**3GPP TSG-RAN WG4 Meeting # 110 *R4-2400769***

**Athens, Greece, 26th Feb. – 1st March, 2024**

**Agenda item:** 9.4.6

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

**Title:** Topic summary for [110][233] 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 9.4.3)
* Topic#2: RRM performance requirements (AI 9.4.4)

Recommended issues for online discussion:

* Issue 2-1-1: Test case principle
* Issue 2-2-3: For NB/eMTC, NGSO test configuration
* Issue 2-3-1: For NB/eMTC, test cases for time/location-based triggering of cell reselection in IDLE mode
* Issue 2-3-3: For eMTC, test cases for time/location-based CHO
* Issue 2-2-1: For NB/eMTC, inter-frequency tests with neighbour cells
* Other issues

# Topic #1: RRM core requirements (AI 9.4.3)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2401955**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2401955.zip) | Ericsson | 1. For eMTC and NB-IoT, the UE shall start the intra-frequency or inter-frequency neighbour cell measurements at least time T1 before discontinuous coverage indicated by e.g. *t-Service/t-ServiceStart*, where T1 is the time required to perform the respective measurement. 2. In RRC re-establishment requirements, if the *carrierFreqList* in SIB32 indicates that current and target cells belong to the same carrier, then Ksatellite,I is reduced by factor 1. 3. 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. |
| [**R4-2402699**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402699.zip) | Nokia, Nokia Shanghai Bell | [Observation 1: As GNSS-MG are expected to be frequently configured & triggered, current specification would ensue in frequently having non-applicable requirements for RLM.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273379)  [Observation 2: Refining the specification requirement would be advantageous in order to have a more clear specification.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273380)  [Observation 3: In many situations, when eDRX is configured, there is no need to have additional time for the UE to enlarge the RLM measurement delay.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273381)  [Observation 4: In some scenarios, the full duration of a GNSS-MG is confined withing one eDRX\_Conn\_cyle.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273382)  [Proposal 1: Refine the specification text such that, for the cases where the GNSS-MG is smaller than the eDRX cycle, the RLM requirements are still applicable.](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273383)  [Proposal 2: 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.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273384)  [Proposal 3:](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273385) [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.](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273385)  [Proposal 4: Capture in specification that for NB-IoT it is up for UE implementation which frequencies to be measured/prioritized in RRC\_CONNECTED.](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273386)  [Observation 5: The formula provided, in special for inter-frequency measurements, in Clause 8.14A.6.4 is not very well defined before the measurements, as it depends on variable measurement opportunities, and cannot be used as a reference to “backtrack” how much time bfore t-service the UE shall start measurements](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273387)  [Observation 6: The time to detect, and time to measure can only be set as a requirement if the point in time where the UE shall start the measurements is known. But for time-based measurement initiation, the requirements can only be applicable when a point in time has een decided for the measurements to start.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273388)  [Proposal 5: NB-IoT UE shall start time-based neighbor cell measurements:](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273389)  [a. If no t-serviceStartNeigh is provided, it is up for UE implementation](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273390)  [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](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273391)  [Proposal 6: When a UE starts intra-frequency neighbor cell measurements based on time-based measurement initiation (e.g. T](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273392)[trigger](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273392) [before t-service), the UE skips the serving cell measurements when the following side conditions are met:](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273392)  [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)](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273393)  [b. The S-Criterion is still met by the serving cell, according to the most recent measurements on the serving cell.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273394)  [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.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273395)  [Proposal 7: When a UE starts inter-frequency neighbor cell measurements based on time-based measurement initiation (e.g. T](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273396)[trigger](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273396) [before t-service), and the inter-frequency neighbor cells associated to the same satellite are also configured with t-Service, then the UE is not required to measure these cells.](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273396)  [Proposal 8:](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273397) [No modification in K\_satellite is needed for RRC Re-establishment when carrierFreqList is provided in SIB.](file:///C:\\Users\\mtk12330\\Desktop\\2402%20R4_110_Local\\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\\TDoc%20-%20Core%20Disc\\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx" \l "_Toc159273397) |

## 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: Time-based measurement initiation

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

Proposals:

* [Proposal 1 (Nokia): When a UE starts intra-frequency 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:](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273392)

[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)](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273393)

[b. The S-Criterion is still met by the serving cell, according to the most recent measurements on the serving cell.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273394)

[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.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273395)

Recommended WF: Discuss Proposal.

#### Issue 1-1-2: Time for UE to start the measurement before *t-service*

Background:

// In TS 36.331, 5.5.8 Measurements in NB-IoT

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*;**

Proposals:

* Proposal 1 (Ericsson): For eMTC and NB-IoT, the UE shall start the intra-frequency or inter-frequency neighbour cell measurements at least time T1 before discontinuous coverage indicated by e.g. t-Service/t-ServiceStart, where T1 is the time required to perform the respective measurement.
* Proposal 2 (Nokia): NB-IoT UE shall start time-based neighbor cell measurements:

[a. If no t-serviceStartNeigh is provided, it is up for UE implementation](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273390)

[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](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273391)

Recommended WF: Discuss Proposal.

#### Issue 1-1-3: Measurement on inter-frequency neighbor cells associated to the same satellite

Proposals:

* [Proposal 1 (Nokia): When a UE starts inter-frequency neighbor cell measurements based on time-based measurement initiation (e.g. Ttrigger before t-service), and the inter-frequency neighbor cells associated to the same satellite are also configured with t-Service, then the UE is not required to measure these cells.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Core%20Disc\R4-2402699%20Discussion%20on%20mobility%20requirements%20for%20IoT%20NTN%20enhancements.docx#_Toc159273396)

Recommended WF: Discuss Proposal.

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

#### Issue 1-2-1: For NB-IoT, frequencies to be measured

Proposals:

* Proposal 1 (Nokia): Capture in specification that for NB-IoT it is up for UE implementation which frequencies to be measured/prioritized in RRC\_CONNECTED.

Recommended WF:

* Discuss proposal 1.

### Sub-Topic 1-3: GNSS re-acquisition gap in connected mode

#### Issue 1-3-1: GNSS-MG with (e)DRX

Proposals:

* Proposal 1 (Ericsson, Nokia): 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.
* Proposal 2 (Nokia): Refine the specification text such that, for the cases where the GNSS-MG is smaller than the eDRX cycle, the RLM requirements are still applicable.
* Proposal 3 (Nokia): 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.

Recommended WF:

* Discuss if Proposal 1 is agreeable?
* Further discuss Proposal 2 and Proposal 3.

### Sub-Topic 1-4: Others

#### Issue 1-4-1: For NB/eMTC NGSO, Ksatellite in Re-establishment delay requirement

Proposals:

* Proposal 1 (Ericsson): In RRC re-establishment requirements, if the *carrierFreqList* in SIB32 indicates that current and target cells belong to the same carrier, then Ksatellite,I is reduced by factor 1.
* Proposal 2 (Nokia): No modification in K\_satellite is needed for RRC Re-establishment when carrierFreqList is provided in SIB.

Recommended WF:

* Discuss the proposal.

### RRM core part draft CRs

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Title** | **Source** |
| [**R4-2400849**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400849.zip) | (IoT\_NTN\_enh-Core) CR to TS 36.133 Correction of Cat-M1 conditional HO for IOT-NTN | CMCC |
| [**R4-2401316**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2401316.zip) | DraftCR on maintenance for R18 NB-IoT NTN | Huawei, HiSilicon |
| [**R4-2401956**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2401956.zip) | (IoT\_NTN\_enh-Core) Draft CR to 38.133: IoT NTN RRC re-establishment requirements during discontinuous coverage | Ericsson |
| [**R4-2402205**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402205.zip) | draftCR on IDLE mode requirements for eMTC over NTN | Huawei, HiSilicon |
| [**R4-2402700**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402700.zip) | CR on 36.133 Applicability of measurement requirements for NBIoT in Connected Mode | Nokia, Nokia Shanghai Bell |

# Topic #2: RRM performance requirements (AI 9.4.4)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2400850**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400850.zip) | CMCC | *Proposal 1: Introduce inter-frequency test cases as follows:*  *For NB1 UE*   |  |  | | --- | --- | | *Cell re-selection* | *HD–FDD Inter frequency case for UE Category NB1* | | *RRC re-establishment* | *HD-FDD Inter-frequency RRC Re-establishment for UE category NB1* |   *For Cat-M1 UE*   |  |  | | --- | --- | | *Cell re-selection* | *FDD–FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *HD–FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *Handover* | *FDD-FDD Inter frequency handover for Cat-M1 UEs* | | *HD-FDD Inter frequency handover for Cat-M1 UEs* | | *FDD-FDD Inter frequency conditional handover for Cat-M1 UEs* | | *HD-FDD Inter frequency conditional handover for Cat-M1 UEs* | | *RRC re-establishment* | *FDD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE* | | *HD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE* | | *UE measurement procedure in RRC-CONNECTED* | *FDD-FDD inter-frequency event triggered reporting for Cat-M1 UE in CE-ModeA* | | *HD-FDD inter-frequency event triggered reporting for Cat-M1 UE in CE-ModeA* | | *FDD-FDD inter-frequency event triggered reporting for Cat-M1 UE in CE-ModeA when DRX is used* | | *HD-FDD inter-frequency event triggered reporting for Cat-M1 UE in CE-ModeA when DRX is used* |   *Proposal 2: Introduce the general parameters for SIB33 setup for neighbour satellite assistance information as follows:*   |  |  |  |  | | --- | --- | --- | --- | | *Parameter* | *Unit* | *Value* | | | *Reference configuration for serving satellite* |  | *NSC.1* | *NSC.2* | | *Scenario* |  | *GSO* | *NGSO* | | *Interval between adjacent epoch time* | *s* | *10.24* | *2.56* | | *neighValidityDuration-r18* | *s* | *900* | *5* | | *k-Mac-r18* | *slot* | *Not configured* | *Not configured* | | *nta-Common-r18* |  | *0* | *0* | | *nta-CommonDrift-r18* |  | *0* | *0* | | *nta-CommonDriftVariation-r18* |  | *0* | *0* | | *ephemerisInfo* |  | *According to Annex B.8* | |   *Proposal 3: Both GSO test configuration and NGSO test configuration should be supported for all the test cases.*  *Proposal 4: Introduce following test cases to verify the new features, only unknown case for time/location only-based CHO for eMTC over NTN is covered in order to limit the test number.*  *For NB1 UE*   |  |  | | --- | --- | | *Cell re-selection* | *Time-based measurement initiation to HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage* | | *Location-based measurement initiation to HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage* | | *Time-based measurement initiation to HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverage* | | *Location-based measurement initiation to HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverage* | | *UE measurement procedure in RRC-Connected* | *HD-FDD intra-frequency event triggered reporting for UE Category NB1 in normal coverage* | | *Time-based measurement initiation to HD – FDD Intra frequency case for UE Category NB1 in normal coverage* | | *location-based measurement initiation to HD – FDD Intra frequency case for UE Category NB1 in normal coverage* | | *HD-FDD inter-frequency event triggered reporting for UE Category NB1 in normal coverage* | | *Time-based measurement initiation to HD – FDD Inter frequency case for UE Category NB1 in normal coverage* | | *location-based measurement initiation to HD – FDD Inter frequency case for UE Category NB1 in normal coverage* |   *For Cat-M1 UE*   |  |  | | --- | --- | | *Cell re-selection* | *Time-based measurement initiation to E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *Location-based measurement initiation to E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *Time-based measurement initiation to E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *Location-based measurement initiation to E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *Time-based measurement initiation to E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *Location-based measurement initiation to E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *Time-based measurement initiation to E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *Location-based measurement initiation to E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *CHO* | *E-UTRAN FDD-FDD Intra frequency Time-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN FDD-FDD Intra frequency Location-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN FDD-FDD Intra frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN FDD-FDD Intra frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN HD-FDD Intra frequency Time-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN HD-FDD Intra frequency Location-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN HD-FDD Intra frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN HD-FDD Intra frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN FDD-FDD Inter frequency Time-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN FDD-FDD Inter frequency Location-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN FDD-FDD Inter frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN FDD-FDD Inter frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN HD-FDD Inter frequency Time-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN HD-FDD Inter frequency Location-based conditional handover for Cat-M1 UEs in CEModeA* | | *E-UTRAN HD-FDD Inter frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *E-UTRAN HD-FDD Inter frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA (for unknown target cell)* | | *UE measurement procedure in RRC-Connected* | *Time-based measurement initiation to FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *location-based measurement initiation to FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *Time-based measurement initiation to HD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *location-based measurement initiation to HD – FDD Intra frequency case for Cat-M1 UE in normal coverage* | | *Time-based measurement initiation to FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *location-based measurement initiation to FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *Time-based measurement initiation to HD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *location-based measurement initiation to HD – FDD Inter frequency case for Cat-M1 UE in normal coverage* | | *Measurement performance requirements* | *FDD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeA* | | *HD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeA* |   *Proposal 5: Revise the propagation condition to AWGN for the existing tests of intra-frequency event triggered reporting for Cat-M1 UE (A.14.5 in TS36.133).*  *Proposal 6: For the new test cases which to be introduced, set AWGN as propagation condition.* |
| [**R4-2401015**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2401015.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.  Observation 1: R5 RRM test cases in R18 IoT NTN will mainly focus on NB-IoT NTN.  Proposal 5: The R4 RRM test cases for R18 IoT NTN enh WI in TS 36.133 will mainly focus on NB-IoT NTN, and once there is clear industry commercialization deployment plan for eMTC NTN in the future, eMTC NTN could be well covered and polished in the future released versions for TS 36.133.  Proposal 6: RAN4 to discuss the test case work split for IoT NTN enh. |
| [**R4-2401317**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2401317.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 | | IDLE: Time-based measurement triggering | NB/eMTC | | IDLE: Location-based measurement triggering | NB/eMTC | | CONN: Location-based measurement triggering [NB/eMTC] | NB/eMTC | | CONN: Time-based measurement triggering | eMTC | | CHO configured with condEventD1 | eMTC | | CHO configured with condEventT1 | eMTC |   Observation 1: For NB-IoT neighbour cell measurement in connected mode, it is reasonable that UE choose the frequency indicated in the SIB with ephemeris information provided in SIB xx.  Proposal 3: For NB-IoT NTN, define test cases for inter-frequency neighbour cell measurement when the target frequency information is indicated in the SIB with ephemeris information provided in SIB xx.  Proposal 4: Regarding whether to consider additional margin for location related test cases for earth moving cell, conclusion in NR NTN can be reused. |
| [**R4-2401957**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2401957.zip) | Ericsson | 1. RAN4 to define the missing inter-frequency tests for NB-IoT and eMTC as shown in Table 1 and 2.   Table 1 Missing tests for NB-IoT NTN   |  | | --- | | **IDLE mode test for NB1**A.13.1.1.1x HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverageA.13.1.1.3x HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverage with UE specific DRX **RRC re-establishment tests for NB1** A.13.3.1.1x HD-FDD Inter-frequency RRC Re-establishment for UE category NB1 in Standalone mode under normal coverageA.13.3.1.2x HD-FDD Inter-frequency RRC Re-establishment for UE category NB1 in Standalone mode under enhanced coverage |   Table 2 Missing tests for eMTC NTN   |  | | --- | | A.14.1.1.1x E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverageA.14.1.1.2x E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage **CONNECTED state mobility for M1: handover** A.5.1.27x E-UTRAN FDD inter frequency handover for Cat-M1 UEs in CEModeAA.5.1.28x E-UTRAN HD-FDD inter frequency handover for Cat-M1 UEs in CEModeAA.5.1.30 E-UTRAN FDD inter frequency handover for Cat-M1 UEs in CEModeBA.5.1.31 E-UTRAN HD-FDD inter frequency handover for Cat-M1 UEs in CEModeB **CONNECTED state mobility for M1: RRC re-establishment** A.6.1.17x E-UTRAN FD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE in CEModeAA.6.1.18x E-UTRAN HD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE in CEModeA **CONNECTED state measurement procuedure tests for M1** A.8.3.11x E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells with burst gapA.8.3.12x E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeAA.8.3.13x E-UTRAN HD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeAA.8.3.14x E-UTRAN FDD-FDD inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeBA.8.3.15x E-UTRAN HD-FDD inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeB **CONNECTED state measurement performance tests for M1** A.9.1.62x FD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeAA.9.1.63x HD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeAA.9.1.65x FD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeBA.9.1.66x HD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeB |  1. RAN4 to define the missing intra-frequency handover tests for eMTC as follows:  |  | | --- | | A.5.1.13x E-UTRAN FDD-FDD Intra frequency handover for Cat-M1 UEs in CEModeAA.5.1.14x E-UTRAN HD-FDD Intra frequency handover for Cat-M1 UEs in CEModeA |  1. RAN4 to introduce NGSO configuration in existing intra-frequency tests for NB-IoT and eMTC NTN. 2. RAN4 to introduce tests to verify location-based triggering of neighbour cell measurements to verify following core requirements:  * 4.6A.2.2, intra-frequency measurements in normal coverage for NB1, * 4.6A.2.4, intra-frequency measurements in enhanced coverage for NB1, * 4.6A.2.5, inter-frequency measurements in normal coverage for NB1, * 4.6A.2.6, inter-frequency measurements in enhanced coverage for NB1 * 4.7A.2.1.2, intra-frequency measurements in normal coverage for M1 * 4.7A.2.1.3, inter-frequency measurements in normal coverage for M1, * 4.7A.2.2.2, intra-frequency measurements in enhanced coverage for M1 * 4.7A.2.2.3, inter-frequency measurements in enhanced coverage for M1  1. RAN4 to introduce following tests to verify both location- and time-based conditional handover for eMTC:  * Intra-frequency time-based conditional Handover * Inter-frequency time-based conditional Handover * Intra-frequency location-based conditional Handover * Inter-frequency location-based conditional Handover  1. RAN4 to introduce tests for both time-based and location-based triggering of neighbour cell measurements in CONNECTED mode for NB-IoT. 2. RAN4 to introduce tests for time-based triggering of neighbour cell measurements in CONNECTED mode for eMTC. 3. RAN4 to introduce tests as follows for verify the GNSS measurement when the GNSS gaps overlaps with the mobility measurement gaps for eMTC, considering selecting a short GNSS gap length to make test practical:  * Subtest 1: gaps are colliding and GNSS measurements are performed and neighbour cell measurements are not performed. * Subtest 2: GNSS measurement is completed and UE performs neighbour cell measurements.  1. RAN4 to introduce tests as follows for verify the UE can be scheduled on the serving cell depending on whether t-ServiceStart is reached or not:  * Subtest 1: UE is scheduled on the serving cell and *t-ServiceStart* is not reached . * Subtest 2: *t-ServiceStart* is reached and UE performs negibhour cell measurements. |
| [**R4-2402701**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402701.zip) | Nokia, Nokia Shanghai Bell | [Proposal 1: Introduce missing test cases from previous WI that were removed due to lack of neighbour cell assistance information](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271416)  [a. Introduce inter-frequency test cases for GSO](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271417)  [b. Introduce NGSO configuration for the existing intr-frequency test cases](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271418)  [Proposal 2: Do not introduce test cases for NB-IoT measurement procedures in RRC\_Connected](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271419)  [Proposal 3: For NB-IoT/eMTC introduce distance-based measurement triggering test cases for RRC Idle and RRC connected modes in Earth moving cell scenarios.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271420)  [Proposal 4: For NB-IoT/eMTC introduce time-based measurement triggering test cases for RRC Idle and RRC connected modes in Earth Fixed cell scenarios.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271421)  [Proposal 5: For eMTC, introduce test cases for CHO with conditional D1 and T1.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271422) |

## Open issues summary

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

### Sub-Topic 2-1: General

#### Issue 2-1-1: Test case principle

Background:

* R5 RRM test cases for baseline requirement in R18 IoT NTN will mainly focus on NB-IoT NTN. (R5-237674)

***WF 1****: TS 36.521-4 (v18.0.0) will mainly focus on NB-IoT NTN. Once there is clear industry commercialization deployment plan for eMTC NTN in the future, eMTC NTN could be well covered and polished in the future released versions for TS 36.521-4 .*

Proposals:

* Proposal 1 (MTK): The R4 RRM test cases for R18 IoT NTN enh WI in TS 36.133 will mainly focus on NB-IoT NTN, and once there is clear industry commercialization deployment plan for eMTC NTN in the future, eMTC NTN could be well covered and polished in the future released versions for TS 36.133.

Recommended WF:

* Discuss proposal

#### Issue 2-1-2: SIB33

Proposals:

* Proposal 1 (CMCC): Introduce the general parameters for SIB33 setup for neighbour satellite assistance information as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | |
| Reference configuration for serving satellite |  | NSC.1 | NSC.2 |
| Scenario |  | GSO | NGSO |
| Interval between adjacent epoch time | s | 10.24 | 2.56 |
| neighValidityDuration-r18 | s | 900 | 5 |
| k-Mac-r18 | slot | Not configured | Not configured |
| nta-Common-r18 |  | 0 | 0 |
| nta-CommonDrift-r18 |  | 0 | 0 |
| nta-CommonDriftVariation-r18 |  | 0 | 0 |
| ephemerisInfo |  | According to Annex B.8 | |

Recommended WF: Discuss proposal 1.

#### Issue 2-1-3: propagation channel for eMTC

Proposals:

* Proposal 1 (CMCC): Revise the propagation condition to AWGN for the existing tests of intra-frequency event triggered reporting for Cat-M1 UE (A.14.5 in TS36.133).
* Proposal 2 (CMCC): For the new test cases which to be introduced, set AWGN as propagation condition.

Recommended WF: Discuss proposals.

### Sub-Topic 2-1: Test cases with neighbour ephemeris

Background:

* Some test cases were suspended in IoT NTN WI due to lack of neighbour cell assistant information.

#### Issue 2-2-1: For NB/eMTC, inter-frequency tests with neighbour cells

Proposals:

* Proposal 1: Define test cases which are suspended in Rel-17 due to lack of neighbour cell assistant information. (CMCC, Huawei, MTK, Ericsson, Nokia)

Recommended WF:

* Define test cases which are suspended in Rel-17 due to lack of neighbour cell assistant information.
* Define the following TCs for NB-IoT inter-frequency tests with neighbour cells

|  |  |  |
| --- | --- | --- |
| Cell Re-Selection  (A.13.1.1) | HD – FDD **Inter frequency** case for UE Category NB1 in normal coverage | NB-1-1 |
| RRC Re-establishment  (A.13.3.1) | HD-FDD **Inter-frequency** RRC Re-establishment for UE category NB1 in Standalone mode under normal coverage | NB-3-1 |

* Discuss the following TCs for NB inter-frequency tests with neighbour cells

|  |  |  |
| --- | --- | --- |
| Cell Re-Selection  (A.13.1.1) | A.13.1.1.3x HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverage with UE specific DRX | NB-1-2 |
| RRC Re-establishment  (A.13.3.1) | A.13.3.1.2x HD-FDD Inter-frequency RRC Re-establishment for UE category NB1 in Standalone mode under enhanced coverage | NB-3-2 |

* Discuss the following TCs for eMTC inter-frequency tests with neighbour cells

|  |  |  |
| --- | --- | --- |
| Cell re-selection  (A.14.1.1) | E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage | M-1-1 |
| E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage | M-1-2 |
| Handover  (A.14.2.1) | E-UTRAN FDD inter frequency handover for Cat-M1 UEs in CEModeA | M-2-1 |
| E-UTRAN HD-FDD inter frequency handover for Cat-M1 UEs in CEModeA | M-2-2 |
| E-UTRAN FDD inter frequency handover for Cat-M1 UEs in CEModeB | M-2-3 |
| E-UTRAN HD-FDD inter frequency handover for Cat-M1 UEs in CEModeB | M-2-4 |
| E-UTRAN FDD inter frequency **conditional** handover for Cat-M1 UEs in CEModeA | M-2-5 |
| E-UTRAN HD-FDD inter frequency **conditional** handover for Cat-M1 UEs in CEModeA | M-2-6 |
| RRC re-establishment  (A.14.3.1) | E-UTRAN FD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE in CEModeA | M-3-1 |
| E-UTRAN HD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE in CEModeA | M-3-2 |
| UE measurement procedure in RRC-CONNECTED  (A.14.5.2) | E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA | M-5-1 |
| E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 in CEModeA when **DRX is used** | M-5-2 |
| E-UTRAN **HD**-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA | M-5-3 |
| E-UTRAN **HD**-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 in CEModeA when **DRX is used** | M-5-4 |
| E-UTRAN FDD-FDD inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeB | M-5-5 |
| E-UTRAN HD-FDD inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeB | M-5-6 |
| E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells with **burst gap** | M-5-7 |

|  |  |  |
| --- | --- | --- |
| Measurement Performance Requirements  (A.14.6.1) | FD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeA | M-6-1 |
| HD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeA | M-6-2 |
| FD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeB | M-6-3 |
| HD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeB | M-6-4 |

#### Issue 2-2-2: For eMTC, intra-frequency handover tests

Background:

* Some test cases were suspended in IoT NTN WI due to lack of neighbour cell assistant information.

Proposals:

* Proposal 1 (Ericsson): RAN4 to define the missing intra-frequency handover tests for eMTC

Recommended WF:

* Discuss the following TCs for eMTC intra-frequency handover tests

|  |  |  |
| --- | --- | --- |
| Handover  (A.14.2.1) | E-UTRAN FDD-FDD Intra frequency handover for Cat-M1 UEs in CEModeA | M-2-7 |
| E-UTRAN HD-FDD Intra frequency handover for Cat-M1 UEs in CEModeA | M-2-8 |

#### Issue 2-2-3: For NB/eMTC, NGSO test configuration

Proposals:

* Proposal 1 (MTK, Ericsson, Nokia): RAN4 to introduce NGSO configuration for the existing intra-frequency test cases.
* Proposal 1a (CMCC): Both GSO test configuration and NGSO test configuration should be supported for all the test cases.

Recommended WF: Proposal 1a.

#### Issue 2-2-4: For NB-IoT, neighbour cell measurement in CONNNECTED mode

Proposals:

* Proposal 1 (MTK): For NB-IoT, introduce test cases for neighbour cell measurement in CONNNECTED mode.
* Proposal 2 (Nokia): Do not introduce test cases for NB-IoT measurement procedures in RRC\_Connected

Recommended WF: Discuss proposals

#### Issue 2-2-5: For NB-IoT, condition of test cases for inter-frequency neighbour cell measurement

Proposals:

* Proposal 1 (Huawei): For NB-IoT NTN, define test cases for inter-frequency neighbour cell measurement when the target frequency information is indicated in the SIB with ephemeris information provided in SIB xx.

Recommended WF: Discuss proposals

### Sub-Topic 2-3: Test cases with time/location-based measurement initiation

#### Issue 2-3-1: For NB/eMTC, test cases for time/location-based triggering of cell reselection in IDLE mode

Proposals:

* Proposal 1: (CMCC)

*For NB1 UE*

|  |  |
| --- | --- |
| *Cell re-selection* | *Time-based measurement initiation to HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage* |
| *Location-based measurement initiation to HD – FDD Intra frequency case for UE Category NB1 Standalone mode in normal coverage* |
| *Time-based measurement initiation to HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverage* |
| *Location-based measurement initiation to HD – FDD Inter frequency case for UE Category NB1 Standalone mode in normal coverage* |

*For Cat-M1 UE*

|  |  |
| --- | --- |
| *Cell re-selection* | *Time-based measurement initiation to E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage* |
| *Location-based measurement initiation to E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage* |
| *Time-based measurement initiation to E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage* |
| *Location-based measurement initiation to E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage* |
| *Time-based measurement initiation to E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage* |
| *Location-based measurement initiation to E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage* |
| *Time-based measurement initiation to E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage* |
| *Location-based measurement initiation to E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage* |

* Proposal 2: (Huawei)

|  |  |
| --- | --- |
| **Requirements** | **NB/eMTC** |
| IDLE: Time-based measurement triggering | NB/eMTC |
| IDLE: Location-based measurement triggering | NB/eMTC |

* Proposal 3 (Ericsson): to introduce tests to verify **location**-based triggering of neighbour cell measurements to verify following core requirements:
  + 4.6A.2.2, intra-frequency measurements in normal coverage for NB1,
  + 4.6A.2.4, intra-frequency measurements in enhanced coverage for NB1,
  + 4.6A.2.5, inter-frequency measurements in normal coverage for NB1,
  + 4.6A.2.6, inter-frequency measurements in enhanced coverage for NB1
  + 4.7A.2.1.2, intra-frequency measurements in normal coverage for M1
  + 4.7A.2.1.3, inter-frequency measurements in normal coverage for M1,
  + 4.7A.2.2.2, intra-frequency measurements in enhanced coverage for M1
  + 4.7A.2.2.3, inter-frequency measurements in enhanced coverage for M1

Recommended WF:

* Based on Proposal 1, half of tests are interleaved with enhanced coverage.
* Further discuss the following tests.

For NB-IoT,

|  |  |  |
| --- | --- | --- |
| Cell Re-Selection  (A.13.1.1) | HD – FDD **Intra** frequency case for UE Category NB1 in normal coverage, **time**-based triggering | NB-IDLE-1T |
| HD – FDD **Intra** frequency case for UE Category NB1 in **[enhanced]** coverage, **location**-based triggering | NB-IDLE-1D |
| HD – FDD Inter frequency case for UE Category NB1 in **[enhanced]** coverage, time-based triggering | NB-IDLE-2T |
| HD – FDD Inter frequency case for UE Category NB1 in normal coverage, location-based triggering | NB-IDLE-2D |

For eMTC,

|  |  |  |
| --- | --- | --- |
| Cell Re-Selection  (A.14.1.1) | E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage, time-based triggering | M-IDLE-1T |
| E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in **[enhanced]**  coverage, location-based triggering | M-IDLE-1D |
| E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in **[enhanced]**  coverage, time-based triggering | M-IDLE-2T |
| E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage, location-based triggering | M-IDLE-2D |
| E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in **[enhanced]** coverage, time-based triggering | M-IDLE-3T |
| E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage, location-based triggering | M-IDLE-3D |
| E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage, time-based triggering | M-IDLE-3T |
| E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in **[enhanced]**  coverage, location-based triggering | M-IDLE-3D |

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

Proposals:

* Proposal 1: (CMCC)

|  |  |
| --- | --- |
| **Requirements** | **NB/eMTC** |
| CONN: Location-based measurement triggering | NB/eMTC |
| CONN: Time-based measurement triggering | NB/eMTC |

* Proposal 2: (Huawei)

|  |  |
| --- | --- |
| **Requirements** | **NB/eMTC** |
| CONN: Location-based measurement triggering | **NB**/eMTC |
| CONN: Time-based measurement triggering | **eMTC** |

* Proposal 3: (Ericsson)

|  |  |
| --- | --- |
| **Requirements** | **NB/eMTC** |
| CONN: Location-based measurement triggering | NB |
| CONN: Time-based measurement triggering | NB/eMTC |

Recommended WF:

* Further discuss the following TCs

For NB-IoT,

|  |  |  |
| --- | --- | --- |
| Measurement Procedure | HD-FDD **Intra**-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage, time-based triggering | NB-CONN-1T |
| HD-FDD **Intra**-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage, location-based triggering | NB-CONN-1D |
| HD-FDD **Inter**-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage, time-based triggering | NB-CONN-2T |
| HD-FDD **Inter**-frequency neighbour cell measurement for UE category NB1 in standalone mode under normal coverage, location-based triggering | NB-CONN-2D |

For eMTC,

|  |  |  |
| --- | --- | --- |
| Measurement Procedure  (A.14.5.1) | E-UTRAN FDD-FDD intra-frequency event triggered reporting under fading propagation conditions in asynchronous cells for Cat-M1 UE in CEModeA, time-based triggering | M-CONN-1T |
| E-UTRAN FDD-FDD intra-frequency event triggered reporting under fading propagation conditions in asynchronous cells for Cat-M1 UE in CEModeA, location-based triggering | M-CONN-1D |
| E-UTRAN HD-FDD intra-frequency event triggered reporting under fading propagation conditions in asynchronous cells for Cat-M1 UE in CEModeA, time-based triggering | M-CONN-2T |
| E-UTRAN HD-FDD intra-frequency event triggered reporting under fading propagation conditions in asynchronous cells for Cat-M1 UE in CEModeA, location-based triggering | M-CONN-2D |
| E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA, time-based triggering | M-CONN-3T |
| E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA, location-based triggering | M-CONN-3D |
| E-UTRAN HD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA, time-based triggering | M-CONN-4T |
| E-UTRAN HD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA, location-based triggering | M-CONN-4D |

#### Issue 2-3-3: For eMTC, test cases for time/location-based CHO

Proposals:

* Proposal 1: RAN4 to define test cases for location/time-based CHO (CMCC, Huawei, Ericsson, Nokia)
* Proposal 1a: Introduce following test cases to verify the new features, only unknown case for time/location only-based CHO for eMTC over NTN is covered in order to limit the test number. (CMCC)

Recommended WF:

* Further discuss the following TCs for eMTC location/time-based CHO

|  |  |
| --- | --- |
| E-UTRAN FDD-FDD Intra frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-11 |
| E-UTRAN FDD-FDD Intra frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-12 |
| E-UTRAN HD-FDD Intra frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-13 |
| E-UTRAN HD-FDD Intra frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-14 |
| E-UTRAN FDD-FDD Inter frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-15 |
| E-UTRAN FDD-FDD Inter frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-16 |
| E-UTRAN HD-FDD Inter frequency Time only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-17 |
| E-UTRAN HD-FDD Inter frequency Location only-based conditional handover for Cat-M1 UEs in CEModeA [for unknown target cell] | M1-2-18 |

#### Issue 2-3-4: For NB/eMTC, test cases upon t-ServiceStart

Proposals:

* Proposal 1 (Ericsson) RAN4 to introduce tests as follows for verify the UE can be scheduled on the serving cell depending on whether t-ServiceStart is reached or not:
* Subtest 1: UE is scheduled on the serving cell and *t-ServiceStart* is not reached .
* Subtest 2: *t-ServiceStart* is reached and UE performs negibhour cell measurements.

Recommended WF: Discuss proposal

#### Issue 2-3-5: Margin for location-based test cases with earth moving cell

Proposals:

* Proposal 1 (Huawei) Regarding whether to consider additional margin for location related test cases for earth moving cell, conclusion in NR NTN can be reused.

Recommended WF: Postpone discussion in this meeting

#### Issue 2-3-6: Cell setting

Proposals:

* Proposal 1 (Nokia):
  + [For NB-IoT/eMTC introduce distance-based measurement triggering test cases for RRC Idle and RRC connected modes in Earth moving cell scenarios.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271420)
  + [For NB-IoT/eMTC introduce time-based measurement triggering test cases for RRC Idle and RRC connected modes in Earth Fixed cell scenarios.](file:///C:\Users\mtk12330\Desktop\2402%20R4_110_Local\%5b203%5d%5b202%5d%5b224%5d%5b233%5d%5bNTN%20evo%5d\%5bM233%5d%20R18%20IoT%20NTN%20enh%20-%20Disc1ok\TDoc%20-%20Perf%20Disc\R4-2402701%20Performance%20considerations%20%20for%20NTN%20enhancements.docx#_Toc159271421)

Recommended WF: Discuss proposals.

### Sub-Topic 2-4: Test cases with GNSS gap

#### Issue 2-4-1: For eMTC, test case with GNSS gap

Proposals:

* Proposal 1 (Ericsson): RAN4 to introduce tests as follows for verify the GNSS measurement when the GNSS gaps overlaps with the mobility measurement gaps for eMTC, considering selecting a short GNSS gap length to make test practical:
  + Subtest 1: gaps are colliding and GNSS measurements are performed and neighbour cell measurements are not performed.
  + Subtest 2: GNSS measurement is completed and UE performs neighbour cell measurements.

Recommended WF: Discuss Proposal 1.