**3GPP TSG-RAN WG4 Meeting # 109 R4-2318191**

**Chicago, US, November 13 – 17, 2023**

**Agenda item:** 9.6.7

**Source:** Moderator (MediaTek inc.)

**Title:** Topic summary for [109][235] IoT\_NTN\_enh

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this summary (e.g. list of treated agenda items).*

This document is the topic summary for RRM requirements for R18 IoT (Internet of Things) NTN (non-terrestrial network) enhancements, including the following topics covered

* Topic#1: RRM core requirements (AI 9.6.4)
* Topic#2: RRM performance requirements (AI 9.6.5)

*List of candidate target of discussions for this topic.*

* 1st round: Issue 1-2-1, 1-2-3, 1-2-4, 1-4-1, 1-4-2
* 2nd round: discuss CRs and WF.

# Topic #1: RRM core requirements (AI 9.6.4)

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318073**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318073.zip) | MediaTek inc. | Proposal 1: For NB-IoT in connected mode, when the intra-frequency measurement on the neighbor cell with NGSO which is different from the serving NGSO, the delay requirement is defined as in “best effort manner”, like the existing NB-IoT inter-frequency measurement approach.  Observation 1: UE is not required to update the GNSS location for Location-based connected mode measurement initiation.  Proposal 2: For location-based triggering neighbour cell measurements in connected mode, the requirements apply provided that the distance exceeds the distanceThresh by a margin of 100 m, as the UE is not required to update the GNSS location for Location-based connected mode measurement initiation.  Proposal 3: add generic description that the measurement delay requirements are suspended and resumed when the GNSS measurement is finished.   * + When the UE triggers an early termination (i.e. MSG3) of the GNSS-MG, the measurement delay requirements are suspended by the duration of the early-terminated GNSS-MG.   + The UE shall restart the cell detection/measurement when the interval between two samples are larger than 5000 ms. |
| [**R4-2318912**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318912.zip) | CMCC | *Proposal 1: Reuse the legacy intra-frequency measurements requirements for inter-satellite neighbor NGSO satellite intra-frequency measurement case. The whole intra-frequency measurements requirements will be scaled by ksatellite.*  *Proposal 2: Regarding the exact time for UE to start the measurement, wait further output from RAN2 of the Connected mode ‘t-Service’ IE.*   * *If the same ‘t-Service’ as IDLE is applied for Connected, RAN4 design an exact time for UE to start the measurement before it. E.g., UE shall start the measurement at least T1 before t-Service, where T1 is the time required to perform neighbour cell measurements configured by network.* * *If new ‘t-Service’ IE will be introduced in connected mode, and this connected ‘t-Service’ is the timing earlier than service stopping time, which depends on RAN2’s design, then the timing when UE start the measurement is up to UE implementation.*   *Proposal 3: Considering the network could set the ‘t-ServiceStarNeigh’ ideally or early than ideal timing, the measurement gap pattern(s) configured for neighbour cell measurements can be suspended until the earliest time t-ServiceStartNeigh among neighbour satellites.*  *Proposal 4: Update Tinterrupt to include Tsearch, based on handover interruption requirement as in*   * *5.5A.2.1.2 Interruption time for CEMode A* * *5.5A.3.1.2 Interruption time for CEMode A*   *Proposal 5: When the GNSS gap shorter than [5]s, the measurement delay requirements are extended by the duration of the GNSS-MG.*  *Proposal 6: When the GNSS gap equal or longer than [5]s, UE should re-start the measurements after GNSS measurement gap. The requirements are not applicable when the UE is performing GNSS measurement using such gaps.* |
| [**R4-2319352**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319352.zip) | Huawei, HiSilicon | Proposal 1: Define requirements for NGSO intra-frequency inter-satellite neighbour cell measurement as “inter-frequency” case.  Proposal 2: Not to capture the exact time for UE to start measurement in RAN4 spec.  Proposal 3: For eMTC neighbour cell measurement, MG shall be configured as legacy TN case.  Proposal 4: Measurement gap pattern(s) configured for neighbour cell measurements are suspended when *t-ServiceStartNeigh* is configured for all satellite and the earliest *t-ServiceStartNeigh* has not started.  Proposal 5: Add generic description that the measurement delay could be longer if GNSS fix happens during measurement period  Proposal 6: When GNSS gap overlaps with MG, MG is not suspended if GNSS-MG is terminated earlier than MG and UE does not sent CBRA or after CBRA if CBRA is sent. |
| [**R4-2320140**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320140.zip) | Ericsson | 1. The location accuracy of 50 meter used for comparing the *distanceThresh* from NR NTN is reused for IoT NTN (eMTC and NB-IoT). 2. The interruption time in conditional handover requirements shall not include Tsearch. 3. For intra-frequency neighbour cells managed by a satellite different from the serving satellite, the legacy requirements apply provided that cell is available as indicated by *t-ServiceStartNeigh*. 4. For eMTC and NB-IoT, the UE shall start the intra-frequency neighbour cell measurements at least time T1 before *t-Service*, where T1 is the time required to perform one intra-frequency neighbour cell measurement. 5. For eMTC and NB-IoT, RAN4 to maintain defining of RRM requirements based on satellite type (GSO, NGSO). 6. If *t-ServiceStart* is provided, measurement gap pattern(s) configured for neighbour cell measurements are suspended until time *t-ServiceStart*. 7. For eMTC location-based triggering of neighbour cell measurements, RAN4 to discuss the conditions on when the neighbour cell measurements can be performed without gaps. The NB-IoT conditions defined in clause 8.14.6 in TS 36.33 is used as baseline. 8. Measurements that occur during GNSS reacquisition time period using gaps are suspended. 9. If the *carrierFreqList* in SIB32 indicates that current and target cells belong to the same carrier, then Ksatellite,I can be set to 1. Otherwise, Ksatellite,I shall correspond to the number of NGSO satellites the UE shall monitor. |
| [**R4-2320741**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320741.zip) | Nokia, Nokia Shanghai Bell | [Proposal 1: When more than 2 satellites are available for measurement in a given frequency layer, the requirements apply for the two satellites with highest priority in a given frequency layer, where the priorities might be given by](#_Toc149938141)  [a. Send an LS to RAN2 to provide neighbbor cell priorities when more than 2 cells are configured for measurements; or](#_Toc149938142)  [b. Assume implicit priorities based on the order of configuration](#_Toc149938143)  [Proposal 2: RAN4 to discuss whether the availability of high priority frequency layers in a given satellite might be used to decide which satellite to measure in all frequency layers, when there is no difference in priority between the satellites.](#_Toc149938144)  [Proposal 3: When a UE starts neighbor cell measurements based on time-based measurement initiation (e.g. Ttrigger before t-service), the UE skips the serving cell measurements when the following side conditions are met:](#_Toc149938145)  [a. When skipping serving cell measurements reduces the value of Ksatellite (i.e. no neighbor cell is configured for measurements in the same satellite as the serving cell)](#_Toc149938146)  [b. The S-Criterion is still met by the serving cell, according to the most recent measurements on the serving cell.](#_Toc149938147)  [c. If those conditions are met, the UE is allowed to use the last value for the serving cell measurements for cell reselection purpose until t-service is reached.](#_Toc149938148)  [Observation 1: If no time-based trigger is used for starting the measurements, the requirements for time-based measurement initiation are not applicable.](#_Toc149938149)  [Proposal 4: NB-IoT UE shall start time-based neighbor cell measurements:](#_Toc149938150)  [a. If no t-serviceStartNeigh is provided, it is up for UE implementation](#_Toc149938151)  [b. If t-serviceStartNeigh is provided for the neighbor cells, measurements shall start at tinitiate\_inter = min( [Y] DRX Cycles, tService-tServiceStartNeigh) before t-service](#_Toc149938152)  [Proposal 5: Do not define a point in time for UE to initiate measurements before losing its coverage on Earth Moving Cell scenarios (for both NB-IoT and eMTC).](#_Toc149938153)  [Proposal 6: For eMTC, time-based measurement initiation is only applicable for the cases where the UE does not require a MG (e.g. intra-frequency measurements, for cells in the same satellite, if any is configured).](#_Toc149938154)  [Proposal 7: Revise the agreement for T trigger, to include only the measurements where a MG is not needed.](#_Toc149938155)  [Proposal 8: Discuss the effect of t-serviceStartNeigh on Ttrigger](#_Toc149938156)  [Proposal 9: For eMTC, location-based measurement initiation is only applicable for the cases where the UE does not require a MG (e.g. intra-frequency measurements, for cells in the same satellite, if any is configured).](#_Toc149938157)  [Proposal 10: If the UE is provided with MG for neighbor cell measurements, if t-serviceStartNeigh is provided for a given frequency, the UE is allowed to drop the MGs for that frequency. The MG might be used for measurements in different frequencies.](#_Toc149938158)  [Observation 2: As GNSS-MG are expected to be frequently configured & triggered, option 1 would ensue in frequently having non-applicable requirements for RLM.](#_Toc149938159)  [Observation 3: In some scenarios, the full duration of a GNSS-MG is confined withing one eDRX\_Conn\_cyle.](#_Toc149938160)  [Proposal 11: For the cases where the GNSS-MG is smaller than the eDRX cycle, the RLM requirements are still applicable.](#_Toc149938161)  [Proposal 12: When the GNSS-MG is shorter than the (e)DRX cycle and it collides with the on Duration part of one (e)DRX cycle, the time to evaluate requirements might be extended by one (e)DRX cycle.](#_Toc149938162)  [Proposal 13: When the UE is configured with eDRX cycle, and the GNSS-MG is larger than the eDRX cycle, the requirements applicable right after the GNSS-MG shall be corresponding to a DRX cycle of [1.28] s.](#_Toc149938163) |

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### RRM core requirements

### Sub-Topic 1-1: IDLE mode measurements

#### Issue 1-1-1: Skipping serving cell measurement before *t-service*

Proposals:

* Proposal 1 (Nokia): When a UE starts neighbor cell measurements based on time-based measurement initiation (e.g. Ttrigger before t-service), the UE skips the serving cell measurements when the following side conditions are met:
  + When skipping serving cell measurements reduces the value of Ksatellite (i.e. no neighbor cell is configured for measurements in the same satellite as the serving cell)
  + The S-Criterion is still met by the serving cell, according to the most recent measurements on the serving cell.
  + If those conditions are met, the UE is allowed to use the last value for the serving cell measurements for cell reselection purpose until t-service is reached.
* Proposal 2: no new change

Recommended WF: Discuss Proposal.

### Sub-Topic 1-2: CONN mode neighbour cell measurements

#### Issue 1-2-1: For NB-IoT NGSO, intra-frequency inter-satellite neighbour cell measurement

Proposals:

* Proposal 1: Define requirements for NGSO intra-frequency inter-satellite neighbour cell measurement as “inter-frequency” case. (Huawei, MTK)
* Proposal 2: Reuse the legacy intra-frequency measurements requirements for inter-satellite neighbor NGSO satellite intra-frequency measurement case. The whole intra-frequency measurements requirements will be scaled by ksatellite. (CMCC)
* Proposal 2a: For intra-frequency neighbour cells managed by a satellite different from the serving satellite, the legacy requirements apply provided that cell is available as indicated by *t-ServiceStartNeigh*. (Ericsson)

Recommended WF:

* Define requirements for NGSO intra-frequency inter-satellite neighbour cell measurement as “inter-frequency” case
* Add condition that requirements apply provided that cell is available as indicated by t-ServiceStartNeigh if indicated.

#### Issue 1-2-2: For NB/eMTC, time-based triggering, the exact time for UE to start the measurement

Background: Agreement in RAN4 #108bis

* *For NB-IoT, time-based (t-Service) measurement initiation requirements apply to earth fixed cell.*
  + *RAN4 understand that the exact time for UE to start the measurement is up to UE implementation according to RAN2.*
  + *FFS whether to capture the exact time for UE to start the measurement in RAN4 requirements.*
* *For earth moving cell, UE shall initiate the measurement before losing its coverage and this needs to reflected in RAN4 requirements.*
  + *RAN4 understand that the exact time for UE to start the measurement is up to UE implementation according to RAN2.*
  + *FFS whether to capture the exact time for UE to start the measurement in RAN4 requirements.*
* *For eMTC, time-based (t-Service) measurement initiation requirements apply to earth fixed cell.*
  + *RAN4 understand that the exact time for UE to start the measurement is up to UE implementation according to RAN2.*
  + *FFS whether to capture* *the exact time for UE to start the measurement in RAN4 requirements.*
* *For earth moving cell, UE shall initiate the measurement before losing its coverage and this needs to reflected in RAN4 requirements.*
  + *RAN4 understand that the exact time for UE to start the measurement is up to UE implementation according to RAN2.*
  + *FFS whether to capture the exact time for UE to start the measurement in RAN4 requirements.*
* *Further discuss for time-based neighbor cell measurement, requirements apply for the eMTC UE provided the measurement gaps are configured.*

// 5.5.8 Measurements in NB-IoT, in TS 36.331 running CR R2-2309286

While in RRC\_CONNECTED mode, the UE shall:

1> if *t-Service* is present in *SystemInformationBlockType3-NB*:

2> perform intra-frequency measurements or inter-frequency measurements before *t-Service*, the exact time to start measurements is left to UE implementation;

2> if *t-ServiceStartNeigh* is present in *SystemInformationBlockType3-NB*, UE implementation can decide to start measurements upon or after *t-ServiceStartNeigh*;

// to *t-Service* in current 36.331 as below.

|  |
| --- |
| ***t-Service***  Time information on when a NTN quasi-Earth fixed cell is going to stop serving the area it is currently covering, as specified in TS 36.304 [4]. |
| ***t-ServiceStartNeigh***  Time information on when an NTN quasi-Earth fixed neighbour cell is going to start serving the area covered by the current serving cell. |

Proposals:

* Proposal 1 (Huawei): Not to capture the exact time for UE to start measurement in RAN4 spec
* Proposal 1a (CMCC): wait further output from RAN2 of the Connected mode ‘t-Service’ IE
  + If the same ‘t-Service’ as IDLE is applied for Connected, RAN4 design an exact time for UE to start the measurement before it. E.g., UE shall start the measurement at least T1 before t-Service, where T1 is the time required to perform neighbour cell measurements configured by network.
  + If new ‘t-Service’ IE will be introduced in connected mode, and this connected ‘t-Service’ is the timing earlier than service stopping time, which depends on RAN2’s design, then the timing when UE start the measurement is up to UE implementation.
* Proposal 2 (Ericsson): the UE shall start the intra-frequency neighbour cell measurements at least time T1 before t-Service, where T1 is the time required to perform one intra-frequency neighbour cell measurement.
* Proposal 3 (Nokia): NB-IoT UE shall start time-based neighbor cell measurements:
  + [a. If no t-serviceStartNeigh is provided, it is up for UE implementation](#_Toc149938151)
  + [b. If t-serviceStartNeigh is provided for the neighbor cells, measurements shall start at tinitiate\_inter = min( [Y] DRX Cycles, tService-tServiceStartNeigh) before t-service](#_Toc149938152)
* Proposal 4 (Nokia): Do not define a point in time for UE to initiate measurements before losing its coverage on Earth Moving Cell scenarios (for both NB-IoT and eMTC).

Recommended WF: Not to capture if no consensus.

Issue 1-2-3: For eMTC, time-based triggering and MG perpectives

Proposals:

* Proposal 1 (Huawei): For eMTC neighbour cell measurement, MG shall be configured as legacy TN case.
* Proposal 2 (Nokia):
  + For eMTC, time-based measurement initiation is only applicable for the cases where the UE does not require a MG (e.g. intra-frequency measurements, for cells in the same satellite, if any is configured).
  + Revise the agreement for T trigger, to include only the measurements where a MG is not needed.
  + Discuss the effect of t-serviceStartNeigh on Ttrigger

Recommended WF:

* Discussions needed.

Issue 1-2-4: For eMTC, location-based triggering and MG perpectives

Proposals:

* Proposal 1 (Huawei): For eMTC neighbour cell measurement, MG shall be configured as legacy TN case.
* Proposal 2 (Nokia): For eMTC, location-based measurement initiation is only applicable for the cases where the UE does not require a MG (e.g. intra-frequency measurements, for cells in the same satellite, if any is configured).
  + Proposal 2a (Ericsson): For eMTC location-based triggering of neighbour cell measurements, RAN4 to discuss the conditions on when the neighbour cell measurements can be performed without gaps. The NB-IoT conditions defined in clause 8.14.6 in TS 36.33 is used as baseline.

Recommended WF:

* Further discuss whether the location-based measurement initiation is appliable when MG is configured.
* Further discuss the conditions on when the neighbour cell measurements can be performed without gaps.

Issue 1-2-5: For eMTC, suspend MG upon *t-ServiceStarNeigh*

Proposals:

* Proposal 1 (CMCC): Considering the network could set the ‘*t-ServiceStarNeigh*’ ideally or early than ideal timing, the measurement gap pattern(s) configured for neighbour cell measurements can be suspended until the earliest time *t-ServiceStartNeigh* among neighbour satellites.
* Proposal 2 (Huawei): Measurement gap pattern(s) configured for neighbour cell measurements are suspended when *t-ServiceStartNeigh* is configured for all satellite and the earliest *t-ServiceStartNeigh* has not started.
* Proposal 3 (Ericsson): If *t-ServiceStart* is provided, measurement gap pattern(s) configured for neighbour cell measurements are suspended until time *t-ServiceStart*.
* Proposal 4 (Nokia): If the UE is provided with MG for neighbor cell measurements, if t-serviceStartNeigh is provided for a given frequency, the UE is allowed to drop the MGs for that frequency. The MG might be used for measurements in different frequencies.

Recommended WF:

* If *t-ServiceStartNeigh* is provided for all satellite for a given frequency, measurement gap pattern(s) configured for neighbour cell measurements are suspended until the earliest t-ServiceStartNeigh.

#### Issue 1-2-6: For NB/eMTC NGSO, Ksatellite in Re-establishment delay requirement

Proposals:

* Proposal 1 (Ericsson): If the *carrierFreqList* in SIB32 indicates that current and target cells belong to the same carrier, then Ksatellite,I can be set to 1. Otherwise, Ksatellite,I shall correspond to the number of NGSO satellites the UE shall monitor.

Recommended WF:

* Discuss the proposal.

### Sub-Topic 1-3: eMTC, CHO

#### Issue 1-3-1: For eMTC, CHO requirements

Background: Agreement in RAN4 #108bis

*Agreement:*

* *Introduce CHO requirements for NTN eMTC with time and location-based trigger conditions. DCHO = TRRC + Tmeasure + TEvent\_DU +Tinterrupt + TCHO\_execution*

*Where:*

* + *TRRC is the RRC procedure delay*
  + *TEvent\_DU is the delay uncertainty which is the time from when the UE successfully decodes a conditional handover command until the time/location condition fulfilled.*
  + *Tmeasure is the measurements time. Tmeasure=0 if only condEventD1 or condEventT1 is configured.*
  + *TCHO\_execution is the conditional execution preparation time*
  + *Tinterrupt is the interruption time.*
  + *FFS Update Tinterrupt to include Tsearch, based on handover interruption requirement as in*
    - *5.5A.2.1.2 Interruption time for CEMode A*
    - *5.5A.3.1.2 Interruption time for CEMode A*

Proposals:

* Proposal 1 (CMCC):
  + *Update Tinterrupt to include Tsearch, based on handover interruption requirement as in*
    - *5.5A.2.1.2 Interruption time for CEMode A*
    - *5.5A.3.1.2 Interruption time for CEMode A*
* Proposal 2 (Ericsson): The interruption time in conditional handover requirements shall not include Tsearch.

*Moderators’ understanding is condEventD1/T1 can be configured without signal quality criteria and thus UE may not have measured the target CHO cell. So it could be different from the legacy CHO.*

Recommended WF: Discussions needed

### Sub-Topic 1-4: GNSS re-acquisition gap in connected mode

#### Issue 1-4-1: GNSS-MG spec impact

Background: Agreement in RAN4 #108bis

*Discuss the following options until next meeting.*

* *Option 1: add generic description that the measurement delay could be longer if GNSS fix happens during measurement period.*
* *Option 2: The measurement delay requirements are extended by the duration of the GNSS-MG.* 
  + *When the UE triggers an early termination of the GNSS-MG, the measurement delay requirements are extended by the duration of the early-terminated GNSS-MG.*
* *Option 3: The measurement delay requirements are suspended until the termination of the GNSS-MG.*

Background: RAN2#123bis agreement

Proposal 4: The following update in NOTE in Stage 2 running CR is agreed:

NOTE: The AS operations (e.g. RLM related timers, dataInactivityTimer, CHO execution, neighbour cell measurement, RACH, SR, and BSR) are **suspended** when UE is performing GNSS measurement during GNSS measurement gap and **resumed** when the GNSS measurement is finished

* Agreed

Proposals:

* Proposal 1: add generic description that the measurement delay requirements are suspended and resumed when the GNSS measurement is finished. (MTK)
  + When the UE triggers an early termination (i.e. MSG3) of the GNSS-MG, the measurement delay requirements are suspended by the duration of the early-terminated GNSS-MG.
  + The UE shall restart the cell detection/measurement when the interval between two samples are larger than 5000 ms.
* Proposal 2 (CMCC)
  + When the GNSS gap shorter than [5]s, the measurement delay requirements are extended by the duration of the GNSS-MG.
  + When the GNSS gap equal or longer than [5]s, UE should re-start the measurements after GNSS measurement gap. The requirements are not applicable when the UE is performing GNSS measurement using such gaps.
* Proposal 3 (Huawei): Add generic description that the measurement delay could be longer if GNSS fix happens during measurement period
* Proposal 4 (Ericsson): Measurements that occur during GNSS reacquisition time period using gaps are suspended.
* Proposal 5 (Nokia):
  + For the cases where the GNSS-MG is smaller than the eDRX cycle, the RLM requirements are still applicable.
  + When the GNSS-MG is shorter than the (e)DRX cycle and it collides with the on Duration part of one (e)DRX cycle, the time to evaluate requirements might be extended by one (e)DRX cycle.
  + When the UE is configured with eDRX cycle, and the GNSS-MG is larger than the eDRX cycle, the requirements applicable right after the GNSS-MG shall be corresponding to a DRX cycle of [1.28] s.

Recommended WF:

* Add generic description that the measurements are suspended when UE is performing GNSS measurement during GNSS measurement gap. Wording to be discussed directly in the CR.
* Discuss whether the UE shall restart the cell detection/measurement when the interval between two samples are larger than 5000 ms.
* Further discuss the following proposals for (e)DRX cycle during the meeting
  + For the cases where the GNSS-MG is smaller than the eDRX cycle, the RLM requirements are still applicable.
  + When the GNSS-MG is shorter than the (e)DRX cycle and it collides with the on Duration part of one (e)DRX cycle, the time to evaluate requirements might be extended by one (e)DRX cycle.
  + When the UE is configured with eDRX cycle, and the GNSS-MG is larger than the eDRX cycle, the requirements applicable right after the GNSS-MG shall be corresponding to a DRX cycle of [1.28] s.

Issue 1-4-2: For eMTC, GNSS-MG overlapping with MG

Background: Agreement in RAN4 #108bis

*Agreement:*

* *If gaps configured for reacquiring GNSS and gaps configured for mobility measurements at least partially overlaps in time with other, then UE shall suspend the gaps configured for mobility measurements and instead prioritize the use of GNSS gaps*
  + *Note: it considers as no overlapping between GNSS-MG and gaps configured for mobility measurements after the UE has performed early termination of GNSS-MG.*

Proposals:

* Proposal 1: When GNSS gap overlaps with MG, MG is not suspended if GNSS-MG is terminated earlier than MG and UE does not sent CBRA or after CBRA if CBRA is sent. (Huawei)

Recommended WF:

* When GNSS gap overlaps with MG, MG applies if GNSS-MG is terminated earlier than MG and after CBRA if CBRA is sent.
  + Further discuss whether MG is applicable if GNSS-MG is terminated earlier than MG but the UE does not sent CBRA.

### Sub-Topic 1-5: Others

#### Issue 1-5-1: Requirement terminologies

Background: TDoc R4-2320140 mentioned:

*In addition, it is noted that the RAN4 agreements shown above are defined using the terminologies earth-fixed cell and earth-moving cells which are currently not used in the IoT NTN RRM requirements. RRM requirements are differentiated based on satellite types, GSO and NGSO*

Proposals:

* Proposal 1: For eMTC and NB-IoT, RAN4 to maintain defining of RRM requirements based on satellite type (GSO, NGSO). (Ericsson)

Moderator’s understanding is the *earth-fixed cell* and *earth-moving cells* can be transparent in R4 core spec. Whether need to clarify it in the test case configuration can be further discuss in the performance part.

Recommended WF: For eMTC and NB-IoT, RAN4 to maintain defining of RRM core requirements based on satellite type (GSO, NGSO).

#### Issue 1-5-2: Location-based triggering cell measurements – margin for distanceThresh

Proposals:

* Proposal 1: The location accuracy of 50 meters used for comparing the distanceThresh from NR NTN is reused for IoT NTN (eMTC and NB-IoT). (Ericsson)
* Proposal 2: For location-based triggering neighbour cell measurements in connected mode, the requirements apply provided that the distance exceeds the distanceThresh by a margin of 100 m, as the UE is not required to update the GNSS location for Location-based connected mode measurement initiation. (MTK)

Recommended WF: Postpone the margin discussion in performance part.

#### Issue 1-5-3: Clarification on more than two NGSO satellites on a frequency layer

* Proposal 1 (Nokia): When more than 2 satellites are available for measurement in a given frequency layer, the requirements apply for the two satellites with highest priority in a given frequency layer, where the priorities might be given by
  + Send an LS to RAN2 to provide neighbbor cell priorities when more than 2 cells are configured for measurements; or
  + Assume implicit priorities based on the order of configuration
* Proposal 2 (Nokia): RAN4 to discuss whether the availability of high priority frequency layers in a given satellite might be used to decide which satellite to measure in all frequency layers, when there is no difference in priority between the satellites.

Recommended WF: Discuss Proposal 1 and 2.

### RRM core part draft CRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Title** | **Source** |
| [**R4-2318074**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318074.zip) | CR on cell re-selection requirement for IoT NTN enhancement for UE category NB-IoT | MediaTek inc. |
| [**R4-2318913**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318913.zip) | Draft CR to TS 36.133: Conditional HO for Cat-M1 for IOT-NTN | CMCC |
| [**R4-2319353**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319353.zip) | Draft CR on RRM impact of GNSS re-acquisition for NB-IoT | Huawei, HiSilicon |
| [**R4-2320015**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320015.zip) | draftCR on IDLE mode requirements for eMTC over NTN | Huawei, HiSilicon |
| [**R4-2320141**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320141.zip) | IoT NTN RRM requirements during GNSS reacquisition | Ericsson |
| [**R4-2320142**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320142.zip) | IoT NTN RRC re-establishment requirements during discontinuous coverage | Ericsson |
| [**R4-2320742**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320742.zip) | DraftCR to 36.133 on Connected Mode Mobility for IoT NTN | Nokia, Nokia Shanghai Bell |
| [**R4-2320743**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320743.zip) | DraftCR to 36.133 on Connected Mode Mobility for Emtc NTN | Nokia, Nokia Shanghai Bell |

# Topic #2: RRM performance requirements (AI 9.6.5)

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

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318076**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318076.zip) | MediaTek inc. | **Proposal 1: Introduce inter-frequency test cases, which were postponed by the previous WI.**  **Proposal 2: Introduce NGSO configuration for the existing intra-frequency test cases.**  **Proposal 3: For NB-IoT, introduce test cases for neighbour cell measurement in CONNNECTED mode.**  **Proposal 4: RAN4 to further discuss the test case list and whether and how to reduce the number of test cases for time-based / location-based triggering cell reselection, connected mode measurement, and CHO (for eMTC only).** |
| [**R4-2319354**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319354.zip) | Huawei, HiSilicon | **Proposal 1: Define test cases which are suspended in Rel-17 [2][3] due to lack of neighbour cell assistant information.**  **Proposal 2: Define test cases to verify the performance of enhancement introduced in Rel-18 IoT NTN based on following table I.**  **Table I. Test case for Rel-18 IoT NTN**   |  |  |  | | --- | --- | --- | | **Requirements** | **NB/eMTC** | **Quasi-fixed/Earth moving** | | IDLE: Time-based measurement triggering | NB/eMTC | Quasi-fixed | | IDLE: Location-based measurement triggering | NB/eMTC | Quasi-fixed/Earth moving | | **CONN: Location-based measurement triggering [NB/eMTC]** | **NB/eMTC** | **Quasi-fixed/Earth moving** | | **CONN: Time-based measurement triggering** | **eMTC** | **Quasi-fixed** | | CHO configured with condEventD1 | eMTC | Quasi-fixed/Earth moving | | CHO configured with condEventT1 | eMTC | Quasi-fixed/Earth moving | |
| [**R4-2320143**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320143.zip) | Ericsson | 1. **RAN4 to define new tests to verify the requirements for the intra- and inter-frequency cell reselections based on location criteria for NB-IoT.** 2. **RAN4 to define new tests to verify the intra- and inter-frequency handover requirements for eMTC.** 3. **RAN4 to discuss feasibility of defining tests for time- and location based triggering of neighbour cell measurements.** 4. **RAN4 to postpone the discussions on test cases due to use of GNSS measurement gaps.** |
| [**R4-2320744**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320744.zip) | Nokia, Nokia Shanghai Bell | [**Proposal 1: Introduce the test cases for inter-frequency mobility and NGSO mobility that were not addressed in the previous WI, before introducing the test cases for the mobility enhancements created in this WI.**](#_Toc149938278) |

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

#### Issue 2-1: Work Plan on RRM performance part

Proposals:

* Proposal 1: R4-2318075

Recommended WF: check whether work plan in Proposal 1 is agreeable? or necessary change is needed.

#### Issue 2-2-1: For NB/eMTC, test cases suspended due to lack of neighbour cell assistant information

Background:

* Some test cases were suspended in Rel-17 due to lack of neighbour cell assistant information.

Proposals:

* Proposal 1: Define test cases which are suspended in Rel-17 [2][3] due to lack of neighbour cell assistant information. (Huawei)
* Proposal 1a: Introduce inter-frequency test cases, which were postponed by the previous WI. (MediaTek, Nokia)
* Proposal 2: Introduce NGSO configuration for the existing intra-frequency test cases. (MediaTek, Nokia, Huawei)

Recommended WF:

* Define test cases which are suspended due to lack of neighbour cell assistant information.
  + Introduce inter-frequency test cases
  + Introduce NGSO configuration for the existing intra-frequency test cases

#### Issue 2-2-2: For NB-IoT, neighbour cell measurement in CONNNECTED mode

Background:

* For NB-IoT, neighbour cell measurement in CONNNECTED mode was introduced in R18 (not in R17).

Proposals:

* Proposal 1: For NB-IoT, introduce test cases for neighbour cell measurement in CONNNECTED mode. (MediaTek)

Recommended WF: Agree on Proposal 1.

#### Issue 2-2-3: For NB/eMTC, test cases for time/location based triggering of cell reselection in IDLE mode

Proposals:

* Proposal 1: RAN4 to define new tests to verify the requirements for the intra- and inter-frequency cell reselections based on location criteria for NB-IoT. (Ericsson)
* Proposal 2: define the following tests (Huawei)

|  |  |  |
| --- | --- | --- |
| **Requirements** | **NB/eMTC** | **Quasi-fixed/Earth moving** |
| IDLE: Time-based measurement triggering | NB/eMTC | Quasi-fixed |
| IDLE: Location-based measurement triggering | NB/eMTC | Quasi-fixed/Earth moving |

Recommended WF:

* RAN4 to define test cases for time/location based triggering of cell reselection in IDLE mode based on the following table:

|  |  |  |
| --- | --- | --- |
| **Requirements** | **NB/eMTC** | **Quasi-fixed/Earth moving** |
| IDLE: Time-based measurement triggering | NB/eMTC | Quasi-fixed |
| IDLE: Location-based measurement triggering | NB/eMTC | Quasi-fixed/Earth moving |

* RAN4 to further discuss whether and how to reduce the number of test cases

#### Issue 2-2-4: For NB/eMTC, test cases for time/location based triggering of neighbour cell measurements in CONNECTED mode

Proposals:

* Proposal 1: RAN4 to discuss feasibility of defining tests for time- and location based triggering of neighbour cell measurements. (Ericsson)
* Proposal 2: define the following tests (Huawei)

|  |  |  |
| --- | --- | --- |
| **Requirements** | **NB/eMTC** | **Quasi-fixed/Earth moving** |
| CONN: Location-based measurement triggering [NB/eMTC] | NB/eMTC | Quasi-fixed/Earth moving |
| CONN: Time-based measurement triggering | eMTC | Quasi-fixed |

Recommended WF: RAN4 to discuss feasibility of defining tests for time- and location based triggering of neighbour cell measurements.

#### Issue 2-2-5: For eMTC, test cases for CHO

Proposals:

* Proposal 1a: RAN4 to define new tests to verify the intra- and inter-frequency handover requirements for eMTC. (Ericsson)
* Proposal 1b: define the following tests (Huawei)

|  |  |  |
| --- | --- | --- |
| CHO configured with condEventD1 | eMTC | Quasi-fixed/Earth moving |
| CHO configured with condEventT1 | eMTC | Quasi-fixed/Earth moving |

Recommended WF:

* RAN4 to define test cases for eMTC CHO based on the following table:

|  |  |  |
| --- | --- | --- |
| **Requirements** | **NB/eMTC** | **Quasi-fixed/Earth moving** |
| CHO configured with condEventD1 | eMTC | Quasi-fixed/Earth moving |
| CHO configured with condEventT1 | eMTC | Quasi-fixed/Earth moving |

* RAN4 to further discuss whether and how to reduce the number of test cases

#### Issue 2-2-6: For NB/eMTC, test cases with GNSS gap

Proposals:

* Proposal 1: RAN4 to postpone the discussions on test cases due to use of GNSS measurement gaps. (Ericsson)

Recommended WF: Agree on Proposal 1.