**3GPP TSG-RAN WG4 Meeting # 104-e R4-2214159**

**Electronic Meeting, 15– 26 August 2022**

**Agenda item:** 12.5.6

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

**Title:** Email discussion summary for [104-e][239] LTE\_NBeMTC\_NTN\_RRM

**Document for:** Information

# Introduction

This document is the email discussion summary for RRM requirements for NB-IoT/eMTC core & perf. requirements for NTN (AI 12.5.5), including the following topics covered

* 12.5.5 RRM core requirements

List of candidate target of email discussion for 1st round and 2nd round

* 1st round: Decide on the scope, priority, options and tentative agreement to be discussed in the 2nd round. Conclude issues with strict consensus, if any.
* 2nd round: Conclude the issues identified in the 1st round.

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Note:

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

# Topic #1: General

*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** |
| [**R4-2212404**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212404.zip) | MediaTek inc. | Proposal 1: The following aspects/features are not relevant for NB-IoT/eMTC UE served by SAN and therefore should not be used in RRM requirements for NB-IoT/eMTC UE served by SAN:* **TDD related aspects**
* **Positioning requirements**

Proposal 2: The RRM requirements for autonomous gap for CGI reading are not applicable for NB-IoT/eMTC UE served by SAN. Proposal 3: The requirements apply provided that serving and all neighbour satellites on the same layer are of same satellite type (LEO or GEO). Proposal 4: Follow TN section structure as in TS 36.133 in general and use suffix “A” for satellite access requirement.Proposal 5: NB1 and NB2 UE share the same requirement for UE category NB-IoT for Satellite Access, unless specified otherwise.Proposal 6: Agree on the initial CR structure as proposed.Proposal 7: For GEO, the existing TN requirements related to DRX/eDRX, HD-FDD can be re-used as baseline. Proposal 8: For LEO/NGSO, the existing TN requirements related to DRX/eDRX, HD-FDD can be re-used as baseline. FFS the applicability of DRX/eDRX cycle length and PTW length.Observation 1: The UE capability on “Segmented UL transmission” are applicable to NB NGSO (NPUSCH), M1 GEO/NGSO (PUSCH/PUCCH) but not for NB GEO. Proposal 9: Segmented UL transmission can be covered by NTN UE transmit timing requirements, i.e. Te\_NTN. FFS whether and how to capture in RAN4. Proposal 10: The following UE capability, introduced in RAN4 R17 NR NTN, are not applicable for LTE IoT in Rel-18: * **25-1 Parallel measurements on multiple SMTC-s for a single frequency carrier**
* **25-3 Parallel measurements with multiple measurement gaps**
* **25-4 Enhanced RRM requirements for measurements in IDLE and INACTIVE modes**
* **25-6 Relaxed cell reselection on GEO**

Proposal 11: For NB in IDLE, the existing TN requirements of UE measurement capability of monitoring on number carriers apply, as in 4.6.2.8 in TS 38.133* **Depending on UE capability, an intra-frequency carrier.**
* **Depending on UE capability, at least 2 inter-frequency carriers.**

Proposal 12: For M1, the existing TN requirements of UE measurement capability of monitoring on number carriers apply* **Depending on UE capability, 2 FDD E-UTRA inter-frequency carriers, and**
* **Depending on UE capability, 2 TDD E-UTRA inter-frequency carriers.**
* **the number of NTN and TN carriers UE needs to monitor is 5 including serving CC**

Proposal 13: For both NB and M1 in NGSO, the number of target satellites UE needs to monitor per carrier is 2 including serving LEO satellite. Proposal 14: For NB-IoT/eMTC cell re-selection requirement, * **For GEO,**
	+ **For NB, the existing TN requirements apply, as in 4.6.2**
	+ **For M1, the exiting TN requirements apply, as in 4.7.2.1/4.7.2.2**

Proposal 15: For NB-IoT/eMTC cell re-selection requirement, * **For NGSO,**
	+ **the existing delay requirements (Tdetect, Tmeasure, Tevaluate) can be scaled up by** *KSatellite*
		- **where** *KSatellite* **is the number NGSO satellites and is can assume** *KSatellite* =[2]**for intra-frequency measurement in IDLE mode and** *KSatellite* =1**for inter-frequency measurement in IDLE mode.**
	+ **For Normal Cover, the exiting TN requirement can be the baseline.**
	+ **For Enhanced Coverage intra-/inter-frequency measurement, the existing TN requirement on Tmeasure, Tevaluate can be the baseline. FFS the cell detection time (Tdetect).**
	+ **cell stop serving time based cell reselection can be further considered for Quasi-Earth Fixed satellites**

Observation 2: In current 38.133 NR NTN, the maximum interruption in paging reception is extended if the target cell belongs to a different satellite than the current one and the target cell’s satellite is non-GEO.Proposal 16: For NB, the maximum interruption in paging reception for NTN cell reselection shall not exceed * **TSI-NB1-NC/EC + 100 ms,**
	+ **the target cell’s satellite is GEO, or**
	+ **the target cell’s satellite is NGSO and the target cell belongs to the same satellite as the current one**
	+ **Note: same as the existing TN requirement, as in 4.6.2.7/4.6.2.7A**
* **TSI-NB1-NC/EC + [250] ms,**
	+ **the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one**

Proposal 17: For M1, the maximum interruption in paging reception for NTN cell reselection shall not exceed * **TSI-EUTRA-M1-NC/EC + 50 ms,**
	+ **the target cell’s satellite is GEO, or**
	+ **the target cell’s satellite is NGSO and the target cell belongs to the same satellite as the current one**
	+ **Note: same as the existing TN requirement, as in 4.7.2.1.5/4.7.2.2.5**
* **TSI-EUTRA-M1-NC/EC + [125] ms, if**
	+ **the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one**

Proposal 18: If the cell stop time (i.e., *t-serve*) is applicable, and the time span between SIB broadcasting cell stop time and the cell stop time is less than Ttrigger, longer interruption is expected.Proposal 19: For M1, the existing TN requirements of channel quality report for in idle mode apply, as in 4.7.3.Proposal 20: For WUS receptions, * **For NB, the existing TN requirements apply, as in 4.6.2.9.**
* **For M1, the existing TN requirements apply, as in 4.7.2.3.**

Proposal 21: For Transmission using preconfigured uplink resources (PUR), * **For NB, the existing TN requirements apply, as in 4.6.3.**
* **For M1, the existing TN requirements apply, as in 4.7.4.**

Proposal 22: For M1, the existing requirements of E-UTRAN Handover for Cat-M1 UE apply, as in 5.5. Proposal 23: For Random Access,* **For NB, the existing TN requirements apply, as in 6.6**
* **For M1, the existing TN requirements apply, as in 6.2.3**
* **If UE specific TA reporting is enabled and applicable, UE shall be able to report information about UE specific timing advance during a Random Access procedure as specified in TS 36.321[17].**

Proposal 24: For RRC Re-establishment,* **For NB, the existing TN requirements apply, as in 6.5**
* **For M1, the existing TN requirements apply, as in 6.7**

Proposal 25: For RRC Connection Release with Redirection,* **For NB, the existing TN requirements apply, as in 6.9**
* **For M1, the existing TN requirements apply, as in 6.8**

**Proposal 26: For IoT NTN, Te\_NTN is extended by [17] Ts,*** **For NB, Te\_NTN: 80+ [17] = [97] Ts.**
* **For M1 CE Mode A, Te\_NTN: 24+[17] = [41] Ts**
* **For M1 CE Mode B, Te\_NTN: 48+[17] =[65] Ts**

**Proposal 27: For gradual timing adjustment, the reference timing shall be (*N*TA *+ N*TA-offset *+ N*TA,common *+ N*TA,UE-specific)*×*Tc before the downlink timing of the reference cell. Clarify the adjustment with “apart from a change of NTA,UE-specific and NTA,common”****Proposal 28: For gradual timing adjustment, the legacy values of Tq /Tp  are applicable to Tq\_NTN /Tp\_NTN.**Proposal 29: UE Timer accuracy,* **For NB, the existing TN requirements apply, as in 7.21**
* **For M1, the existing TN requirements apply, as in 7.27**

Proposal 30: For Timing Advance adjustment accuracy,* **Existing NB TN (accuracy) requirements apply, as in 7.22**
* **Existing M1 TN (accuracy) requirements apply, as in 7.28**
* **Clarify the adjustment of timing with “apart from a change of NTA,UE-specific and NTA,common between the preceding uplink transmission and the current transmission”**

Proposal 31: For RLM,* **For NB, the existing TN requirements apply for GEO and NGSO, as in 7.23**
* **For M1,**
	+ **For GEO, the existing M1 TN requirements apply, as in 7.19**
	+ **For NGSO, define the RLM requirements based on UE measures on one NGSO satellite at a time, without introducing the UE capability of L1/L3 processing in parallel.**

Observation 3: NB-IoT intra frequency measurements are specified for serving NB-IoT cell.Proposal 32: for intra-frequency measurements,* **For NB, the existing TN intra frequency measurement requirements apply, as in 8.14.2 for Normal Coverage and 8.14.3 for Enhanced Coverage.**
* **For M1 in GEO, the existing M1 TN intra frequency measurement requirements apply, as in 8.13.2.1 for CE mode A and 8.13.3.1 for CE mode B**
* **For M1 in NGSO, the delay requirements are scaled up by the number NGSO satellites.**

Proposal 33: for inter-frequency measurements,* **For M1 in GEO, the existing M1 TN requirements apply, as in 8.13.2.6 for CE mode A and 8.13.3.5 for CE mode B.**
* **For M1 in NGSO, the delay requirements are scaled up by the number NGSO satellites.**

 Proposal 34: for Connected mode channel quality report,* **For NB, the existing TN requirements apply, as in 8.14.4**
* **For M1, the existing TN requirements apply, as in 8.13.2.8 for CE-A, 8.13.3.8 for CE-B**
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| [**R4-2212908**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212908.zip) | Nokia, Nokia Shanghai Bell | 1. The LTE\_IoT\_NTN work item defines several communication scenarios: LEO, GEO and MEO. These scenarios are significantly different, for example, in term of cell-coverage, round trip time, differential delay and max Doppler shift, which might impact on RRM core / Demodulation requirements. Additionally, the WID specifies that requirements for both eMTC and NB-IoT are to be defined.

RAN4 NTN work only considered LEO and GEO scenarios, but the TR 36.763 concluded that the enhancements from the NTN work are applicable to MEO as well.1. RAN4 to develop RRM requirements for LEO and GEO scenarios. If needed, prioritize LEO
2. RAN4 to develop RRM requirements for both eMTC and NB-IoT devices over NTN.
3. RAN4 to consider the following list of requirements in the discussion of the scope of RRM requirements for IoT NTN:

RAN2 has agreed that the UE in discontinuous coverage deployment is not required to perform any cell search. A new SIB32 was defined so that the ephemeris information for discontinuous coverage is shared with the Ues.1. Define the RAN4 requirements based on the assumption that the UE is able to predict the coverage.
2. In IDLE mode or PSM mode, the UEs are not required to perform any cell search while out of coverage in discontinuous coverage.
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| [**R4-2212971**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212971.zip) | Huawei, HiSilicon | **Observation 1: The cell detection time in enhanced coverage is very long compared with serving time of LEO satellite.****Proposal 1: Discuss whether to define requirements of cell Re-selection for enhanced coverage.****Proposal 2: The cell-stop time based cell reselection should be considered in IoT NTN.****Proposal 3: Do not define location-based cell reselection for IoT NTN.****Observation 2: For relaxed serving cell measurement and evaluation, legacy requirements can be taken as baseline.****Proposal 4: Do not consider positioning requirements for IoT NTN.****Proposal 5: Discuss whether to define RSRP-based TA validation for PUR in IoT NTN.****Proposal 6: Requirements of RRC Re-establishment and RRC release with redirection of TN can apply to IoT NTN.** **Proposal 7: Define Te requirements in the same method as NR NTN where the reference point is defined considering the UE specific TA, and discuss whether to keep the same GNSS estimation accuracy assumption as NR NTN.****Proposal 8: The restriction on UL transmission adjustment shall be updated according to RAN1 LS on per-segment TA pre-compensation.****Proposal 9: Similar as NR NTN, the mobility and measurement requirements for IoT NTN apply provided that valid information for the neighbor/target cell is made available to the UE.****Proposal 10: For eMTC over NTN, define HO requirements by re-using TN HO requirements for NTN as baseline, and define CHO requirements for NTN (no need to consider time or location based CHO).****Proposal 11: For eMTC over NTN, re-use the TN measurement delay requirements for NTN as baseline, and the scaling factor for measurement of multiple LEO satellites should also apply.****Proposal 12: For eMTC over NTN, RAN4 not to define scheduling restriction due to RRM measurement.****Proposal 13: For eMTC over NTN, a single MG is considered for RRM measurement.** |
| [**R4-2213415**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213415.zip) | Ericsson | **Proposal 1:** The general section on terminologies and band groups are updated to contain NTN IoT specific changes. **Proposal 2:** The serving cell evaluation and neighbour cell measurement requirements are reused with following modifications: eDRX and long DRX cycles are excluded when the serving cell coverage is impacted due to satellite movement (e.g. as indicated by Tservice).**Proposal 3:** The NTN paging reception requirements based on type of satellites are reused for NTN IoT. **Proposal 4:** The existing measurement capability requirements are reused for NTN IoT.**Proposal 5:** The principles of defining WUS reception requirements is reused but the required number of repetitions are kept TBD.**Proposal 6:** The UE update the uplink timing for transmitting on PUR using the configured TA command according to TS 36.211 v17.2.0 i.e. transmission of uplink radio frame number  from the UE starts **Proposal 7:** The UE assumes TA is valid provided that the following conditions are met, otherwise the UE is considered invalid:* Satellite assistance information (SAI) is valid i.e. T317 has not expired and
* Current time of the UE is at least ΔT seconds earlier than t-Service.

**Proposal 8:** For legacy handovers, the existing HO requirements are reused. For Conditional handovers, new requirements based on corresponding NTN CHO are defined NB-IoT and eMTC. **Proposal 9:** Existing RRC re-establishment requirements are reused for NTN IoT.**Proposal 10:** Existing random access requirements are reused for NTN IoT.**Proposal 11:**  Existing RRC connection release with redirection requirements are reused for NTN IoT.**Proposal 12:** The timing requirements from Rel-17 NTN is used as baseline with some modification to the values to account for the lower BW is needed for NTN IoT. **Proposal 13:** RAN4 shall investigate Doppler shift impact on the overlapping receiving window from multiple inter-frequency satellites on IoT NTN. **Proposal 14:** The UE in DRX shall evaluate the RLM according non-DRX requirements provided that the following conditions are met, otherwise the UE is allowed to evaluate following DRX requirements:* Satellite assistance information (SAI) is valid i.e. T317 has not expired and
* Current time of the UE is at least ΔT seconds earlier than t-Service.

**Proposal 15:** CONNECTED mode serving cell and neighbour cell measurements as introduced in Rel-17 NB-IoT are reused for NTN NB-IoT.**Proposal 16:** CONNECTED mode measurements for serving cell and neighbour cell measurements as introduced in Rel-17 NB-IoT are reused for NTN NB-IoT.**Proposal 17:** NB-IoT/eMTC over NTN requirements are introduced in separate sections. **Proposal 18:** Clarify defining of positioning requirements for NTN IoT is not part of this WI. |
| [**R4-2213745**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213745.zip) | CMCC | ***Proposal 1: TDD related requirements are not applicable to R17 IOT-NTN.******Proposal 1: TDD related requirements are not applicable to R17 IOT-NTN.******Proposal 2: The reference point for the UE initial transmit timing control requirement*** ***and timing advanced adjustment requirement shall be revised******Proposal 3: Te should be relaxed, the extended value can reuse NTN assumption in each case******Proposal 4: For cell-reselection requirement, when the case of cell stop time is broadcasted and applicable, the UE cell-reselection behavior and other restrictions should be decided and specified.******Proposal 5: The maximum interruption in paging reception should be relaxed under the unknow cell case.*** ***Proposal 6: For eMTC-NTN, if the*** ***measurements of cells belonging to different satellite as the serving cell and performed outside the MG, and UE don’t support parallel measurements capability**** ***For L1 RLM measurements, a scaling factor should be used to account overlapping between L1 resources and SMTC for L3 measurements.***
* ***For L3 measurements, a factor should be introduced to account overlapping between the associated SMTC and L1 resources***
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## Open issues summary

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

### General

#### Issue 1-1-1: Work plan

*Work Plan is proposed in R4-2211799, the RRM part is attached below.*

RRM core & performance requirements part

3GPP RAN4 #104-e meeting (August, 2022, **Core Part**)

* Approve Work plan
* Endorse initial CR structure
* Discuss RRM core part requirements.
1. 3GPP RAN4 #104-bis-e meeting (October, 2022, **Core Part**)
* Discuss RRM core part requirements.
* Initial draft CR(s) on core part in TS38.133
1. 3GPP RAN4 #105-e meeting (November, 2022, **Core Part**)
* finalize RRM core part and the corresponding final CR(s) on core part in TS38.133
1. 3GPP RAN4 #106 meeting (Feb., 2023, **Performance part**)
* Work split on test cases CR responsible companies.
1. 3GPP RAN4 #106-bis meeting (April, 2023, **Performance part**)
* Initial draft CR(s) on test cases in TS38.133.
1. 3GPP RAN4 #107 meeting (May, 2023, **Performance part**)
* Finalization on test cases design.
* Agree CR(s) on test cases in TS38.133.
* Proposals
	+ Option 1: RAN4 to endorse the work plan for NB-IoT/eMTC for NTN as presented in R4-2211799.
* Recommended WF
	+ Option 1. Please provide your comments below.

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| **Company** | **Comments** |
| Nokia | In general we are OK with the work plan, except for the Initial draft CRs on meeting R4 #104bis. We think that agreements / work split discussions are needed for the first version of the draft CRs.  |
| CMCC | We think the spec should be TS 36.133 |
| Ericsson | Typo in the WF: Spec should be 36.133 as pointed out CMCC also. |

#### Issue 1-1-2: WI scope

* Background: the WID states following:“NOTE: Rel-17 IoT NTN specifications do not cover non-NTN NB-IoT/eMTC functionality defined later than Rel-16.”
* Proposals
	+ Proposal 1: RAN4 to develop RRM requirements for LEO and GEO scenarios. If needed, prioritize LEO (Nokia)
	+ Proposal 2: RAN4 to develop RRM requirements for both eMTC and NB-IoT devices over NTN. (Nokia)
	+ Proposal 3: CONNECTED mode measurements for serving cell and neighbour cell measurements as introduced in Rel-17 NB-IoT are reused for NTN NB-IoT. (Ericsson)
* Moderator’s understanding is the CONNECTED mode neighbour cell measurements introduced in Rel-17 NB-IoT is out of the scope of this WI.
* Recommended WF
	+ RAN4 to develop RRM requirements for LEO and GEO scenarios.
	+ RAN4 to develop RRM requirements for both eMTC and NB-IoT devices over NTN.

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| **Company** | **Comments** |
| MTK | Agree with the suggested WF.Neighbour cell measurements as introduced in Rel-17 NB-IoT can be considered in the future release.  |
| Nokia | We agree with the recommended WF. RAN2 will work on introducing NB-IoT CONNECTED mode measurements in IoT NTN release 18 (according to WID RP-221806), thus it is out of scope for RAN4 in this WI. |
| Qualcomm | Agree with the moderator’s recommended WF. |
| CMCC | Ok with the recommended WF. |
| Ericsson | Following recommended WF is agreeable:* + RAN4 to develop RRM requirements for LEO and GEO scenarios in this release.
	+ RAN4 to develop RRM requirements for both eMTC and NB-IoT devices over NTN.
 |
| Xiaomi | Fine with the recommended WF |
| Huawei | Support recommended WF |

#### Issue 1-1-3: Requirement applicability

* Proposals
* Proposal 1a: Do not consider positioning requirements for IoT NTN (Hauwei)
* Proposal 1b: Clarify defining of positioning requirements for NTN IoT is not part of this WI. (Ericsson)
* Proposal 2: TDD related requirements are not applicable to R17 IOT-NTN. (CMCC)
* Proposal 3: The following aspects/features are not relevant for NB-IoT/eMTC UE served by SAN and therefore should not be used in RRM requirements for NB-IoT/eMTC UE served by SAN: (MTK)
	+ TDD related aspects
	+ Positioning requirements
* Proposal 4: The RRM requirements for autonomous gap for CGI reading are not applicable for NB-IoT/eMTC UE served by SAN. (MTK)
* Proposal 5: The requirements apply provided that serving and all neighbour satellites on the same layer are of same satellite type (LEO or GEO). (MTK)
* Recommended WF
* Do not consider the following requirements/aspects for IoT NTN
	+ TDD related aspects
	+ Positioning requirements
	+ autonomous gap for CGI reading
* The requirements apply provided that serving and all neighbour satellites on the same layer are of same satellite type (LEO or GEO).

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| **Company** | **Comments** |
| MTK | Agree with the suggested WF. |
| Nokia | Partial OK. We would suggest to adjust the wording in the recommended WF to: “Rel-16 NB-IoT/eMTC positioning requirements”Regarding positioning requirements, the eMTC must be able to report a coarse location based on GNSS (approximately 2 km granularity according to coarseLocationInfo element in 36.331), but we agree positioning like OTDOA is out of scope for IoT NTN. |
| Qualcomm | Support the recommended WD. |
| CMCC | Ok with the recommended WF. |
| Ericsson | Recommended WF is fine.  |
| Xiaomi | Fine with the recommended WF. |
| Huawei | Support recommended WF. |

#### Issue 1-1-4: RRM requirement list

* Proposals
* Proposal 1: RAN4 to consider the following list of requirements in the discussion of the scope of RRM requirements for IoT NTN (Nokia)

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| Section | NB-IoT | eMTC |
| RRC\_Idle mobility | Yes | Yes |
| Random access | Yes  | Yes |
| Handover |  | Yes |
| RRC Re-establishment | Yes | Yes |
| RRC connection release with redirection | Yes | Yes |
| Radio Link Monitoring | Yes | Yes |
| Timing requirementsTransmit timingTiming Advance | Yes  | Yes |
| Intra-frequency / inter-frequency measurements |  | Yes |

* Recommended WF
	+ Please provide your comments below.

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| **Company** | **Comments** |
| MTK | General fine with Option 1, except NB-IoT also supports intra-frequency measurement on serving cells in CONNECTED mode. We can agree with the following clarification:

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| Section | NB-IoT | eMTC |
| Intra-frequency / inter-frequency measurements | Only measurements on serving cells in CONNECTED mode | Yes |

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| Nokia | We are fine with the clarification of MTK. |
| Qualcomm | Support the recommended WF and agree with the table from MTK. |
| CMCC | We are fine with Option 1 and the additional clarification from MTK. |
| Ericsson | In addition to the listed table in proposal 1, we believe also the general section may be impacted since terminologies and band groups need to be updated/included.  |
| Xiaomi | Fine with option 1 and the clarification from MTK |
| Huawei | Generally fine with the table. For NB-IoT, at least intra-frequency (serving cell) shall be included. |

#### Issue 1-2-1: Spec structure

* Proposals
* Proposal 1: NB-IoT/eMTC over NTN requirements are introduced in separate sections. (Ericsson)
* Proposal 2: Follow TN section structure as in TS 36.133 in general and use suffix "A" for satellite access requirement (MTK)
* Proposal 3: NB1 and NB2 UE share the same requirement for UE category NB-IoT for Satellite Access, unless specified otherwise. (MTK)
* Recommended WF
	+ Agree on Proposal 1, 2, 3.

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| **Company** | **Comments** |
| MTK | Agree with the suggested WF. |
| Nokia | We are OK with the proposal. |
| Qualcomm | Support the recommended WF. |
| CMCC | Ok with the recommended WF. |
| Ericsson | Recommended WF is agreeable.  |
| Xiaomi | Fine with the recommended WF |
| Huawei | Support recommended WF. |

#### Issue 1-2-2: initial CR structure

* Proposals
	+ Option 1: initial CR structure as provided in R4-2212404 (MTK)

3.6 General

3.6.1 Applicability of requirements in this specification version

// the following clauses are specific for NB1/NB2 UEs for Satellite Access

4.6.2A Cell Re-selection for UE category NB-IoT for Satellite Access

4.6.3A Requirements for transmission using preconfigured uplink resources for UE category NB-IoT for Satellite Access

6.5A RRC Re-establishment for NB-IoT UEs for Satellite Access

6.6A Random Access for UE category NB-IoT for Satellite Access

6.9A RRC Connection Redirection to Non-anchor Carrier in NB-IoT for Satellite Access

7.20A UE transmit timing for NB-IoT for Satellite Access

7.21A UE timer accuracy for NB-IoT for Satellite Access

7.22A Timing Advance for NB-IoT for Satellite Access

7.23A Radio Link Monitoring for Category NB-IoT for Satellite Access

8.14A Measurements for UE category NB-IoT for Satellite Access

// the following clauses are specific for M1 UEs for Satellite Access

4.7.2A Cell Re-selection for UE category M1 for Satellite Access

4.7.3A Channel quality report for UE Category M1 in idle mode for Satellite Access

4.7.4A Requirements for transmission using preconfigured uplink resources for UE category M1 for Satellite Access

5.5A E-UTRAN Handover for Cat-M1 Ues for Satellite Access

6.2.3A Random Access Requirements for Cat-M1 UEs for Satellite Access

6.7A RRC Re-establishment for Cat-M1 UEs for Satellite Access

6.8A RRC Connection Release with Redirection for Cat-M1 UEs for Satellite Access

7.19A Radio Link Monitoring for UE Category M1 for Satellite Access

7.24A UE transmit timing for Category M1 for Satellite Access

7.27A UE timer accuracy for category M1 for Satellite Access

7.28A Timing Advance for Category M1 for Satellite Access

8.13A Measurements for UE Category M1 for Satellite Access

* Recommended WF
	+ Please provide your comments below.

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| **Company** | **Comments** |
| MTK | Agree with the initial CR structure. |
| Nokia | We are OK with the specification structure |
| CMCC | Fine with Option 1 |
| Ericsson | OK. In addition, we also need a note that Aadditional clauses specific to satellite access if needed can also be included.  |
| Huawei | Fine with option 1. |

#### Issue 1-3-1: Band groups and terminologies

* Proposals
	+ Proposal 1: The general section on terminologies and band groups are updated to contain NTN IoT specific changes. (Ericsson)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | Agree to the proposal. |
| CMCC | Support the proposal 1. |
| Ericsson | We support proposal 1. The general section contains the terminologies such as CE modes, coverage levels, band groups etc. that need to be updated.  |

#### Issue 1-3-2: information for the neighbor/target cell

* Proposals
* Proposal 1: Similar as NR NTN, the mobility and measurement requirements for IoT NTN apply provided that valid information for the neighbor/target cell is made available to the UE. (Hauwei)
* Recommended WF
	+ Proposal 1

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | Ok with the proposal |
| Qualcomm | Agree with Proposal 1. |
| CMCC | Support the proposal 1. |
| Ericsson | Proposal 1 is agreeable.  |
| Xiaomi | Fine with proposal 1 |

#### Issue 1-3-3: measurement capability of monitoring on number of carriers

* Background
	+ For NB in IDLE, the existing TN requirements of UE measurement capability of monitoring on number carriers, as in 4.6.2.8 in TS 36.133
		- Depending on UE capability, an intra-frequency carrier.
		- Depending on UE capability, at least 2 inter-frequency carriers.
	+ For M1, the existing TN requirements of UE measurement capability of monitoring on number carriers
		- Depending on UE capability, 2 FDD E-UTRA inter-frequency carriers, and
		- Depending on UE capability, 2 TDD E-UTRA inter-frequency carriers.
		- UE needs to monitor is 5 including serving CC
* Proposals
	+ Proposal 1: The existing measurement capability requirements are reused for NTN IoT. (Ericsson, MTK)
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | We are ok with the proposal, considering that it is for monitoring both TN and NTN carriers. |
| Qualcomm | Okay with the proposals. Regarding “TN-NTN” mobility, RAN4 may not need to define something special for that as Rel-17 NR NTN. |
| CMCC | Ok with proposal 1. |
| Ericsson | Recommended WF is agreeable.  |
| Xiaomi | Fine with proposal 1, some typo need to be revisited in background. |
| Huawei | Fine with proposal 1. |

#### Issue 1-3-4: measurement capability on number of NGSO satellites

* Proposals
	+ Proposal 1: For both NB and M1 in NGSO, the number of target satellites UE needs to monitor per carrier is 2 including serving LEO satellite. (MTK)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | Our view is that clarification of this proposal and more discussion is needed. The UE does not monitor satellites, but cells. Is the intention inter-satellite cells i.e. cells not provided by the same satellite as the serving cell? There might be scenarios in which it is relevant to monitor 3 inter-satellites cells in the same carrier. |
| Qualcomm | Agree with Proposal 1, but we want to put “per carrier” in [] for now. |
| CMCC | Generally fine with proposal 1, maybe more clarification is needed to make it clearer. Based on our understanding, there will be two satellites (serving and 1 neighbour) per frequency carrier, and two cells under two satellites respectively. |
| Ericsson | We prefer to reuse the corresponding agreement for NTN WI where the UE monitors up to 4 satellites including LEO and UE’s capability indicates the exact number of satellites UE can support.  |
| Xiaomi | Fine with proposal 1 |
| Huawei | Fine with proposal 1 |

#### Issue 1-3-5: For NGSO, Doppler shift impact in Multiple NGSO satellites

* Proposals
	+ Proposal 1: RAN4 shall investigate Doppler shift impact on the overlapping receiving window from multiple inter-frequency satellites on IoT NTN. (Ericsson)
	+ Proposal 2: the scaling factor for measurement of multiple LEO satellites should also apply (Huawei)
	+ Proposal 3: For eMTC over NTN, RAN4 not to define scheduling restriction due to RRM measurement. (Huawei)
	+ Proposal 4: For eMTC-NTN, if the measurements of cells belonging to different satellite as the serving cell and performed outside the MG, and UE don’t support parallel measurements capability
		- For L1 RLM measurements, a scaling factor should be used to account overlapping between L1 resources and SMTC for L3 measurements.
		- For L3 measurements, a factor should be introduced to account overlapping between the associated SMTC and L1 resources
* Moderator’s note: In proposal 3, it also mentioned “For eMTC, the measurement is done with MG, so there is no need to define scheduling restriction for RRM measurement”
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with P1/P2/P3. On P4 (for eMTC-NTN LEO), since there is no SMTC structure in LTE, and CRS are provided in all subframes.  |
| Nokia | We prefer Proposal 1. We need time to investigate this issue. |
| Qualcomm | P1: “multiple inter-freq” might be only for RRC Idle/Inactive mode for for NB-IoT?P4: Same comment as MTK |
| Ericsson | We support proposal 1. Doppler shift more than 50KHz may happen in LEO scenario, which has a considerable impact on the entire carrier bandwidth. For a case of intra-frequency measurements (e.g. 1 serving cell and 1 neighbor cell) on NB carrier with 200KHz bandwidth, receiving window of UE shall be enable to reserve 250KHz frequency width for intra-frequency measurements. UE may retune RF to measure the intra-frequency neighbor cell. Another issue is various Doppler shifted signal from one satellite may degrade or distort power level of anther satellite assessed by UE and consequently impact cell change, e.g. re-selection. |
| Xiaomi | Fine with P1, P2 and P3 |
| Huawei | Support P2/3. We are also fine with P1. We think P4 is not needed as measurement are performed within gap. |

#### Issue 1-3-6: DRX/eDRX, HD-FDD applicability

* Proposals
	+ Proposal 1: (MTK)
		- For GEO, the existing TN requirements related to DRX/eDRX, HD-FDD can be re-used as baseline.
		- For LEO/NGSO, the existing TN requirements related to DRX/eDRX, HD-FDD can be re-used as baseline. FFS the applicability of DRX/eDRX cycle length and PTW length.
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | OK |
| Qualcomm | Okay with Proposal 1. |
| CMCC | Fine with proposal 1. |
| Ericsson | It is not clear to us what is meant by “existing TN requirements related to DRX/eDRX HD-FDD”. It is better to refer to what those requirements are and then check if those requirements can be reused.  |
| Xiaomi | Fine with proposal 1 |
| Huawei | Fine with proposal 1. |

#### Issue 1-4: RAN1 LS on per-segment TA pre-compensation

* Background:
	+ One incoming LS from RAN1 (R4-2211518) regarding the UL Segmented Transmission for UL synchronization for IoT NTN, and a transmission gap between segments are introduced
	+ The “restriction” in Proposal 2 is referring to the following statement
		- *When a repetition period is configured on the uplink for which R>1, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission as defined above.*
* Proposals
	+ Proposal 1: Segmented UL transmission can be covered by NTN UE transmit timing requirements, i.e. Te\_NTN. FFS whether and how to capture in RAN4 (MTK)
	+ Proposal 2: The restriction on UL transmission adjustment shall be updated according to RAN1 LS on per-segment TA pre-compensation. (Huawei)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1 and 2. |
| Nokia | We support Proposal 2. We kindly ask to consider our discussion paper on this topic: R4-2212909, which is discussed in Thread #240 |
| Qualcomm | Agree with Proposal 1 and 2. Will consider the observations presented in R4-2212909 (Nokia). Besides, the definition of reference timing needs to be further studied, e.g. the first symbol of the segmented UL block or average across symbols in the block. |
| CMCC | We support proposal 1 and 2. |
| Ericsson | This topic is being discussed separately under thread 240. No need to discuss it here.  |
| Xiaomi | Fine with proposal 1 and 2 |
| Huawei | Fine with proposal 1 and 2. |

#### Issue 1-5: UE capability introduced in R17 NR NTN

* Proposals
	+ Proposal 1: The following UE capability, introduced in RAN4 R17 NR NTN, are not applicable for LTE IoT in Rel-18: (MTK)
	+ 25-1 Parallel measurements on multiple SMTC-s for a single frequency carrier
	+ 25-3 Parallel measurements with multiple measurement gaps
	+ 25-4 Enhanced RRM requirements for measurements in IDLE and INACTIVE modes
	+ 25-6 Relaxed cell reselection on GEO
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | We are OK with the proposal.  |
| Qualcomm | Okay with the first three bullets. FFS on FG#25-6 for now. |
| CMCC | We are ok with the proposal. |
| Ericsson | We prefer introduce UE’s capabilities for parallel measurements which provide enough flexible of use cases, minimal capability UE doesn’t need to perform parallel measurements. Enhanced /relaxed cell reselection shall be applicable in IoT NTN.  |
| Xiaomi | UE capability on enhanced RRM requirement in idle/inactive mode should be applicable to IoT NTN |
| Huawei | We think the proposal is straightforward as these are capability for NR. But the corresponding feature for NB/MTC should be considered. E.g. relaxed reselection. |

### IDLE state mobility requirements

#### Issue 2-1: Discontinuous Coverage

* Proposals
	+ Proposal 1: Define the RAN4 requirements based on the assumption that the UE is able to predict the coverage. (Nokia)
	+ Proposal 2: In IDLE mode or PSM mode, the UEs are not required to perform any cell search while out of coverage in discontinuous coverage. (Nokia)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1 and 2. The Discontinuous coverage specific requirement can be FFS.  |
| Nokia | We are ok to keep the details FFS |
| Qualcomm | In principle, okay with proposals. But whether and how to define the requirement is FFS. |
| CMCC | Fine with the principle in proposal 1 and 2, the details about requirement definition should be FFS. |
| Ericsson | Generally, we agree on Proposal 1 and 2. We shall assume UE has enough information, e.g. ephemeris data, time instant corresponding to discontinuous coverage, to perform cell search procedure after re-entering coverage. We shall check any restriction or optimization when leaving and re-entering coverage.  |
| Huawei | We are open to FFS. |

#### Issue 2-2-1a: GEO, cell re-selection

* Proposals
	+ Proposal 1: For GEO, the existing TN requirements apply (MTK)
		- For NB, as in 4.6.2
		- For M1, as in 4.7.2.1/4.7.2.2
* Recommended WF
	+ Discuss proposals.

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| * **Company**
 | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | OK |
| Qualcomm | Okay with Proposal 1. |
| CMCC | Fine with proposal 1. |
| Ericsson | Proposal 1 is agreeable except impact on relaxed measurements is FFS.  |
| Xiaomi | Fine with proposal 1 |
| Huawei | Fine with proposal 1. |

#### Issue 2-2-1b: NGSO, cell re-selection

* Proposals
	+ Proposal 1: The serving cell evaluation and neighbour cell measurement requirements are reused with following modifications: eDRX and long DRX cycles are excluded when the serving cell coverage is impacted due to satellite movement (e.g. as indicated by Tservice). (Ericsson)
	+ Proposal 2: For Normal coverage, the exiting TN requirement can be the baseline (MTK)
		- the existing delay requirements (Tdetect, Tmeasure, Tevaluate) can be scaled up by *KSatellite,* where *KSatellite* is the number NGSO satellites and is can assume *KSatellite* =[2]for intra-frequency measurement in IDLE mode and *KSatellite* =1for inter-frequency measurement in IDLE mode.
* Recommended WF
	+ Discuss proposals.

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| * **Company**
 | **Comments** |
| MTK | Agree with Proposal 2. On P1, does it propose eDRX and long DRX are not appliable if Tservice is configured or also for LEO case in general? Our understanding is the cell detection time on neighboring cell in Enhance Coverage would be too long, but other cases seems ok.  |
| Nokia | We agree with proposal 1 in the sense that NGSO satellite movement must be considered, because cell availability time may be short compared to detection, measurement and evaluation time requirements.For proposal 2, we think that more discussion is needed, based on the outcome of issue 1-3-4. |
| Qualcomm | More discussion.For Proposal 1, at less FFS on GEO scenario. |
| CMCC | For proposal 1, we are not sure whether the general precluding criteria is enough or not.For proposal 2, the K value can be FFS at the current stage. |
| Ericsson | We support option 1. We believe some of the eDRX/DRX cycles (especially the long cycles) may not be suitable for NTN scenarios when the coverage cell can be impacted (disappear). As soon as UE detects that coverage of the serving cell is impacted (going to disappear), it is important to perform the measurements faster assuming the shorter DRX/eDRX cycles. This can be based on the information provided about the statellite coverage, e.g. based on ‘t-Service’. We think proposal 2 is not contradicting to proposal 1 and we are open to discuss it separately. We are open to discuss proposal 2.  |
| Xiaomi | Need more discussion, as mentioned in issue 1-5, the enhanced cell re-selection requirement should be considered due to LEO movement. |
| Huawei | For Proposal 1, we are open to further discuss the impact of Tservice on serving cell evaluation and neighbor cell measurement, which can take NR NTN as baseline. We are fine to consider Ksatellite, but the value need FFS. |

#### Issue 2-2-2: NGSO, cell-stop time based cell reselection

* Proposals
	+ Proposal 1: The cell-stop time based cell reselection should be considered in IoT NTN. (Huawei, MTK)
	+ Proposal 1a: For cell-reselection requirement, when the case of cell stop time is broadcasted and applicable, the UE cell-reselection ehaviour and other restrictions should be decided and specified (CMCC)
* Recommended WF
	+ RAN4 to specify cell-stop time based cell reselection in IoT NTN

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| **Company** | **Comments** |
| MTK | Agree with the suggested WF. |
| Nokia | OK to consider t-Service (time quasi-EFC stops serving an area), but RAN4 also needs to consider the t-ServiceStart (SIB32) for discontinuous coverage (defining when quasi-EFC starts serving an area).We propose that the Recommended WF is changed to:RAN4 to specify cell-stop and t-ServiceStart time based cell reselection in IoT NTN |
| Qualcomm | Agree with the recommended WF. |
| CMCC | Agree with the recommended WF. |
| Ericsson | We support both proposals. In proposal 2, it is stated that the details upon receiving the cell stop time needs to be decided and specified which makes sense.  |
| Xiaomi | Fine with the recommended WF |
| Huawei | Support the recommended WF. |

#### Issue 2-2-3: NGSO, location-based cell reselection

* Proposals
	+ Proposal 1: Do not define location-based cell reselection for IoT NTN. (Huawei)
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. Our understanding is this is not introduced by RAN2. |
| Nokia  | Ok |
| Qualcomm | Okay with Proposal 1. |
| CMCC | OK with proposal 1. |
| Ericsson | Unless location-based cell reselection is excluded for IoT NTN, RAN4 shall defined requirements for this case. However, if feature is already excluded by RAN2, then we are fine with proposal 1. We need time to confirm proposal 1.  |
| Xiaomi | Fine wit proposal 1 |

#### Issue 2-2-4: NGSO, cell Re-selection in Enhanced Coverage

* Proposals
	+ Proposal 1: Discuss whether to define requirements of cell Re-selection for enhanced coverage. (Huawei)
	+ Proposal 2: For Enhanced Coverage intra-/inter-frequency measurement, the existing TN requirement on Tmeasure, Tevaluate can be the baseline. FFS the cell detection time (Tdetect). (MTK)
* Moderator’s note: the major concern in Proposal 1 is on NGSO/LEO.
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Our understanding is the cell detection time on neighboring cell in Enhance Coverage would be too long, but serving cell measurements and Tmeas./Teval. Seems ok. And the Discontinuous coverage specific modification can be FFS.  |
| Nokia | We prefer to have requirements in this case, and can agree to Proposal 2 to discuss detection time, when considering NGSO movement and short availability time. |
| Qualcomm | Share the same comment as MTK. |
| CMCC | We think the requirements for enhanced coverage cell-reselection should be defined. The details can be FFS |
| Ericsson | In general we are fine with proposal 2, however the values of Tdetect, Tevaluate and Tmeasure are better kept as FFS.  |
| Huawei | We are open to discuss the details |

#### Issue 2-3-1: Maximum interruption in paging reception

* Proposals
	+ Proposal 1: The NTN paging reception requirements based on type of satellites are reused for NTN IoT. (Ericsson)
	+ Proposal 1a: (MTK)
		- For NB, the maximum interruption in paging reception for NTN cell reselection shall not exceed
			* TSI-NB1-NC/EC + 100 ms,
				+ the target cell’s satellite is GEO, or
				+ the target cell’s satellite is NGSO and the target cell belongs to the same satellite as the current one
				+ Note: same as the existing TN requirement, as in 4.6.2.7/4.6.2.7A
			* TSI-NB1-NC/EC + [250] ms,
				+ the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one
		- For M1, the maximum interruption in paging reception for NTN cell reselection shall not exceed
			* TSI-EUTRA-M1-NC/EC + 50 ms,
				+ the target cell’s satellite is GEO, or
				+ the target cell’s satellite is NGSO and the target cell belongs to the same satellite as the current one
				+ Note: same as the existing TN requirement, as in 4.7.2.1.5/4.7.2.2.5
			* TSI-EUTRA-M1-NC/EC + [125] ms, if
				+ the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1 and 1a. Proposal 1a provides details for Proposal 1. |
| Nokia | We believe that more discussion is needed for this issue |
| Qualcomm | Needs more time. FFS for now. |
| CMCC | We are fine with proposal 1. The details can be FFS. |
| Ericsson | Our view is that corresponding NR NTN requirements (cited) are enough for IoT NTN:*The interruption time shall not exceed TSI-NR + K\*Ttarget\_cell\_SMTC\_period ms.* *Where,**If the target cell belongs to the same satellite as the current one, K = 2;* *If the target cell belongs to a different satellite than the current one and the target cell’s satellite is GEO, then K = 2;* If the target cell belongs to a different satellite than the current, then K = 5. |
| Xiaomi | Need more discussion. |
| Huawei | More discussion is needed. |

#### Issue 2-3-2: Maximum interruption in paging reception – longer interruption

* Background: in R17 NR NTN, unknown cell is defined time span between SIB broadcasting cell stop time and the cell stop time is less than Ttrigger.
* Proposals
	+ Proposal 1: The maximum interruption in paging reception should be relaxed under the unknow cell case (CMCC)
	+ Proposal 2: If the cell stop time (i.e., t-serve) is applicable, and the time span between SIB broadcasting cell stop time and the cell stop time is less than Ttrigger, longer interruption is expected. (MTK)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 2. The intention is not to define the explicit requirement for the unknown case, as it is now discussing in R17 NR NTN, and we still need to note the longer interruption is expected.  |
| Nokia | More discussion is needed |
| Qualcomm | Okay with Proposal 2. |
| CMCC | We are also ok with proposal 2. |
| Ericsson | We understand the intent, but we can observe that if UE still camps on serving cell before re-selection is ready, then no longer interruption.At least, the statement shall be updated to: ‘ If the cell stop time (i.e., t-serve) is applicable, and the time span between SIB broadcasting cell stop time and the cell stop time is less than Ttrigger, and S-criteria isn’t fulfilled, longer interruption is expected.’ |
| Xiaomi | As discussed in thread#214, it depends on whether unknown case is considered or not. |
| Huawei | Fine with proposal 1 and 2. |

#### Issue 2-4: Channel quality report for UE Category M1 in idle mode

* Proposals
	+ Proposal 1: For M1, the existing TN requirements of channel quality report for in idle mode apply, as in 4.7.3. (MTK)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Nokia | Ok |
| Qualcomm | Okay for GEO. For LEO, may need some discussion regarding which specific time instance the CQR corresponds to. |
| CMCC | We are fine with proposal 1. |
| Ericsson | Proposal 1 is fine. But we are also fine to have discussions for LEO as commented by Qualcomm.  |
| Huawei | OK |

#### Issue 2-5: WUS receptions

* Proposals
	+ Proposal 1: The principles of defining WUS reception requirements is reused but the required number of repetitions are kept TBD. (Ericsson)
	+ Proposal 2: the existing TN requirements apply (MTK)
		- For NB, as in 4.6.2.9.
		- For M1, as in 4.7.2.3.
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Fine with Proposal 1. |
| Nokia | Fine with Proposal 1 |
| Qualcomm | Okay with Proposal 1. |
| CMCC | We support Proposal 1. |
| Ericsson | The difference between proposal 1 and 2 is that in proposal 1 the number of repetitions required to correctly decode the WUS is kept as TBD while in proposal 2 the number form TN is reused. Under the assumption that the side conditions and transmit power levels are same, proposal 2 can be agreed. In that case, the proposal needs to be revised to include the assumptions.  |
| Xiaomi | Prefer option 1 |
| Huawei | Fine with proposal 1 and 2. |

#### Issue 2-6: Transmission using preconfigured uplink resources (PUR)

* Proposals
	+ Proposal 1: Discuss whether to define RSRP-based TA validation for PUR in IoT NTN. (Huawei)
	+ Proposal 2: The UE update the uplink timing for transmitting on PUR using the configured TA command according to TS 36.211 v17.2.0 i.e. transmission of uplink radio frame number  from the UE starts (Ericsson)
	+ Proposal 3: The UE assumes TA is valid provided that the following conditions are met, otherwise the UE is considered invalid: (Ericsson)
		- Satellite assistance information (SAI) is valid i.e. T317 has not expired and
		- Current time of the UE is at least ΔT seconds earlier than t-Service.
	+ Proposal 4: the existing TN requirements apply (MTK)
		- For NB, as in 4.6.3.
		- For M1, as in 4.7.4.
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| XXX | On P1, we think the legacy RSRP-bsed TA validation can be the baseline and it’s fine to consider some modification.Proposal 2 is fine. Proposal 3 is ok in general. But how to determine ΔT?The existing TN requirements can be used as baseline with modifications as suggested. |
| Nokia | We propose to postpone the discussion until the general uplink transmission timing has been discussed |
| Qualcomm | We would like to investigate the whole framework of PUR in NTN because UE should be able to derive the propagation delay directly based on GNSS info and ephemeris info. And it is unclear if applying the previously provided TA to UL even after UE autonomous TA update is needed. |
| Ericsson | We support proposal 2 and 3. We don’t think the existing TA validation based on RSRP measurement changes is relevant for NTN since the UE is already provided with the parameters ( and ) from the network i.e. in SIB31 which contains satellite assistance information (SAI) for the serving cell. However, upon expiry of the SAI the TA should be considered invalid by the UE and UE should not transmit on PUR. The SAI expires upon expiry of T317 which is started upon the reception of SAI at the Epoc time which is also signed in the SI. Furthermore, when the UE current time is close to or equal to t-Service (signalled in the SI) then the TA should not be considered (i.e. consider it as invalid) since the serving cell coverage will soon expire.  |
| Huawei | We would like to hear more views on proposal 1. As IoT NTN UE is equipped with GNSS, is there still necessity to evaluate the changing of TA by RSRP measurement since UE is performing UE specific TA estimation. |

### CONNECTED state mobility requirements

#### Issue 3-1: RRC Re-establishment and RRC release with redirection

* Proposals
	+ Proposal 1: Requirements of RRC Re-establishment and RRC release with redirection of TN can apply to IoT NTN. (Huawei, MTK, Ericsson)
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1. |
| Qualcomm | FFS for now. |
| CMCC | Whether the scaling factor should be applied should be further discussed based on Issue 1-3-4 |
| Ericsson | Proposal 1 is fine.  |
| Xiaomi | Fine with proposal 1 |
| Huawei | Fine with proposal 1. |

#### Issue 3-2: Random Access

* Proposals
	+ Proposal 1: Existing random access requirements are reused for NTN IoT. (Ericsson, MTK)
		- Proposal 1a: (MTK)
			* For NB, the existing TN requirements apply, as in 6.6
			* For M1, the existing TN requirements apply, as in 6.2.3
	+ Proposal 2: If UE specific TA reporting is enabled and applicable, UE shall be able to report information about UE specific timing advance during a Random Access procedure as specified in TS 36.321[17]. (MTK)
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with Proposal 1 and 2. |
| Nokia | OK to proposals. Reporting of UE-specific TA is important for eNB scheduling decisions. |
| Qualcomm | In principle, agree. Do we still need to consider non-anchor carrier based RA for NB-IoT in NTN? |
| CMCC | Fine with proposal 1 and proposal 2. |
| Ericsson | Proposal 1 is fine. But proposal 2 needs to be discussed further.  |
| Xiaomi | Fine with proposal 1 and 2 |
| Huawei | Fine with proposal 1 and 2. |

#### Issue 3-3: M1, E-UTRAN Handover

* Proposals
	+ Proposal 1: For legacy handovers, the existing HO requirements are reused. (Ericsson, MTK, Huawei)
		- Proposal 1a: For eMTC over NTN, define HO requirements by re-using TN HO requirements for NTN as baseline (Huawei)
		- Proposal 1b: For M1, the existing requirements of E-UTRAN Handover for Cat-M1 UE apply, as in 5.5 (MTK)
* Recommended WF
	+ For eMTC (M1) over NTN, define E-UTRAN Handover requirements by re-using TN HO requirements for NTN as baseline

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| **Company** | **Comments** |
| MTK | Agree with the suggested WF. |
| Nokia | OK to use TN as baseline, but RAN4 need to consider the RAN2 agreement concerning UE may need to measure GNSS during handover to obtain new GNSS validity duration. |
| Qualcomm | Agree with “baseline” in the recommended WF. |
| CMCC | Ok to use TN as baseline. |
| Ericsson | We support option 1a, i.e. to use the existing eMTC requirements as basis. Based on that, RAN4 can discuss and identify potential NTN specific impact, e.g. based on coverage information of the cell.  |
| Xiaomi | Fine with the recommended WF |
| Huawei | Fine with the recommended WF |

#### Issue 3-4: M1, CHO requirements

* Proposals
	+ Proposal 1: define CHO requirements for NTN (no need to consider time or location based CHO) (Huawei)
	+ Proposal 2: new requirements based on corresponding NTN CHO are defined NB-IoT and eMTC (Ericsson)
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTC | We notice that legacy CHO requirement was not introduced even for Terrestrial IoT. Thus we think the new IoT CHO requirements should be introduced in the legacy Terrestrial IoT first, then we can consider it for IoT NTN.On P2, NB-IoT has no HO requirement in our understanding. For eMTC CHO IoT, same comment as above.  |
| Nokia | OK to define basic CHO. The location/time enhancements are treated by RAN2 in release 18. |
| Qualcomm | Similar view as MTK and Nokia.NB-IoT does not support HO.Whether we want to define CHO even for TN is a separate topic. For now, FFS. |
| CMCC | Proposal 1 for M1 is fine for us. |
| Ericsson | Both proposals are similar, but proposal 1 excludes time or location based CHO which we would like to check further. Thus we propose to agree on a high-level that RAN4 shall define CHO requirements for NTN, but whether to consider time or location based CHO is FFS.  |
| Xiaomi | Proposal 1 is fine for CHO for M1 |
| Huawei | Support proposal 1 and no need to consider time or location based CHO as in NR NTN. |

### Timing requirements and RLM

#### Issue 4-1-1: UE transmit timing (Te) requirement

* Proposals
	+ Proposal 1: Define Te requirements in the same method as NR NTN where the reference point is defined considering the UE specific TA (Huawei, CMCC)
	+ Proposal 2: discuss whether to keep the same GNSS estimation accuracy assumption as NR NTN. (Huawei)
	+ Proposal 3: The timing requirements from Rel-17 NTN is used as baseline with some modification to the values to account for the lower BW is needed for NTN IoT (Ericsson)
	+ Proposal 4: Te should be relaxed, the extended value can reuse NTN assumption in each case
	+ Proposal 5: For IoT NTN, Te\_NTN is extended by [17] Ts (MTK)
	+ For NB, Te\_NTN: 80+ [17] = [97] Ts.
	+ For M1 CE Mode A, Te\_NTN: 24+[17] = [41] Ts
	+ For M1 CE Mode B, Te\_NTN: 48+[17] =[65] Ts
* Recommended WF
	+ the reference point is defined considering the UE specific TA
	+ Te is relaxed by considering GNSS estimation accuracy
	+ Discuss whether to keep the same GNSS estimation accuracy assumption as NR NTN in the 1st round

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| **Company** | **Comments** |
| MTK | Agree with the suggested WF and we think the same GNSS estimation accuracy assumption as NR NTN can be assumed, as the current Te is large enough.  |
| Nokia | Agree the reference point has to consider the UE-specific TA. Do not agree to extend the Te, because it makes configuration of segment duration even more challenging (see discussion in R4-2212909).  |
| Qualcomm | Needs more investigation. |
| CMCC | We support Proposal 1 and proposal 4. |
| Ericsson | First bullet in WF is unclear. It should be like below: The reference point for Te should be the downlink timing of the reference cell minus If above cannot be agreed then * The reference point for Te should be the downlink timing of the reference cell minus the UE UL timing (which is FFS)

2nd bullet in WF OK. Exact values are FFS.3rd bullet in WF. Need further discussion. |
| Xiaomi | Need more discussion.The first bullet in recommended WF is not clear, in my view, the reference point should be the same as defined for Rel-17 NR NTN, which is captured by Ericsson.The 2nd bullet should be FFS by considering whether to consider the same GNSS accuracy assumption. |
| Huawei | Support the recommended WF. We suggest to FSS whether and how to relax the GNSS estimation accuracy. |

#### Issue 4-1-2: Gradual timing adjustment

* Proposals
	+ Proposal 1: For gradual timing adjustment, the reference timing shall be (*N*TA *+ N*TA-offset *+ N*TA,common *+ N*TA,UE-specific)*×*Tc before the downlink timing of the reference cell. Clarify the adjustment with “apart from a change of NTA,UE-specific and NTA,common” (MTK)
	+ Proposal 2: the legacy values of Tq /Tp  are applicable to Tq\_NTN /Tp\_NTN. (MTK)
* Recommended WF
	+ Discuss the proposals

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1 and Proposal 2.  |
| Nokia | Agree with the proposals.The definitions of N\_TA,UE-specific and N\_TA,common including when the UE needs to update the values must be defined by 3GPP, but they should not be part of the accumulated time adjustments covered by the legacy gradual timing adjustment requirements. We suggest to refer to this NR NTN document for a definition R4-2212853  |
| Qualcomm | In principle, agree.Needs further study about the impact of “segmented UL transmission.” There can be a little more aspect that needs to be taken into account compared to NR NTN. |
| CMCC | We agree with proposal 1 and 2. We also agree with QC’s comments at segmented UL transmission |
| Ericsson | P1 is OK but Tc should be replaced by Ts in the equation i.e. should be P2: It also unclear what is meant by ‘legacy’? Is this NTN Rel-17 or NB/Cat-M values. In any case it is better to keep gradual timing adjustment figures (max step size, max, min rate etc) as FFS. In NB/cat-M, Tp  is not used.  |
| Xiaomi | Fine with proposal 1 and 2 in general, and we agree with QC that RAN4 need to investigate the impact of “segment UL transmission”  |
| Huawei | Fine with proposal 1/2 which is same as NR NTN. And the impact of segmented UL transmission shall be further evaluated. |

#### Issue 4-2: UE Timer accuracy

* Proposals
	+ Proposal 1: the existing TN requirements apply. (MTK)
		- For NB, as in 7.21
		- For M1, as in 7.27
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1  |
| CMCC | OK with the recommended WF. |
| Ericsson | Support the WF |
| Xiaomi | Fine with proposal 1 |

#### Issue 4-3: Timing Advance adjustment accuracy

* Proposals
	+ Proposal 1a: The reference point for timing advanced adjustment requirement shall be revised
	+ Proposal 1b: the existing TN requirements apply, and clarify the adjustment of timing with “apart from a change of NTA,UE-specific and NTA,common between the preceding uplink transmission and the current transmission” (MTK)
		- For NB, as in 7.22
		- For M1, as in 7.28
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1b, which covers Proposal 1a and follows the same wording as in NR NTN spec.  |
| Nokia | OK, please also note our comment on N\_TA,UE-specific and N\_TA,common for issue 4-1-2 |
| Qualcomm | Agree with Proposal 1b. However, it should not preclude any other change at this point. There can be additional changes due to “segmented UL transmission.” |
| CMCC | Ok with proposal 1b. |
| Ericsson | Better to revise Proposal 1a as, “The reference point for timing advanced adjustment requirement needs further analysis”.Proposal 1b: Even though this looks fine but better to discuss once proposal 1a is resolved.  |
| Xiaomi | Agree with QC |
| Huawei | Fine with proposal 1a/1b |

#### Issue 4-4: RLM

* Proposals
	+ Proposal 1: The UE in DRX shall evaluate the RLM according non-DRX requirements provided that the following conditions are met, otherwise the UE is allowed to evaluate following DRX requirements: (Ericssion)
		- Satellite assistance information (SAI) is valid i.e. T317 has not expired and
		- Current time of the UE is at least ΔT seconds earlier than t-Service.
	+ Proposal 2: (MTK)
		- For NB GEO and NGSO, the existing TN requirements apply, as in 7.23
		- For M1 GEO, the existing TN requirements apply, as in 7.19
		- For M1 NGSO, define the RLM requirements based on UE measures on one NGSO satellite at a time, without introducing the UE capability of L1/L3 processing in parallel.
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 2. Proposal 1 is fine, if t-Service is provided and applicable for quasi-fixed NGSO scenario.  |
| Nokia | For GEO, we believe that the existing TN requirements apply. For NGSO we are OK to consider the satellite assistance information and t-Service. |
| Qualcomm | In principle okay with Proposal 2. |
| CMCC | Ok with first two bullets of proposal 2. For bullet#3, we think the UE capability 25-2 is not precluded.  |
| Ericsson | We support proposal 1. As described in our paper, the coverage cell can be impacted (disappear). Based on the this received coverage information received by the UE, by evaluating the RLM according to non-DRX requirements the UE will have a possibility o complete the RLM evaluation before the statellite gone. This is also similar to how current RLM works, where the UE starts evaluating RLM according to non-DRX when detecting radio link problems. Regarding the proposal 2, RLM for NB/eTMC in NGSO scenario needs some more study/discussions and we would like to continue the discussion. At this stage, we don’t think such conclusion as in proposal 2 for NGSO can be drawn.  |
| Xiaomi | Fine with proposal 2 in general |
| Huawei | Fine with proposal 2. |

### Measurement requirements

#### Issue 5-1-1: NB, Measurement requirement

* Proposals
	+ Proposal 1: existing TN intra frequency measurement requirements apply (MTK)
		- as in 8.14.2 for Normal Coverage and 8.14.3 for Enhanced Coverage.
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1.  |
| Nokia | Agree to proposal 1 |
| Qualcomm | Okay with Proposal 1. |
| CMCC | Ok with proposal 1. |
| Ericsson | Proposal 1 is fine.  |
| Xiaomi | Fine with proposal 1 |
| Huawei | Fine with proposal 1. |

#### Issue 5-1-2: M1, Measurement requirement

* Proposals
	+ Proposal 1: eMTC over NTN, re-use the TN measurement delay requirements for NTN as baseline, and the scaling factor for measurement of multiple LEO satellites should also apply. (Huawei, MTK)
		- Proposal 1a: (MTK)
			* For M1 in GEO, the existing M1 TN intra frequency measurement requirements apply, as in 8.13.2.1 for CE mode A and 8.13.3.1 for CE mode B
			* For M1 in NGSO, the delay requirements are scaled up by the number NGSO satellites.
			* For M1 in GEO, the existing M1 TN requirements apply, as in 8.13.2.6 for CE mode A and 8.13.3.5 for CE mode B.
			* For M1 in NGSO, the delay requirements are scaled up by the number NGSO satellites.
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1 and 1a.  |
| Qualcomm | Okay with Proposal 1. |
| CMCC | Ok with the recommended WF |
| Ericsson | Since this it the first time being discussed, we are fine with a high-level agreement that the corresponding TN requirements are used as baseline for IoT NTN but the details are FFS. The different specific sub-proposals in proposal 1a , depending on the type of satellite need to be carefully studied. Thus we prefer to keep the details FFS.  |
| Xiaomi | Fine with proposal 1 |
| Huawei | Support proposal 1. |

#### Issue 5-2: M1, Measurement Gap

* Proposals
	+ Proposal 1: For eMTC over NTN, a single MG is considered for RRM measurement. (Huawei)
* Recommended WF
	+ Proposal 1.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1.  |
| Qualcomm | Okay with Proposal 1. |
| CMCC | Ok with proposal 1 |
| Ericsson | We prefer to introduce UE’s capabilities for single or 2 MGs. This means not all UEs have to support 2 MGs, but those who have the capability can have improved performance.  |
| Xiaomi | Need more time to check one gap is enough to cover all the satellite in one frequency layer, the propagation delay difference among satellites need to be considered. |
| Huawei | Support proposal 1. |

#### Issue 5-3: Connected mode channel quality report

* Proposals
	+ Proposal 1: existing TN requirements apply (MTK)
		- For NB, as in 8.14.4
		- For M1, as in 8.13.2.8 for CE-A, 8.13.3.8 for CE-B
* Recommended WF
	+ Discuss proposals.

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| **Company** | **Comments** |
| MTK | Agree with the Proposal 1.  |
| Qualcomm | Okay for GEO. For LEO, may need some discussion regarding which specific time instance the CQR corresponds to. |
| Ericsson | Proposal 1 is agreeable.  |
| Huawei | Fine with proposal 1. |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

#### Issue 1-1-1: Work plan

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| **Status summary**  |
| Comments received on work split for initial CR draft.Typo spotted. *Recommendations for 2nd round:* * Separate email thread will be triggered in the 2nd round for the revised Work plan to correct typos and address comments received in the 1st round. The approval of the revised Work plan will be handled in main session.
* Work split on initial CRs will be triggered in the 2nd round.
 |

#### Issue 1-1-2: WI scope

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| **Status summary**  |
| *Tentative agreements:* * + RAN4 to develop RRM requirements for LEO and GEO scenarios in this release.
	+ RAN4 to develop RRM requirements for both eMTC and NB-IoT devices over NTN.

*Recommendations for 2nd round:* Issue closed. |

#### Issue 1-1-3: Requirement applicability

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| **Status summary**  |
| *Recommended WF:** Do not consider the following requirements/aspects for IoT NTN
	+ TDD related aspects
	+ positioning requirements
		- Note: eMTC requirements related to coarseLocationInfo can be FFS.
	+ autonomous gap for CGI reading
* The requirements apply provided that serving and all neighbour satellites on the same layer are of same satellite type (LEO or GEO).

*Recommendations for 2nd round:* @ Nokia: Please clarify which existing eMTC requirement would be concerned. Positioning requirements (e.g. OTDAO) are not only in Rel-16 but also in the previous releases in our understanding. Would it be ok to add a note to keep it FFS?  |

#### Issue 1-1-4: RRM requirement list

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| **Status summary**  |
| *Tentative agreements:* * RAN4 to consider the following list of requirements in the discussion of the scope of RRM requirements for IoT NTN

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| Section | NB-IoT | eMTC |
| General  | Yes | Yes |
| RRC\_Idle mobility | Yes | Yes |
| Random access | Yes  | Yes |
| Handover |  | Yes |
| RRC Re-establishment | Yes | Yes |
| RRC connection release with redirection | Yes | Yes |
| Radio Link Monitoring | Yes | Yes |
| Timing requirementsTransmit timingTiming Advance | Yes  | Yes |
| Intra-frequency/ inter-frequency measurements | Only measurements on serving cells in CONNECTED mode | Yes |

*Recommendations for 2nd round:* Based on the list, work split on initial CR will be triggered in the 2nd round.  |

#### Issue 1-2-1: Spec structure

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| **Status summary**  |
| *Tentative agreements:* * NB-IoT/eMTC over NTN requirements are introduced in separate sections.
* Follow TN section structure as in TS 36.133 in general and use suffix "A" for satellite access requirement
* NB1 and NB2 UE share the same requirement for UE category NB-IoT for Satellite Access, unless specified otherwise.

*Recommendations for 2nd round:* Issue closed. |

#### Issue 1-2-2: initial CR structure

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| **Status summary**  |
| *Tentative agreements:* * initial CR structure as provided in R4-2212404
* Add a note that additional clauses specific to satellite access if needed can also be included.

*Recommendations for 2nd round:* Issue closed. The initial CR structure will be captured in WF with the note as suggested.  |

#### Issue 1-3-1: Band groups and terminologies

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| **Status summary**  |
| *Tentative agreements:* * The general section on terminologies and band groups are updated to contain NTN IoT specific changes.

*Recommendations for 2nd round:* Issue closed. |

#### Issue 1-3-2: information for the neighbor/target cell

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| **Status summary**  |
| *Tentative agreements:* * Similar as NR NTN, the mobility and measurement requirements for IoT NTN apply provided that valid information for the neighbor/target cell is made available to the UE.

*Recommendations for 2nd round:* Issue closed. |

#### Issue 1-3-3: measurement capability of monitoring on number of carriers

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| **Status summary**  |
| *Tentative agreements:* * The existing measurement capability requirements are reused for NTN IoT

*Recommendations for 2nd round:* Issue closed. |

#### Issue 1-3-4: measurement capability on number of NGSO satellites

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| **Status summary**  |
| Clarification and UE capability for more than 2 satellites are asked. *Recommended WF:* * Proposal 1a (modified): For both NB and M1 in NGSO, the number of target satellites UE needs to monitor [per carrier] is 2 including serving LEO satellite.
	+ FFS whether to introduce UE capability for the number of target satellites the UE can monitor per carrier including serving LEO satellite, which can be up to 4

*Recommendations for 2nd round:* Continue discussion. @ Nokia: the intention is to discuss the requirement on the number of LEO satellites, similar to the Issue 1 in [214] for NR NTN. As the baseline, more than 2 neighbouring cells are still supported as long as the cells are corresponding to 2 satellites.  |

#### Issue 1-3-5: For NGSO, Doppler shift impact in Multiple NGSO satellites

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| **Status summary**  |
| *Recommended WF:* * RAN4 shall investigate Doppler shift impact on the overlapping receiving window from multiple inter-frequency satellites on IoT NTN
	+ Except NB-IoT in Connected mode
* FFS the following proposals
	+ the scaling factor for measurement of multiple LEO satellites should also apply
	+ For eMTC over NTN, RAN4 not to define scheduling restriction due to RRM measurement

*Recommendations for 2nd round:* Continue discussion.@Qualcomm: yes, for NB-IoT, no need to consider inter-frequency in CONNECTED mode.  |

#### Issue 1-3-6: DRX/eDRX, HD-FDD applicability

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| **Status summary**  |
| Ericsson concerned the proposal is no clear. *Recommended WF:* * FFS the applicability of DRX/eDRX cycle length and PTW length for LEO.
* The existing TN requirements can be used as a starting point.

*Recommendations for 2nd round:* Continue discussion. @ Ericsson: the specific requirements can be discussed in the corresponding issues. But it is also good to have a general principle for the applicability of DRX/eDRX cycle length and PTW length in LEO.  |

#### Issue 1-4: RAN1 LS on per-segment TA pre-compensation

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| **Status summary**  |
| Relevant discussion also in thread [240].Majority supports Option 2. Comment on the definition on timing needs to be further studied, e.g. the first symbol of the segmented UL block or average across symbols in the block.*Recommendations for 2nd round:* Since the discussion is triggered by LS, suggest not to discuss it in the 2nd round and focus on [240] in this meeting.  |

#### Issue 1-5: UE capability introduced in R17 NR NTN

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| **Status summary**  |
| *Recommended WF:* * FFS whether to introduce the following UE capability, for LTE IoT NTN in Rel-18
	+ Enhanced RRM requirements for measurements in IDLE and INACTIVE modes
	+ Relaxed cell reselection on GEO
	+ Parallel measurements on multiple LEO satellites

*Recommendations for 2nd round:* Continue discussion. |

#### Issue 2-1: Discontinuous Coverage

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| **Status summary**  |
| *Tentative agreements:* * Define the RAN4 requirements based on the assumption that the UE is able to predict the coverage.
* In IDLE mode or PSM mode, the UEs are not required to perform any cell search while out of coverage in discontinuous coverage.
* FFS whether and how to define the requirement.

*Recommendations for 2nd round:* Continue discussion regarding the FFS. |

#### Issue 2-2-1a: GEO, cell re-selection

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| **Status summary**  |
| *Recommended WF:* * For GEO, the existing TN requirements apply
	+ For NB, as in 4.6.2
	+ For M1, as in 4.7.2.1/4.7.2.2
	+ Note: impact on relaxed measurements can be FFS

*Recommendations for 2nd round:* Continue discussion regarding the impact on relaxed measurement.@ Ericsson: could you elaborate what impact on relaxed measurements should be FFS? |

#### Issue 2-2-1b: NGSO, cell re-selection

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| **Status summary**  |
| No consensus. *Recommended WF:* * FFS discuss the impact of Tservice (cell stop time) on serving cell evaluation and neighbor cell measurement and whether to exclude eDRX and long DRX in LEO.
* FFS whether to scaled up the existing TN delay requirements by *KSatellite,* where *KSatellite* is the number NGSO satellites.

*Recommendations for 2nd round:* Continue discussion* Note this issue is specifically for LEO but not for GEO.
 |

#### Issue 2-2-2: NGSO, cell-stop time based cell reselection

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| **Status summary**  |
| *Recommended WF:* * + RAN4 to specify cell-stop time based cell reselection in IoT NTN

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable.@Nokia: the discontinuous coverage regarding t-ServiceStart (SIB32) has been captured in Issue 2-1. |

#### Issue 2-2-3: NGSO, location-based cell reselection

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| **Status summary**  |
| *Recommended WF:* * Do not define location-based cell reselection for IoT NTN.

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable.@Ericsson: The WF will be prepared based on Proposal 1. If you would like to have more time to check until next meeting, please let me know.  |

#### Issue 2-2-4: NGSO, cell Re-selection in Enhanced Coverage

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| **Status summary**  |
| *Recommended WF:* * For Enhanced Coverage intra-/inter-frequency measurement, the existing TN requirement on Tmeasure, Tevaluate can be the baseline.
	+ The exact values are FFS.
	+ FFS the cell detection time (Tdetect).

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable.  |

#### Issue 2-3-1: Maximum interruption in paging reception

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| **Status summary**  |
| *Candidate options:* * Proposal 1: The NTN paging reception requirements based on type of satellites are reused for NTN IoT.
	+ Proposal 1a: (MTK)
		- For NB, the maximum interruption in paging reception for NTN cell reselection shall not exceed
			* TSI-NB1-NC/EC + 100 ms,
				+ the target cell’s satellite is GEO, or
				+ the target cell’s satellite is NGSO and the target cell belongs to the same satellite as the current one
				+ Note: same as the existing TN requirement, as in 4.6.2.7/4.6.2.7A
			* TSI-NB1-NC/EC + [250] ms,
				+ the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one
		- For M1, the maximum interruption in paging reception for NTN cell reselection shall not exceed
			* TSI-EUTRA-M1-NC/EC + 50 ms,
				+ the target cell’s satellite is GEO, or
				+ the target cell’s satellite is NGSO and the target cell belongs to the same satellite as the current one
				+ Note: same as the existing TN requirement, as in 4.7.2.1.5/4.7.2.2.5
			* TSI-EUTRA-M1-NC/EC + [125] ms, if
				+ the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one
	+ Proposal 1b: (Ericsson)
		- *The interruption time shall not exceed TSI-NR + K\*Ttarget\_cell\_SMTC\_period ms.*

*Where,** + - * *If the target cell belongs to the same satellite as the current one, K = 2;*
			* *If the target cell belongs to a different satellite than the current one and the target cell’s satellite is GEO, then K = 2;*
			* If the target cell belongs to a different satellite than the current, then K = 5.

*Recommended WF:* The NTN paging reception requirements based on type of satellites are reused for NTN IoT.*Recommendations for 2nd round:* Continue discussion@ Ericsson: some modification on 1b will be needed since there is no *Ttarget\_cell\_SMTC\_period*in LTE. |

#### Issue 2-3-2: Maximum interruption in paging reception – longer interruption

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| **Status summary**  |
| Consider the GTW agreement for NR NTN. **Agreement:*** For the requirement of maximum interruption in paging reception, if the target cell is unknown, a longer interruption can be expected.
	+ Unknown condition means that UE starts measurement but does not complete the measurement before Tservice.

*Recommended WF:* Follow the same conclusion as in NR NTN: * For the requirement of maximum interruption in paging reception, if the target cell is unknown, a longer interruption can be expected.
	+ Unknown condition means that UE starts measurement but does not complete the measurement before Tservice.

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable. |

#### Issue 2-4: Channel quality report for UE Category M1 in idle mode

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| **Status summary**  |
| *Recommended WF:** For M1 in GEO, the existing TN requirements of channel quality report for in idle mode apply, as in 4.7.3.
* FFS M1 in LEO.

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable. |

#### Issue 2-5: WUS receptions

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| **Status summary**  |
| *Tentative agreements:* * The principles of defining WUS reception requirements is reused but the required number of repetitions are kept TBD

*Recommendations for 2nd round:* no need |

#### Issue 2-6: Transmission using preconfigured uplink resources (PUR)

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| **Status summary**  |
| *Recommended WF:** Continue discussion the following aspect in the next meeting
	+ whether to reuse the legacy RSRP-based TA validation for PUR in IoT NTN
	+ The UE update the uplink timing for transmitting on PUR using the configured TA command according to TS 36.211 v17.2.0 i.e. transmission of uplink radio frame number  from the UE starts
	+ the impact of validity of satellite assistance information (SAI) (i.e. T317)
	+ the impact of t-Service

*Recommendations for 2nd round:* Continue discussion |

#### Issue 3-1: RRC Re-establishment and RRC release with redirection

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| **Status summary**  |
| *Recommended WF:** Continue discussion the following aspect in the next meeting
	+ Whether the requirements of RRC Re-establishment and RRC release with redirection of TN can apply to IoT NTN not not.
	+ the impact of sharing factor regarding to number of NGSO satellites

*Recommendations for 2nd round:* Continue discussion |

#### Issue 3-2: Random Access

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| **Status summary**  |
| *Recommended WF:** Existing random access requirements are reused for NTN IoT.
* The following aspect can be FFS in the next meeting
	+ Specification impact of UE specific TA reporting
	+ Whether to consider non-anchor carrier based RA for NB-IoT in NTN

*Recommendations for 2nd round:* Continue discussion |

#### Issue 3-3: M1, E-UTRAN Handover

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| **Status summary**  |
| *Recommended WF:** For eMTC (M1) over NTN, define E-UTRAN Handover requirements by re-using TN HO requirements for NTN as baseline
	+ Note: RAN4 can further discuss and identify potential NTN specific impact

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable. |

#### Issue 3-4: M1, CHO requirements

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| **Status summary**  |
| *Recommended WF:** Option 1: define CHO requirements for M1 in NTN
	+ FFS no need to consider time or location based CHO
* Option 2: CHO requirements for M1 should be introduced first in the Terrestrial IoT

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable. |

#### Issue 4-1-1: UE transmit timing (Te) requirement

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| --- |
| **Status summary**  |
| *Recommended WF:** The reference time point for Te\_NTN
	+ Option 1: The reference point for Te\_NTN should be the downlink timing of the reference cell minus (*N*TA *+ N*TA-offset *+ N*TA,common *+ N*TA,UE-specific)*×*Ts
	+ Option 2: The reference point for Te should be the downlink timing of the reference cell minus the UE UL timing. FFS the UE UL timing.
* Whether to relaxed Te by considering GNSS estimation accuracy
	+ Option 1: no
	+ Option 2: yes
		- FSS whether and how to relax the GNSS estimation accuracy

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable. |

#### Issue 4-1-2: Gradual timing adjustment

|  |
| --- |
| **Status summary**  |
| *Recommended WF:** For gradual timing adjustment, the reference timing shall be (*N*TA *+ N*TA-offset *+ N*TA,common *+ N*TA,UE-specific)*×*Ts before the downlink timing of the reference cell. Clarify the adjustment with “apart from a change of NTA,UE-specific and NTA,common”
* FFS the gradual timing adjustment figures (max step size, max, min rate etc)
* FFS the impact of “segmented UL transmission

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable.Note: the introduction of requirements for NTA,common and NTA,UE-specific is up to NR NTN discussion. |

#### Issue 4-2: UE Timer accuracy

|  |
| --- |
| **Status summary**  |
| *Tentative agreements:* * the existing TN requirements apply.
	+ For NB, as in 7.21
	+ For M1, as in 7.27

*Recommendations for 2nd round:* Issue closed. |

#### Issue 4-3: Timing Advance adjustment accuracy

|  |
| --- |
| **Status summary**  |
| *Recommended WF:** the existing TN requirements apply, and clarify the adjustment of timing with “apart from a change of NTA,UE-specific and NTA,common between the preceding uplink transmission and the current transmission
* Note: Additional changes due to segmented UL transmission is not precluded

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable and suggest the agreeable statement. |

#### Issue 4-4: RLM

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| --- |
| **Status summary**  |
| *Recommended WF:** For NB GEO, the existing TN RLM requirements apply, as in 7.23
* For NB NGSO, the existing TN RLM requirements apply, as in 7.23
* For M1 GEO, the existing TN RLM requirements apply, as in 7.19
* For M1 NGSO, FFS the impact of satellite assistance information validity and t-Service

*Recommendations for 2nd round:* Continue discussion@Ericsson: since no neighboring cell measurement for NB, so not sure still concerns on NGSO in NB. |

#### Issue 5-1-1: NB, Measurement requirement

|  |
| --- |
| **Status summary**  |
| *Tentative agreements:** existing TN intra frequency measurement requirements apply (MTK)
	+ as in 8.14.2 for Normal Coverage and 8.14.3 for Enhanced Coverage.

*Recommendations for 2nd round:* Issue closed |

#### Issue 5-1-2: M1, Measurement requirement

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| --- |
| **Status summary**  |
| *Recommended WF:** eMTC over NTN, re-use the TN measurement delay requirements for NTN as baseline, and the scaling factor for measurement of multiple LEO satellites should also apply
* FFS
	+ For M1 in GEO, the existing M1 TN intra frequency measurement requirements apply, as in 8.13.2.1 for CE mode A and 8.13.3.1 for CE mode B
	+ For M1 in GEO, the existing M1 TN inter frequency requirements apply, as in 8.13.2.6 for CE mode A and 8.13.3.5 for CE mode B.
	+ For M1 in NGSO, the delay requirements are scaled up by the number NGSO satellites.

*Recommendations for 2nd round:* Please comment if the recommended WF is not agreeable and suggest the agreeable statement. |

#### Issue 5-2: M1, Measurement Gap

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| --- |
| **Status summary**  |
| *Recommended WF:** For M1 over NTN, a single MG is considered as baseline for RRM measurement.
* FFS whether to consider 2 MGs.

*Recommendations for 2nd round:* Continue discussion |

#### Issue 5-3: Connected mode channel quality report

|  |
| --- |
| **Status summary**  |
| *Recommended WF:** For GEO, existing TN requirements apply
	+ For NB, as in 8.14.4
	+ For M1, as in 8.13.2.8 for CE-A, 8.13.3.8 for CE-B
* FFS LEO

*Recommendations for 2nd round:* no need |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Notes:

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

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

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