies views’ collection for 1st round

*Provide your comments on the listed draft CRs*

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| **CRs** | **Company** | **Clauses** |
| R4-2215500 | CMCC | 4.2C.2.2 Measurement and evaluation of serving cell4.2C.2.3 Measurements of intra-frequency NR cells |
| **Comments**Company A: |
| R4-2215604 | Apple | 9.2C.5 Intrafrequency measurements without measurement gaps9.3C.7 Inter frequency measurements without measurement gaps |
| **Comments**Company A: |
| R4-2215749 | Samsung | 9.2C NR intra-frequency measurements for SAN |
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| R4-2216316 | Huawei, HiSilicon | 8.1C Radio Link Monitoring for Satellite Access8.5C Link Recovery Procedures for Satellite Access |
| **Comments**Company A: |
| R4-2216317 | Huawei, HiSilicon | 9.1C.8 Concurrent measurement gaps for SAN |
| **Comments**Company A: |
| R4-2216463 | Nokia, Nokia Shanghai Bell | 4.2C.2.4 Measurements of inter-frequency NR cells |
| **Comments**Company A: |
| R4-2216502 | Ericsson | 9.1C.9 Collision between SMTC and MG for SAN9.2C.5.1 Intrafrequency cell identification9.2C.6 Intra-frequency measurements with measurement gaps9.3C.4 Inter-frequency measurement with measurement gaps9.3C.5 Inter-frequency measurements9.3C.7.1 Inter frequency Cell identification |
| **Comments**Company A: |
| R4-2215395 | CATT | 6.1C.1 NR SAN Handover6.1C.2 NR SAN Conditional Handover |
| **Comments**Company A: |
| R4-2215431 | CATT | 4.2C Cell Re-selection for NR UE for Satellite Access4.3C Minimization of Drive Tests (MDT) for Satellite Access5.3C Minimization of Drive Tests (MDT) for Satellite Access7.1C UE transmit timing for Satellite Access7.2C UE timer accuracy for satellite access7.3C Timing advance for satellite access |
| **Comments**Company A: |
| R4-2215582 | Apple | 9.2C.5.3.2 Scheduling availability of UE performing measurements on a neighbor cell served by a different satellite in LEO |
| **Comments**Company A: |
| R4-2215748 | Samsung | 4.2C.2.3 Measurements of intra-frequency NR cells |
| **Comments**Company A: |
| R4-2216313 | Huawei, HiSilicon | 6.2C RRC Connection Mobility Control for Satellite Access |
| **Comments**Company A: |
| R4-2216314 | Huawei, HiSilicon | 8.12C Uplink spatial relation switch delay for satellite access |
| **Comments**Company A: |
| R4-2216464 | Nokia, Nokia Shanghai Bell | Empty |
| **Comments**Company A: |
| R4-2216592 | Nokia, Nokia Shanghai Bell | 6.1C.1.2.1 Handover delay |
| **Comments**Company A: |

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| **LSs** | **Company** | **To** | **Title** |
| R4-2215605 | Apple | RAN2 | Reply LS on measurement gap enhancements for NTN |
| **Comments**Company A: |

## Summary for 1st round

*TBD*

## Discussion on 2nd round

*TBD*

# Recommendations for Tdocs

## 1st round

**New tdocs**

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**Existing tdocs**

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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

*TBD*

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents