**3GPP TSG RAN meeting #98-e revision\_of\_RP-223231**

**Online, 12th – 16th December 2022**

## Status Report to TSG

**Agenda item:** **10.2.2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **WI / SI Name** | WID on NB-IoT/eMTC core & performance requirements for Non-Terrestrial Networks | | | | |
| included in this status report | Study Item:  No | Core part:  Yes | Performance part:  Yes | | Testing part:  No |
| **Acronym** | LTE\_NBIoT\_eMTC\_NTN\_req | | | | |
| **Unique ID** | 950074 | | | | |
| **TSG Tdoc of latest approved WI/SI description (if any)** | [RP-221556](https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_96/Docs/RP-221556.zip) | | | | |
| **Target Completion Date**  **(indicate if changed)** | Study Item: | Core part: 12/2022 | Performance part: 06/2023 | Testing part: | |
| Overall Completion level | Study Item: | Core part:  Overall: 100% | Performance Part:  Overall: 20% | Testing part: | |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |  |
| --- | --- | --- |
| **Leading WG** | | TSG RAN WG4 |
| **Rapporteur** | **Name** | Tim Frost |
| **Company** | MediaTek Inc. |
| **Email** | Tim.frost@mediatek.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.  
 One time unit (TU) corresponds to ~ 2 hours in the meeting.  
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.  
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### N/A

## 2.2 RAN2

#### N/A

## 2.3 RAN3

#### N/A

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4 #104-bis-e (Oct. 2022)**

**RF core requirements**

On System parameters and UE RF requirements, agreements were captured in the following documents:

* “Way Forward on UE RF and System Parameters for IoT NTN” in [1].
* “Way forward on A-MPR and Emissions requirements” was captured in [2].
* The following agreed Text Proposals to TS36.102:

|  |  |  |
| --- | --- | --- |
| **Tdoc** | **Title** | **Source** |
| R4-2217750 | TP for Out-of-band blocking for b256 | Xiaomi |
| R4-2217810 | TP on Cat-M1 UE NTN Frequency Error and b256 UE Rx sensitivity | Ericsson |
| R4-2217752 | TP for IoT NTN UE clause 6 | MediaTek India Technology Pvt. |
| R4-2217753 | TP for IoT NTN UE clause 7 | MediaTek India Technology Pvt. |
| R4-2217807 | TP to TS 36.102 clause 5 for IoT NTN | ZTE, MediaTek |
| R4-2217755 | TP for clause 4 of TS36.102 | Qualcomm Incorporated, MediaTek |

On SAN RF requirements and Coexistence, agreements were captured in the following documents:

* Way Forward on coexistence study for IoT over NTN in [3]
* WF on NTN SAN RF requirement for IoT over NTN in [4]

**RRM requirements**

* On RRM, the following CRs for TS 36.133 are endorsed in this meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Note** |
| R4-2216858 | Draft CR on band grouping for NB-IoT for satellite access in 36.133 | Ericsson | 3.3, 3.5.1A |
| R4-2217584 | Draft CR on band grouping for Cat-M1 for satellite access in 36.133 | Ericsson | 3.5.1A |
| R4-2217585 | Introduction of  RRC Re-establishment requirement for NB-IoT UEs for Satellite Access | MediaTek inc. | 6.5A |
| R4-2217268 | DraftCR on RRM requirements for NB-IoT for IoT NTN | Huawei, HiSilicon | 6.6A, 7.23A |
| R4-2216860 | Draft CR on RRC release with redirection non-anchor NB-IoT carrier for satellite access in 36.133 | Ericsson | 6.9A |
| R4-2217270 | draft CR of UE UL Timing Requirements for IoT NTN | Qualcomm Incorporated | 7.20A, 7.21A, 7.22A |
| R4-2217271 | Introduction of  measurements requirement for UE category NB-IoT for Satellite Access | MediaTek inc. | 8.14A |
| R4-2217273 | CR on HO and measurement requirements for eMTC over NTN | Huawei, HiSilicon | 5.5A, 8.13A |
| R4-2217274 | Introduction of  Random Access Requirements for Cat-M1 UEs for Satellite Access | MediaTek inc. | 6.2.3A |
| R4-2217275 | draft CR on RRC re-establishment and timing requirement for eMTC UE in IoT-NTN | CMCC | 6.7A,7.24A, 7.27A, 7.28A |
| R4-2217276 | Draft CR on RRC release with redirection for Cat-M1 for satellite access in 36.133 | Ericsson | 6.8A |
| R4-2217277 | Draft CR on RLM for category M1 UE for SA | Ericsson | 7.19A |

* The following summarizes the RRM agreements that were captured in the WF (R4-2217264) [4]:

#### Issue 1-1-1: Satellite access band grouping for NB-IoT

* The satellite access bands 255 and 256 are assigned to same band group for applicability of RRM requirements in TS 36.133.
* The band group for NB-IoT bands 255 and 256 is termed as: “NFDD\_SAB\_G”
  + where SAB stands for satellite access band to distinguish from the terrestrial band group naming.

#### Issue 1-1-2: Satellite access band grouping for Cat-M1

* The band group for Cat-M1 band 255 is termed as: “FDD-M1\_SAB\_A”
  + where SAB stands for satellite access band to distinguish from the terrestrial band group naming.
* The band group for Cat-M1 band 256 will be assigned after REFSENS agreement in RF group.

#### \_\_Issue 1-2-1&1-2-2: measurement capability on number of NGSO satellites

* Introduce UE capabilities on number of NGSO satellites that UE can monitor in total in addition to the baseline requirements.
  + Minimum (baseline) requirements of UE monitoring multiple NGSO satellites per carrier in total should be discussed.

The following Tentative Agreement can be FFS in next meeting

* For minimum (baseline) requirements for NB in IDLE and M1 in both IDLE and CONNCTED **Error! Reference source not found.**
  + for intra-frequency carrier, the number of target satellites UE needs to monitor is [2] including serving LEO satellite.
  + for inter-frequency carrier, the number of target satellites UE needs to monitor per carrier is [2] if one of the target satellites include the UE serving satellite; the number of target satellites UE needs to monitor is [1] otherwise

#### \_\_Issue 1-2-3: UE capability on whether UE can perform parallel measurement on multiple NGSO satellites

No need to introduce UE capability on whether UE can perform parallel measurement on multiple NGSO satellites

#### Issue 1-2-4: UE capability on Enhanced RRM requirements for measurements in IDLE and INACTIVE modes

No need to introduce UE capabilities on Enhanced RRM requirements for measurements in IDLE and INACTIVE modes.

#### Issue 1-2-5: UE capability of relaxed cell reselection on GEO

No need to introduce new UE capabilities of relaxed cell reselection on GEO.

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

* consider a scaling factor related to number of NGSO satellites
  + Note: it can be applied for the following requirements
    - For NB/M1, intra-frequency measurement and inter-frequency measurement in IDLE mode
    - RRC Re-establishment and RRC release with redirection
    - For M1, intra-frequency measurement and inter-frequency measurement in CONNETED mode

#### Issue 1-4: Relaxation of Initial Cell Search for NGSO

FFS if any RRM requirements impacted by initial cell search latency for NGSO and FFS if initial cell search latency is relaxed by [X]% compared to the existing requirements.

# IDLE state mobility requirements

#### Issue 2-1-1: NGSO, *t-service* and neighbouring cell measurement for cell reselection

* if the UE is configured with ‘*t-service*’, the UE should start measurements of the neighbour cells indicated by the serving cell before ‘*t-service*’ is reached, regardless of the rules currently limiting the UE measurement activities.
  + Note: the exact wording can be discussed in the CRs

#### Issue 2-1-2: NGSO, *t-service* and initial cell selection procedures

* UE shall initiate cell selection procedures, provided the UE did not find any new suitable cell, after T seconds from S-Criterion or after t-service, whichever comes first.

#### Issue 2-1-3: NGSO, *t-service* and requirement applicability

* When the time span from the last slot of SI transmission within SI modification period where the broadcasting of ‘serving cell stop time’ is started to the first slot when the cell is scheduled to stop serving the area according to the broadcasted information is less than cell-reselection monitoring time, the cell re-selection requirements should not be applied.

#### \_\_Issue 2-1-4: NGSO, *t-service* impact on DRX/eDRX requirements

The following proposals can be FFS in next meeting

* Proposal 1: Do not consider the impact of *t-service* for excluding requirements for eDRX/DRX cycles (Nokia)
* Proposals 2: If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_cycle, then the UE shall meet the requirements defined for DRX cycle length of [2.56] s starting from at least [1] eDRX cycle before ‘*t-Service-r17*’. (Ericsson)

#### \_\_Issue 2-1-5: NGSO, *t-service* impact on relaxed requirements

The following proposals can be FFS in next meeting

* UE is allowed to meet the relaxed serving cell measurement requirements provided that
  + Option 1a: the UE has met the existing relaxation conditions and the serving cell is not going to stop serving the area, where the UE is located, at least during the last [4] DRX cycles before ‘*t-Service-r17*’ if not configured with eDRX\_IDLE cycle
  + Option 1b: the UE has met the existing relaxation conditions and the serving cell is not going to stop serving the area, where the UE is located, at least during the last [1] DRX cycles before ‘*t-Service-r17*’ if configured with eDRX\_IDLE cycle
  + Option 2: Time span to Tservice when serving cell stops service is longer than Ttrigger
    - Where Ttrigger = max(Tdetect,NB\_Intra\_NC , Pcarrier \* Tdetect,NB\_Inter\_NC) for NB and Ttrigger = max(Tdetect,EUTRAN\_Intra\_NC, Kcarrier\*Tdetect,EUTRAN\_Inter\_NC) for eMTC.
  + Option 3 (merged):
    - **When not configured with eDRX\_IDLE cycle: the** UE has met the existing relaxation conditions and the serving cell is not going to stop serving the area, where the UE is located, at least during the last time Ttrigger before ‘*t-Service-r17*’ if not configured with eDRX\_IDLE cycle
    - **When configured if configured with eDRX\_IDLE cycle**: the UE has met the existing relaxation conditions and the serving cell is not going to stop serving the area, where the UE is located, at least during the last time Ttrigger before ‘*t-Service-r17*’ if configured with eDRX\_IDLE cycle
    - Where Ttrigger = max(Tdetect,NB\_Intra\_NC , Pcarrier \* Tdetect,NB\_Inter\_NC) for NB and Ttrigger = max(Tdetect,EUTRAN\_Intra\_NC, Kcarrier\*Tdetect,EUTRAN\_Inter\_NC) for eMTC.

#### \_\_Issue 2-2-1: NGSO, Discontinuous Coverage - General

* UE is not required to perform cell measurements from the last slot of SI transmission which indicates that UE will be in out of coverage after Tservice when the serving cell stop serving the area.

The following proposals can be FFS in next meeting

* Proposal 3: If the UE is provided with t-serviceStart-r17 and the UE does not find any new suitable cell after T seconds from S-Criterion or after t-service, the UE may delay initial cell search until after t-serviceStart-r17 is reached. (Nokia)
* Proposal 4: FFS if there is a maximum “waiting period” the UE can wait between t-service and t-serviceStart-r17 before initiating the cell search. (Nokia)
* Proposal 5: The UE may optionally delay cell search until it finds itself within the area determined by the “cell radius” parameter on SIB-32, assuming the cell reference point: (Nokia)
  + The reference point in SIB-32 for Quasi-Earth fixed cells.
  + The point determined by the satellite ephemeris and/or the elevation angle of the cell intersecting the Earth.

#### \_\_Issue 2-2-2: NGSO, Discontinuous Coverage – Paging

The following proposals can be FFS in next meeting

* Proposal 1: The UE is allowed to drop paging during [2] DRX cycles immediately after ‘t-ServiceStart-r17’. (Ericsson)

#### \_\_Issue 2-2-3: NGSO, Discontinuous Coverage – DRX/eDRX

The following proposals can be FFS in next meeting

* Proposal 1: If the UE is not configured with eDRX\_IDLE cycle and configured with DRX cycle ≥ [1.28] s then the UE shall meet the requirements defined for DRX cycle of [640] ms during at least [2] configured DRX cycles immediately after ‘t-ServiceStart-r17’ [2]. (Ericsson)
* Proposal 2: If the UE is configured with eDRX\_IDLE cycle then the UE shall meet the requirements defined for eDRX\_IDLE cycle of 5.12 s during [2] eDRX\_IDLE cycles immediately after ‘t-ServiceStart-r17’. (Ericsson)

#### \_\_Issue 2-3: NGSO, DRX/eDRX applicability

* UE is not required to fulfil the requirements for earth-moving LEO deployment when DRX/eDRX cycle is longer than 2.56s.

#### \_\_Issue 2-4: NGSO, cell Re-selection in Enhanced Coverage

* For Enhanced coverage, the current intra- and inter-frequency measurement requirements (Tdetect, Tmeasure, Tevaluate) from TN can be reused as baseline for IoT NTN for eMTC and NB-IoT.

#### \_\_Issue 2-5-1: Relaxed serving cell measurements in IDLE mode

* In GEO, the serving cell measurement relaxation factor is reused from corresponding TN requirements for eMTC and NB-IOT in IDLE mode when cell is served by a GEO satellite
* The following proposals can be FFS in next meeting
* *Proposal 2: In NGSO, the serving cell measurement relaxation factor is reduced by factor N from corresponding TN requirements for eMTC and NB-IOT in IDLE mode when cell is served by a LEO satellite compared to corresponding GEO satellite, where N=[2].*

#### \_\_Issue 2-5-2: Relaxed neighbour cell measurements in IDLE mode

The following proposals can be FFS in next meeting

* *Proposal 1a (revised): In NGSO, the eMTC and NB-IoT UE is allowed to meet the relaxed neighbour cell requirements provided that it has found more than [1] satellite including the serving satellite.*

#### Issue 2-6: Maximum interruption in paging reception

* **Error! Reference source not found.**
  + TSI-NB1-NC/EC + 100 ms, if
    - 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, if
    - the target cell’s satellite is NGSO and the target cell belongs to the different satellite as the current one
* **Error! Reference source not found.**
  + TSI-EUTRA-M1-NC/EC + 50 ms, if
    - 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

#### \_\_Issue 2-7: Channel quality report for UE Category M1 in idle mode in LEO

* For eMTC in LEO, the channel quality reporting requirements (defined for 1.4 MHz) from TN in IDLE mode are reused.

#### Issue 2-8: WUS receptions

* For eMTC and NB-IOT, the WUS reception requirements from TN requirements are reused.

#### \_\_Issue 2-9-1: PUR, RSRP-based TA validation

* Option 1: The legacy RSRP-based TA validation is not applicable for PUR in IoT NTN.
* Option 2a: The legacy RSRP-based TA validation is applicable for PUR in IoT NTN, for both GEO and LEO.
* Option 2b: The legacy RSRP-based TA validation is applicable for PUR in IoT NTN for GEO but not LEO.

#### \_\_Issue 2-9-2: PUR in NGSO, TA validation for NTN based on *t-service*

The following proposals can be FFS in next meeting

* **Proposal 1a (new):** The UE assumes TA is valid provided that the following conditions are met, otherwise the TA is considered invalid (Ericsson)
  + Current time of the UE is at least DT seconds earlier than t-Service, where DT is the configured PUR periodicity.

#### Issue 2-9-3: PUR, Timing

* 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
  + FFS the assumption on

# CONNECTED state mobility requirements

#### \_\_Issue 3-1-1: RRC Re-establishment and RRC release with redirection

* + For GEO, the existing TN RRC Re-establishment and RRC release with redirection requirement can be used as baseline.
  + For NGSO, to consider a scaling factor related to number of NGSO satellites for
    - RRC Re-establishment requirement, RRC release with redirection requirement of M1
    - RRC Re-establishment requirement of NB
  + FFS to consider addition component, , to accommodate for the time needed between the UE acquires the NTN SIB.

#### \_\_Issue 3-1-2: NGSO, *t-Service* and RRC Re-establishment

The following proposals can be FFS in next meeting

* Proposal 1: For LEO and NB-IoT, RRC re-establishment shall be started before or at the least at the time instance of expiry of serving cell coverage (*‘t-Service’*).

#### Issue 3-1-3: RRC redirection to non-anchor carrier

* The legacy RRC redirection to non-anchor carrier delay requirements for NB-IoT can be reused for RRC redirection to non-anchor carrier delay requirements for NB-IoT with satellite access.
  + The RRC redirection to non-anchor carrier delay requirements for NB-IoT with satellite are applicable provided that the anchor and the target non-anchor carriers are served by the same satellite access node and frequencies of the anchor and the target non-anchor carriers are within 20 MHz.

#### \_\_Issue 3-3: M1, E-UTRAN Handover

The following proposals can be FFS in next meeting

* Proposal 1: RAN4 to decide how to introduce the forced additional delay on HO due to the acquisition of valid ephemeris towards the target cell. (Nokia)

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

* + RAN4 to define CHO requirements for M1 in NTN. No need to consider time or location based CHO.

# Timing requirements and RLM

#### Issue 4-1-1: Relaxation on UE transmit timing (Te\_NTN) requirement

* + The agreement from Rel-17 NR NTN on relaxed Te due to GNSS estimation accuracy is reused.
  + Compared with the Te in each case, Te\_NTN should be extended by [17] Ts

#### Issue 4-1-2: Reference time point in UE transmit timing (Te\_NTN) requirement

* The reference point for Te\_NTN should be the downlink timing of the reference cell minus

#### Issue 4-2-1: Reference time point in Gradual timing adjustment

* Current requirements on gradual timing adjustment can apply excluding the change of due to satellite position update and

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

* the legacy minimum/maximum aggregate adjustment rate and maximum adjustment step size can be reused.

#### Issue 4-3: RLM for NGSO

* + For NB NGSO, the existing TN RLM requirements can be applied as baseline.
  + 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.
  + The following enhancement can be FFS in next meeting
    - If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and DRX\_cycle, then at least during [5] DRX cycles before *t-Service-r17*, the UE shall meet the non-DRX requirements.
    - If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_cycle, then at least during [1] eDRX cycle before *t-Service-r17*, the UE shall meet the non-DRX requirements.

# Measurement requirements

#### Issue 5-1-1: M1 in GEO, Measurement requirement

* For M1 in GEO, the existing M1 TN intra frequency measurement requirements apply
  + 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.

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

* For M1 in NGSO, the delay requirements are scaled up by K\_satellite, which is
  + the number NGSO satellites to be measured.

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

* For M1 measurement, only single MG is considered. RAN4 not to define scheduling restriction due to RRM measurement.

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

* For channel quality report in both idle and connected mode, the existing TN requirements are re-used also for LEO.
  + Note: For eMTC in LEO, the channel quality reporting requirements (defined for 1.4 MHz) from TN in CONNECTED mode are reused

# UL Segmented Transmission

#### Issue 6-1: Uplink timing requirement applicability regarding segments

* The Te\_NTN requirement applies when it is the first transmission in each segment of NPUSCH for NB-IoT and PUSCH/PUCCH for eMTC in a repetition period.
  + Note: that exact wording can be discussed in the CR

#### Issue 6-2: Clarification on autonomous uplink timing adjustment during an ongoing repetition period

* UE is allowed to adjust TA at the [start of initial] transmission of a segment. FFS how to clarify in TS 36.133

#### \_\_Issue 6-3: Time pre-compensation during a segment

* Keep the legacy TN restriction and adopt the following text proposal for TS36.133
  + *For satellite access, when a repetition 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 or at the start of a transmission segment boundary, as defined above*

**RAN4 #105 (Nov. 2022)**

**RF core requirements**

The updated version of TS 36.102 v0.2.0 was agreed in [6] that reflected the agreed TPs from RAN4#104bis-e.

On System Parameters and UE RF requirements, agreements were captured in the following documents:

* “Ad-hoc minutes for UE RF requirements for LTE\_NBeMTC\_NTN\_UERF” in [7], which captures agreements made in the online session and the evening adhoc session on UE RF and System parameters remaining aspects. Those agreements were used as a basis for the Way Forward document and Text Proposal contents below.
* “WF on UE RF requirements for LTE\_NBeMTC\_NTN\_UERF” in [8], which captures the final agreements and way forward. It also highlights that some additional European regulatory requirement may be further reflected in the specification if clearly identified as applicable. It is suggested to handle this as part of maintenance activity.
* The following approved Text Proposals to TS 36.102:

|  |  |  |
| --- | --- | --- |
| **Tdoc** | **Title** | **Source** |
| R4-2218767 | TP for IoT NTN RF requirement on ACS | Sony |
| R4-2220803 | TP to TS 36.102 on MPR and A-MPR and discussion on emission requirements | Qualcomm |
| R4-2220804 | TP for UE RF requirement - Frequency error | Ericsson |
| R4-2220805 | TP on suffix clause levels and other clarifications | MediaTek |
| R4-2220806 | TP for 36.102 for NB frequency error | Qualcomm |
| R4-2220812 | TP on channel number offset for NB-IoT NTN | Huawei, HiSilicon |
| R4-2220828 | TP on TS36.102 Clause 2, 3 and 4 | MediaTek |
| R4-2220835 | TP for TS 36.102: Clause 6.5.3 | ZTE |
| R4-2220836 | TP on UE ACLR and SEM for IoT NTN | Huawei, HiSilicon |

* An endorsed CR to TS 36.307 in [9] to capture the Release-independence back to Rel-17 for the UE.
* Final draft of TS 36.102 was agreed in [10].

On SAN RF requirements, the following documents capture the agreements:

* Agreements to reuse SAN ACLR and ACS as proposed in [11] and [12].
* A Way Forward on remaining SAN RF issues, as captured in [13].
* The following approved Text Proposals to TS 36.108:

|  |  |  |
| --- | --- | --- |
| **Tdoc** | **Title** | **Source** |
| R4-2219369 | TP for TS 36.108: Annex | ZTE |
| R4-2219977 | TP to TS 36.108: removal of colocation requirements | Huawei, HiSilicon |
| R4-2220296 | TP for TS 36.108: Section 1,2,3 | ZTE |
| R4-2220297 | TP for TS 36.108: Clause 7 | ZTE |
| R4-2220298 | TP for TS 36.108: Clause 10 | ZTE |
| R4-2220300 | TP for SAN RF requirement clause 9 | Ericsson |
| R4-2220301 | TP for SAN RF requirement clause 6 | Ericsson |
| R4-2220302 | TP to TS 36.108 (section 4) | Huawei, HiSilicon |
| R4-2220614 | TP to TS 36.108 (section 5) | Huawei, HiSilicon |

* Final draft of TS 36.108 was agreed in [14].

**RRM core requirements**

* WF on finalization of remaining open issues for core requirements was captured in the WF (R4-2220362) [11] with agreements captured below. Decision on the issues marked as FFS and any corresponding specification update is proposed to take place as part of maintenance activity. This includes the update on requirements discussed in Issue 3-2 below, if needed, depending on RAN2 conclusions in maintenance phase.

### General

#### Issue 1-1: Measurement capabilities on number of NGSO satellites

* + The minimum of the UE capability on the total number of the NGSO satellites across the layers is [2].
  + For NB in IDLE and M1 in both IDLE and CONNCTED, the UE shall be capable of monitoring
    - for intra-frequency carrier, the number of target satellites UE needs to monitor is [2] including serving LEO satellite.
    - for inter-frequency carrier, the number of target satellites UE needs to monitor per carrier is [2] if one of the target satellites include the UE serving satellite; the number of target satellites UE needs to monitor is [1] otherwise.**Error! Reference source not found.**

### IDLE state mobility requirements

#### Issue 2-1-1: For NGSO, clarification on UE behavior during out of coverage for Discontinuous Coverage

When the UE is provided with *t-serviceStart-r17* and has discontinuous coverage capabilities, then after t-service-r17 is reached and the UE is out of coverage, the UE may delay or resume cell measurements/search till when the UE is in coverage. Definition of in coverage is FFS

#### Issue 2-1-2: For NGSO, revisions on inter-frequency and intra-frequency measurement

* If the UE is configured with ‘*t-Service-r17*’ [2] in the serving cell and eDRX\_cycle, then the UE shall meet the requirements defined for DRX cycle length of [2.56] s starting from at least [K] before ‘*t-Service-r17*’.
* FFS: the UE shall meet the IDLE mode requirements after time period of X + ‘t-ServiceStart-r17’, where X is time until the UE acquires the system information carrying Ephemeris.

#### Issue 2-1-3: For NGSO, whether to revise the paging requirement to drop paging after *t-serviceStart-r17*

FFS for following options for discontinuous coverage scenario:

* Option 1: No need to define paging interruption immediately after t-ServiceStart-r17.
* Option 2: The UE is allowed to drop paging during [2] DRX cycles immediately after ‘t-ServiceStart-r17’.

#### Issue 2-2-1: For NGSO, whether to revise the relaxed measurement requirements in IDLE mode

For NGSO, for RRM measurement relaxation, UE is allowed to follow the relaxed measurement requirements, where the relaxation is less compared to corresponding GSO relaxed requirements. How to define the NGSO relaxed requirements are FFS.

FFS the applicability of the following conditions for relaxed measurement requirements for both serving cell and neighbour cell, in the maintenance phase:

* + In NGSO, the cat-M/NB UE configured with ‘*t-Service*’ in IDLE mode is allowed to meet the relaxed ~~serving~~ cell measurement requirements provided that the UE has met the existing relaxation conditions and the serving cell is not going to stop serving the area, where the UE is located, at least during the last
    - [4] DRX cycles before ‘*t-Service-r17*’ if not configured with eDRX\_IDLE cycle.
    - [1] DRX cycles before ‘*t-Service-r17*’ if configured with eDRX\_IDLE cycle.
  + In NGSO, the serving cell measurement relaxation factor is reduced by factor N from corresponding TN requirements for eMTC and NB-IOT in IDLE mode when cell is served by a LEO satellite compared to corresponding GEO satellite, where N=[2].

#### Issue 2-2-2: For NGSO, whether to revise the relaxed neighbour cell measurement requirements in IDLE mode

FFS for following option:

* The eMTC and NB-IoT UE is allowed to meet the relaxed neighbour cell requirements provided that it has found more than [1] satellite including the serving satellite.

#### Issue 2-3-1: PUR, RSRP-based TA validation

* Agreement
  + Do not define requirements for the legacy RSRP-based TA validation for PUR for both GEO and LEO

### CONNECTED state mobility requirements

#### Issue 3-1-2: For NGSO, triggering RRC Re-establishment based on *t-Service*

* FFS: not to introduce addition triggering of RRC Re-establishment when t-Service expires.

#### Issue 3-2: Additional delay upon target cell’s epoch time for Handover, RRC Re-establishment and RRC release with redirection

* For Re-establishment/re-direction or HO requirement, whether to update the requirements or not need to wait for further conclusion from RAN2.

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

Define CHO requirements for eMTC over NTN by re-using the CHO requirements for normal LTE, except that the following:

* same as in eMTC HO requirements, time for MIB reading should be included in the interruption time when the field *sameSFN-Indication* or *mib-RepetitionStatus* [2] is not included
* the references are updated to corresponding eMTC delay requirements

### Timing requirements and RLM

#### Issue 4-1: For Cat-M1 UE in NGSO, whether to revise the RLM requirement upon *t-service*

* For NGSO and *t-Service* is provided, the RLM requirements for DRX is used when the time is approaching to *t-Service* and DRX is used.
* FFS whether non-DRX RLM requirements shall be applied when eDRX is configured.

#### Issue 4-2: Clarification on the timing adjustment for the initial transmission

* + RAN4 to confirm NB-IoT UE is allowed to adjust timing for the first transmission after an uplink transmission gap in a repetition period (R>1) for NPUSCH and NPRACH.
  + RAN4 to confirm Cat-M1 UE is allowed to adjust timing for the first transmission after an uplink transmission gap in a repetition period (R>1) for PUCCH or PUSCH.
* The following CRs for TS 36.133 are endorsed in this meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Note** |
| R4-2218233 | Big draftCR for IoT NTN core requirements for TS36.133 for draftCRs endorsed in RAN4#104-bis-e | MediaTek inc. | included the CRs endorsed in WG4 Meeting # 104-bis-e, as listed below |
| R4-2220363 | Introduction of cell re-selection and PUR requirement for UE category NB-IoT for Satellite Access | MediaTek inc. | 4.6A |
| R4-2218235 | Introduction of RRC Re-establishment requirement for NB-IoT UEs for Satellite Access | MediaTek inc. | 6.5A |
| R4-2220365 | draft CR on RRC re-establishment and timing requirement for eMTC UE in IoT-NTN | CMCC | 6.7A, 7.24A |
| R4-2220366 | Draft CR on RLM for category M1 UE | Ericsson | 7.19A |
| R4-2219231 | DraftCR on RLM requirements for NB-IoT for IoT NTN | Huawei, HiSilicon | 7.23A |
| R4-2220368 | draftCR on HO requirements for eMTC over NTN | Huawei, HiSilicon | 5.5A |
| R4-2219559 | draftCR on measurement requirements for eMTC over NTN | Huawei, HiSilicon | 8.13A |
| R4-2220369 | IDLE mode requirements for IoT NTN (cat-M) | Ericsson | 4.7A |
| R4-2219844 | Draft CR on RRC release with redirection for Cat-M1 for satellite access in 36.133 | Ericsson | 6.8A |
| R4-2219831 | Correction to CONNECTED mode measurement requirements for eMTC over NTN | Ericsson | 8.13A |

* *Post-RAN4#105:* An LS reply in [15] was sent by RAN2 during RAN2#120 (but not yet received by RAN4) providing feedback on the availability of satellite assistance information for handover and mobility measurements. Any impact to RRM core requirements resulting from the information provided in the LS should be considered in the maintenance phase of the WI once the LS is formally received.

**RRM performance requirements**

Progress was also captured in the WF [16] and is further summarised below:

Issue 1: Measurement accuracy

* Reuse the legacy TN measurement accuracy requirements for IoT NTN.
  + For eMTC, the legacy measurement accuracy requirements (CRS based and RSS based) from LTE eMTC are reused for eMTC NTN.
  + For NB-IoT, the legacy measurement accuracy requirements (NRS based and NSSS-based) from LTE NB-IoT are reused for NB-IoT NTN

Issue 2: Duplex mode

* RAN4 to introduce test cases for UE operating in FD-FDD and HD-FDD duplex modes only.
  + RAN4 to introduce test cases for UE category M1 operating in FD-FDD and HD-FDD duplex modes only.
  + RAN4 to introduce test cases for UE category NB1 and NB2 operating in HD-FDD duplex mode only.

Issue 3: Satellite assistance information

FFS for following proposals:

* RAN4 to reuse the Rel-17 NR NTN test framework for IoT NTN tests which includes predefining configurations for serving cell’s satellite and neighbour cell’s satellite.
* RAN4 to introduce assistance information for test cases that require neighbour cell measurements for NB-IoT and eMTC. Details of assistance information is FFS.
* RAN4 to introduce assistance information for handover to target cell eMTC. Details of assistance information is FFS.

Issue 4: PHR reporting

* For NB-IoT operation with GSO, the legacy NB-IoT PHR reporting tables are used as baseline.
* For NB-IoT operation with NGSO, FFS need to adjust the reporting values compared to the legacy reporting values.
* For UE category M1 operation with GSO and NGSO, the legacy UE category M1 PHR reporting tables are used as baseline.

Issue 5: Side conditions

* RAN4 to introduce new side conditions for IDLE and CONNECTED mode measurements for both NB-IoT and eMTC NTN.

Issue 6: Reference channel

* RAN4 to introduce new RMC assuming the channel bandwidth of 1.4MHz for eMTC NTN.

Issue 7: Test setup – General

* Reuse the test case environment and setup of NR NTN as baseline.

Issue 8-1: List of Tests – General

* For NB-IoT and eMTC NTN, RAN4 to introduce same set of test cases (except TDD related) as defined for legacy NB-IoT and eMTC in LTE.
* FFS whether to define test case involving cell detection when the target cell is in enhanced coverage for NGSO.
* FFS whether to define test case for UL segmented transmission gap for UE dropping of UL resources. The new test is applicable for UEs that indicate this capability.
  + The transmission gap for UE dropping of UL resources does not apply when the timing advance is decreasing from one segment to the next segment.
  + RAN4 to reply the LS from RAN1 indicating the segmented transmission will be taken into account when developing test cases.

Issue 8-2: List of Tests for IoT NTN for NB-IoT

* Further discuss the following test cases list for IoT NTN in the next meeting

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | **#** |
| RRC\_IDLE state | Cell Re-Selection | HD – FDD Intra frequency case for UE Category NB1 in normal coverage | NB 1-1 |
| HD – FDD Inter frequency case for UE Category NB1 in normal coverage | NB 1-2 |
| HD – FDD Intra frequency case for UE Category NB1 In-Band mode in normal coverage with serving cell RRM measurement relaxation | NB 1-3 |
| HD – FDD Intra frequency case for UE Category NB1 In-Band mode in normal coverage with UE specific DRX | NB 1-4 |
| RRC CONNECTED Mode Mobility | NA | NA | n.a. |
| RRC Connection Control | RRC Re-establishment | HD-FDD Intra-frequency RRC Re-establishment for UE category NB1 in In-Band mode under enhanced coverage | NB 2-1 |
| HD-FDD Inter-frequency RRC Re-establishment for UE category NB1 in In-Band mode under normal coverage | NB 2-2 |
| Random Access | Contention Based Random Access Test for UE category NB1 UEs In-band mode in normal coverage | NB 2-3 |
| Contention Based Random Access Test for UE category NB1 UEs In-band mode in Enhanced Coverage | NB 2-4 |
| Contention Based Random Access on Non-anchor Carrier Test for UE category NB1 UEs In-band mode in Enhanced Coverage | NB 2-5 |
| Timing | UE Transmit Timing | HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE In-Band mode under normal coverage | NB 3-1 |
| HD-FDD – UE Transmit Timing Accuracy Tests for Category NB1 UE In-band mode under enhanced coverage | NB 3-2 |
| UE Timing Advance | HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Normal Coverage | NB 3-3 |
| HD-FDD UE Timing Advance Adjustment Accuracy Test for UE Category NB1 in Standalone Mode under Enhance Coverage | NB 3-4 |
| Signaling characteristic | RLM | HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in normal coverage | NB 4-1 |
| HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for UE category NB1 In-band mode in enhanced coverage | NB 4-2 |
| HD-FDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 In-Band mode in Enhanced Coverage | NB 4-3 |
| HD-FDD Radio Link Monitoring Test for In-sync with DRX for UE Category NB1 In-Band mode in Normal Coverage | NB 4-4 |
| HD-FDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 In-Band mode in Normal Coverage | NB 4-5 |
| HD-FDD Radio Link Monitoring Test for In-sync without DRX for UE Category NB1 In-Band mode in Enhanced Coverage | NB 4-6 |
| HD-FDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 Standalone mode in Normal Coverage | NB 4-7 |
| HD-FDD Radio Link Monitoring Test for Out-of-sync without DRX for UE Category NB1 guard band mode in Enhanced Coverage | NB 4-8 |
| Measurement Performance Requirements | channel quality reporting accuracy | HD-FDD Downlink channel quality reporting accuracy for UE Category NB1 Standalone mode under normal coverage | NB 5-1 |
| HD-FDD Downlink channel quality reporting accuracy for UE Category NB1 Standalone mode under enhanced coverage | NB 5-2 |
| HD-FDD Downlink channel quality reporting accuracy on non-anchor carrier for UE Category NB1 Standalone mode under normal coverage | NB 5-3 |
| HD-FDD Downlink channel quality reporting accuracy on non-anchor carrier for UE Category NB1 Standalone mode under enhanced coverage | NB 5-4 |
| HD-FDD Downlink channel quality reporting accuracy in RRC\_CONNECTED for UE Category NB1 Standalone mode under normal coverage | NB 5-5 |
| HD-FDD Downlink channel quality reporting accuracy in RRC\_CONNECTED for UE Category NB1 Standalone mode under enhanced coverage | NB 5-6 |

Issue 8-3: List of Tests for IoT NTN for Cat-M1

* Further discuss the following test cases list for IoT NTN in the next meeting

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | **#** |
| RRC\_IDLE state | Cell Re-Selection | E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage | M1 1-1 |
| E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage | M1 1-2 |
| E-UTRAN FDD – FDD Inter frequency case for Cat-M1 UE in normal coverage | M1 1-3 |
| E-UTRAN HD – FDD Inter frequency case for Cat-M1 UE in normal coverage | M1 1-4 |
| E-UTRAN FDD – FDD Intra frequency case for Cat-M1 UE in normal coverage with serving cell RRM measurement relaxation | M1 1-5 |
| E-UTRAN HD – FDD Intra frequency case for Cat-M1 UE in normal coverage with serving cell RRM measurement relaxation | M1 1-6 |
| RRC CONNECTED Mode Mobility | Handover and Conditional Handover | E-UTRAN FDD-FDD Intra frequency handover for Cat-M1 UEs in CEModeA without SFN acquisition | M1 2-1 |
| E-UTRAN HD-FDD Intra frequency handover for Cat-M1 UEs in CEModeA without SFN acquisition | M1 2-2 |
| E-UTRAN FDD inter frequency handover for Cat-M1 UEs in CEModeA | M1 2-3 |
| E-UTRAN HD-FDD inter frequency handover for Cat-M1 UEs in CEModeA | M1 2-4 |
| E-UTRAN FDD-FDD Intra frequency conditional handover for Cat-M1 UEs in CEModeA | M1 2-5 |
| E-UTRAN HD-FDD Intra frequency conditional handover for Cat-M1 UEs in CEModeA | M1 2-6 |
| E-UTRAN FDD inter frequency conditional handover for Cat-M1 UEs in CEModeA | M1 2-7 |
| E-UTRAN HD-FDD inter frequency conditional handover for Cat-M1 UEs in CEModeA | M1 2-8 |
| RRC Connection Control | RRC Re-establishment | E-UTRAN FD-FDD Intra-frequency RRC Re-establishment for Cat-M1 UE in CEModeA | M1 3-1 |
| E-UTRAN HD-FDD Intra-frequency RRC Re-establishment for Cat-M1 UE in CEModeA | M1 3-2 |
| E-UTRAN FD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE in CEModeA | M1 3-3 |
| E-UTRAN HD-FDD Inter-frequency RRC Re-establishment for Cat-M1 UE in CEModeA | M1 3-4 |
| Random Access | E-UTRAN FDD Contention Based Random Access Test for Cat-M1 UEs in Normal Coverage | M1 3-5 |
| E-UTRAN HD-FDD Contention Based Random Access Test for Cat-M1 UEs in Normal Coverage | M1 3-6 |
| E-UTRAN FDD Contention Based Random Access Test for Cat-M1 UEs in Enhanced Coverage | M1 3-7 |
| E-UTRAN HD-FDD Contention Based Random Access Test for Cat-M1 UEs in Enhanced Coverage | M1 3-8 |
| Timing | UE Transmit Timing | E-UTRAN FDD – UE Transmit Timing Accuracy Tests for Cat-M1 UE in CEModeA | M1 4-1 |
| E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Cat-M1 UE in CEModeA | M1 4-2 |
| E-UTRAN FDD – UE Transmit Timing Accuracy Tests for Cat-M1 UE in CEModeB | M1 4-3 |
| E-UTRAN HD-FDD – UE Transmit Timing Accuracy Tests for Cat-M1 UE in CEModeB | M1 4-4 |
| UE Timing Advance | E-UTRAN FDD Timing Advance Adjustment Accuracy Test for Cat-M1 UE in CEModeA | M1 4-5 |
| E-UTRAN HD-FDD UE Timing Advance Adjustment Accuracy Test for Cat-M1 UE in CEModeA | M1 4-6 |
| E-UTRAN FDD UE Timing Advance Adjustment Accuracy Test in CEModeB | M1 4-7 |
| E-UTRAN HD-FDD UE Timing Advance Adjustment Accuracy Test in CEModeB | M1 4-8 |
| Signaling characteristic | RLM | E-UTRAN FD-FDD Radio Link Monitoring Test for Out-of-sync for Cat-M1 UE in CEMode A | M1 5-1 |
| E-UTRAN FD-FDD Radio Link Monitoring Test for In-Sync for Cat-M1 UE in CEMode A | M1 5-2 |
| E-UTRAN HD-FDD Radio Link Monitoring Test for Out-of-sync for Cat-M1 UE in CEMode A | M1 5-3 |
| E-UTRAN HD-FDD Radio Link Monitoring Test for In-Sync for Cat-M1 UE in CEMode A | M1 5-4 |
| E-UTRAN FD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for Cat-M1 UE in CEMode A | M1 5-5 |
| E-UTRAN FD-FDD Radio Link Monitoring Test for In-Sync in DRX for Cat-M1 UE in CEMode A | M1 5-6 |
| E-UTRAN HD-FDD Radio Link Monitoring Test for Out-of-sync in DRX for Cat-M1 UE in CEMode A | M1 5-7 |
| E-UTRAN HD-FDD Radio Link Monitoring Test for In-Sync in DRX for Cat-M1 UE in CEMode A | M1 5-8 |
| Measurement Procedure | Event triggered reporting | E-UTRAN FDD-FDD intra-frequency event triggered reporting under fading propagation conditions in asynchronous cells for Cat-M1 UE in CEModeA | M1 6-1 |
| E-UTRAN FDD-FDD intra-frequency event triggered reporting under fading propagation conditions in synchronous cells for Cat-M1 UE in CEModeA in DRX | M1 6-2 |
| E-UTRAN HD-FDD intra-frequency event triggered reporting under fading propagation conditions in asynchronous cells for Cat-M1 UE in CEModeA | M1 6-3 |
| E-UTRAN HD-FDD intra-frequency event triggered reporting under fading propagation conditions in synchronous cells for Cat-M1 UE in CEModeA in DRX | M1 6-4 |
| E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA | M1 6-5 |
| E-UTRAN FDD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 in CEModeA when DRX is used | M1 6-6 |
| E-UTRAN HD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 with discontinuous MPDCCH monitoring in CEModeA | M1 6-7 |
| E-UTRAN HD-FDD Inter-frequency event triggered reporting under fading propagation conditions in asynchronous cells for UE category M1 in CEModeA when DRX is used | M1 6-8 |
| Measurement Performance Requirements | RSRP accuracy | FD-FDD RSRP Intra frequency case for Cat-M1 UE in CEModeA | M1 7-1 |
| HD-FDD RSRP Intra frequency case for Cat-M1 UE in CEModeA | M1 7-2 |
| FD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeA | M1 7-3 |
| HD-FDD RSRP Inter frequency case for Cat-M1 UE in CEModeA | M1 7-4 |
| channel quality reporting accuracy | E-UTRAN FD-FDD Downlink channel quality reporting accuracy for UE Category M1 in CE Mode A | M1 7-5 |
| E-UTRAN HD-FDD Downlink channel quality reporting accuracy for UE Category M1 in CE Mode A | M1 7-6 |
| E-UTRAN FD-FDD Downlink channel quality reporting accuracy for UE Category M1 in CE Mode B | M1 7-7 |
| E-UTRAN HD-FDD Downlink channel quality reporting accuracy for UE Category M1 in CE Mode B | M1 7-8 |

**UE demodulation requirements**

The following summarises the demodulation agreements that were captured in the WF [17]:

* Test scope
  + Only consider LEO-600 scenario for LTE NTN IOT performance requirements definition.
  + Only consider standalone deployment to define requirements for NB-IoT over NTN.
  + Define UE demodulation requirement for FDD only, both HD-FDD and FD-FDD
  + Do not introduce new CSI requirements for both NB-IoT and Cat-M1 over NTN.
  + Do not introduce new NPBCH and NPDCCH requirements for NB-IoT over NTN.
  + Do not introduce new PBCH and MPDCCH requirements for Cat-M1 over NTN.
  + Adopt the following applicability rule for Cat-M1 UE for NTN.

|  |  |  |
| --- | --- | --- |
| ntn-Connectivity-EPC-r17 | ntn-ScenarioSupport-r17 | Applicability |
| Supported | GSO only | UE needs to pass TS36.101 Cat-M1 requirements only according to the UE capability |
| Supported | NGSO only | UE needs to pass TS36.101 Cat-M1 requirements and the additional NGSO test in TS36.102 according to the UE capability |
| Supported | Not specified (supporting both GSO and NGSO) | UE needs to pass TS36.101 Cat-M1 requirements and the additional NGSO test in TS36.102 according to the UE capability |
| Not supported | - | UE needs to pass TS36.101 Cat-M1 requirements only according to the UE capability |

* + Adopt the following applicability rule for Cat-NB1/NB2 UE for NTN.

|  |  |  |
| --- | --- | --- |
| ntn-Connectivity-EPC-r17 | ntn-ScenarioSupport-r17 | Applicability |
| Supported | GSO only | UE needs to pass TS36.101 Cat-NB1/NB2 requirements only according to the UE capability |
| Supported | NGSO only | UE needs to pass TS36.101 Cat-NB1/NB2 requirements and the additional NGSO test in TS36.102 according to the UE capability |
| Supported | Not specified (supporting both GSO and NGSO) | UE needs to pass TS36.101 Cat-NB1/NB2 requirements and the additional NGSO test in TS36.102 according to the UE capability |
| Not supported | - | UE needs to pass TS36.101 Cat-NB1/NB2 requirements only according to the UE capability |

* General assumptions
  + Frequency and timing drift modelling
    - Do not consider Doppler shift for feeder link for DL
    - Do not consider the frequency Drift
    - Do not define sampling offset model
    - The maximum Doppler shift is residual frequency offset, i.e., 0.1ppm.
  + Define requirements with 1Tx1Rx for both Cat-M1 and NB-IoT over NTN.
  + Define requirements with K\_offset = 8ms for both Cat-M1 and NB-IoT over NTN.
  + Number of HARQ processes
    - For Cat-M1 UE, define PDSCH demodulation requirements with HARQ retransmission with:
      * 8 HARQ processes for CE Mode A.
      * 2 HARQ processes for CE Mode B.
    - For Cat-NB1/NB2 UE, define NPDSCH demodulation requirements with HARQ retransmissions with 1 HARQ process.

#### 2.4.2 Remaining Open issues

**Core part**

* None, all Core part objectives are considered to be completed. Any further clarifications (e.g. in relation to the FFS issues on RRM requirements highlighted in section 2.4.1) may be further discussed as part of maintenance activity until closure of the Performance part, if needed.
* Any unfished regulatory requirement (e.g. ETSI) is not considered as showstopper to close the WI according to the approved timeplan.

**Performance part**

* On UE RRM performance requirements, RRM test cases, PHR reporting, and remaining details on test configurations remain open.
* For UE demodulation requirements, the requirements configuration and performance details for the LEO-600 scenario are still open.
* For SAN demodulation requirements, the definition of requirements and test configurations remain open.
* For SAN conformance testing requirements, the definition of tests remain open.

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

1. R4-2217747, Way Forward on UE RF and System Parameters for IoT NTN, MediaTek
2. R4-2217748, Way forward on A-MPR and Emissions requirements, ZTE
3. R4-2217473, Way Forward on coexistence study for IoT over NTN, MediaTek
4. R4-2217474, WF on SAN RF requirement for IoT over NTN, ZTE
5. R4-2217264, WF on LTE IoT NTN RRM requirements, MediaTek
6. R4-2218376, TS 36.102 v0.2.0, Specification Editor (MediaTek)
7. R4-2220575, Ad-hoc minutes for UE RF requirements for LTE\_NBeMTC\_NTN\_UERF, MediaTek
8. R4-2220574, WF on UE RF requirements for LTE\_NBeMTC\_NTN\_UERF, MediaTek
9. R4-2220811, draft CR to TS 36.307: release independence requirements introduction for NTN IoT, Rel-17, Huawei/HiSilicon
10. R4-2218377, Draft 36.102 v0.3.0, Specification Editor (MediaTek)
11. R4-2219133, Coexistence simulation restuls for TN-NTN NB IoT, Qualcomm
12. R42219364, Further discussion on simulation assumptions and evaluation results for IoT over NTN, ZTE
13. R4-2220242, WF for IoT over NTN SAN RF requirements, ZTE
14. R4-2219362, Draft TS 36.108 v0.1.0, Specification Editor (ZTE)
15. R2-2213018, Reply LS on information for neighbor/target cell in IoT NTN, RAN2
16. R4-2220362, WF on LTE IoT NTN RRM requirements, MediaTek
17. R4-2220278 WF on IoT-NTN UE demodulation and CQI reporting requirements, MediaTek

01.08.2022 minor adaptations for RAN #97e

21.05.2022 minor adaptations for RAN #96

10.01.2022 minor adaptations for RAN #95e

04.10.2021 minor adaptations for RAN #94e

08.08.2021 minor adaptations for RAN #93e

17.05.2021 minor adaptations for RAN #92e

28.01.2021 minor adaptations for RAN #91e

09.11.2020 minor adaptations for RAN #90e

31.08.2020 minor adaptations for RAN #89e

20.04.2020 minor adaptations for RAN #88e

18.02.2020 minor adaptations for RAN #87e

14.11.2019 minor adaptations for RAN #86

18.08.2019 minor adaptations for RAN #85

12.05.2019 minor adaptations for RAN #84

27.02.2019 minor adaptations for RAN #83

21.11.2018 completion levels with colours added (for RAN #82)

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects (for RAN #81)

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template