**3GPP TSG-RAN2 Meeting #114-e R2-21xxxx**

**Online, May 19 – 27, 2021**

**Agenda Item: 9.2.1**

**Source: RAN2 Chairman (MediaTek)**

**Title: [AT114-e][032][IoT NTN] TR Essential Features**

**Document for: Discussion and decision**

# Introduction

This document Continues on [0] R2-2106468 [Pre114-e][004][IoT NTN] Summary of 9.2.1 Essential Parts by Huawei, from which main parts are copy-pasted below.

Aim to make decisions offline if possible.

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# Discussion

## User Plane

### HARQ

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2104817 [1] | Proposal 1 Enhancements to disabling HARQ are not essential for IoT over NTN in Rel-17. |
| R2-2105415 [4] | Proposal 2: The necessity of HARQ enhancement in Rel-17 depends on data rate requirement for IoT NTN. |
| R2-2105428 [5] | Proposal 5 Capture in TR that HARQ feedback/HARQ retransmission can be disabled to avoid HARQ stalling state in GEO cell. |
| R2-2105664 [6] | Proposal 4: Disabling of HARQ feedback is not essential. |
| R2-2106168 [7] | Proposal 2 The necessity of HARQ enhancements for IoT NTN should be studied considering the reduction in link throughput. |

***[0] Observation 1****: Majority of companies think that enhancements to disable HARQ are not essential (18/24). There is small interest (4/24) to support disabling HARQ for GEO scenario and suggestions (2/24) to wait for RAN1 conclusion.*

**Proposal 1:** Disabling of HARQ feedback is not essential.

**Further Reasoning:** From NR NTN and TR 38.821: 1. Disabling of HARQ feedback could give some power consumption benefits in connected mode. 2. Having a number of HARQ processes without feedback could be a practical enabler to increase the number of HARQ processes (for long delays) to enable higher data rate at long delays. Chairman: None of these benefits are considered significant to the prioritized IoT traffic model of intermittent sparse data. Some companies seems to have interest in the purpose of high data rate.

**Observations potentially related to RAN1 HARQ discussions:** RRC configured HARQ feedback disable (e.g. per HARQ process or otherwise as decided by RAN1) could still be considered feasible in RAN2 (low/limited impact). RAN2 has not considered HARQ changes with MAC impact which may require more time for discussion in RAN2.

**COMMENT ON P1:** Disabling of HARQ feedback is not essential.

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | LEO: Acceptable.  GEO: Not acceptable | In case of GEO, enabling HARQ feedback is not useful, especially for NB-IoT which still uses the UL SCH resource to send HARQ feedback.  Solution could be a lot simpler than in NR and minor change could be sufficient. This does not need to be dynamic enabling/disabling and does not need to be per HARQ process. |
| Nokia | Acceptable with comments | Generally, we agree not support HARQ feedback disabling in Rel 17 IoT NTN SI since the prioritized IoT traffic model of intermittent sparse data. However, we suggest to further study for different scenario with target data rate requirements for NB-IoT and eMTC in normative phase, to check whether HARQ feedback disabling is not needed for all scenario/use cases. |
| Sateliot | Acceptable |  |
| ZTE | Acceptable |  |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable |  |
| Ericsson | Acceptable |  |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable | The main intention of disabling HARQ feedback in NR NTN is to avoid HARQ stalling and support high data rate with a limited HARQ process number. Given that the use case of intermittent delay-tolerant small packet transmissions will be prioritized in Rel-17 IoT NTN, we think disabling HARQ is not essential. |

### Coverage enhancements

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2104817 [1] | Proposal 2 Coverage enhancements are essential for IoT over NTN in Rel-17. |
| R2-2105364 [3] | Proposal 1: From RAN2 perspective, if coverage enhancement is supported for IoT over NTN, it’s essential to discuss whether and how multiple CELs can be supported. |
| R2-2106168 [7] | Proposal 4 Enhancements to coverage and spectral efficiency functionalities are not essential. |

***[0] Observation 4:*** *During discussions at RAN2#113bis-e [9], the majority of views was that coverage enhancements should be decided by RAN1: Coverage enhancements and CE-Mode B should be decided by RAN1 (14/21)*

**Proposal 2:** No need has been identified in RAN2 for further R17 IoT NTN enhancement regarding eMTC and NB-IoT Coverage Enhancement features. They are assumed applicable to NR NTN. L1 issues if any are assumed addressed by RAN1.

**Further Reasoning:** The only technical issue brought up to discussion is that RSRP would not be a good criterion to determine Coverage Enhancement Level as measured RSRP is less varying for NTN deployment. As the objective of repetitions is to overcome high coupling loss, and RSRP can be seen as a measurement of exactly that, the issue would need further explanation/evidence, and none was given, so it was not shown that any enhancement is needed.

**COMMENT ON P2:** No need has been identified in RAN2 for further R17 IoT NTN enhancement regarding eMTC and NB-IoT Coverage Enhancement features. They are assumed applicable to NR NTN. L1 issues if any are assumed addressed by RAN1.

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable but | This needs to be clear in TR that unless RAN1 specifically specifies, existing coverage enhancement definition applies, from RAN2 perspective. |
| Nokia | Acceptable | If RAN1 addressed something need to be enhanced in coverage enhancement, RAN2 can revisit this conclusion. |
| Sateliot | Acceptable |  |
| ZTE | Acceptable |  |
| Eutelsat | Acceptable | C-IoT release 16 baseline from a RAN2 perspective |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable |  |
| Ericsson | Acceptable but | The highlighted part in the text below is not clear to us:  “No need has been identified in RAN2 for further R17 IoT NTN enhancement regarding eMTC and NB-IoT Coverage Enhancement features. They are assumed applicable to NR NTN. L1 issues if any are assumed addressed by RAN1.”  Maybe the intention is to say that “They are assumed applicable to NTN” |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable | It should be RAN1 to decide whether to support coverage enhancement in IoT NTN based on link budget. If RAN1 agrees to support this feature, RAN2 may need to discuss enhancement to coverage level selection. |

### PDCP

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2105664 [6] | Proposal 5: Enhancement to PDCP discard timer is not essential. |

***[0] Observation 3****: Majority of companies think that enhancements to PDCP discard timer are not essential (16/23).There is some interest (7/23) in enhancements to PDCP discard timer, especially considering that the change will be very small.*

**Proposal 3:** Enhancement to PDCP discard timer is not essential, but can be considered anyway as RAN2 impact is very small.

Rapporteur assumes no comments are required for this proposal (can be agreed).

## Control Plane

### Idle mode mobility

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2106168 [7] | Proposal 5 Minor adjustments to existing mobility mechanisms, such as a new parameter, parameter values, timers, timing etc. are considered essential enhancements to adapt functionality to NTN.  Proposal 6 No new mobility mechanisms or major enhancements to existing mechanisms are introduced in Rel-17 for IoT NTN. |
| R2-2106359 [8] | Proposal 2 Earth moving cell scenario and enhancements for TAC update are considered as essential minimum functionality.  Proposal 3 Enhancements to cell selection/re-selection follow NR NTN are considered as essential minimum functionality. |

***[0] Observation 5****: There is small interest (4/24) in study additionally the impact of discontinuous coverage and cell moving scenario in TA handling for NTN IOT,*

***[0] Observation 7****: There is some interest (5/23) for reusing NR idle mobility enhancements.*

NOTE: Below the Already made agreements for Tracking Area Handling:

* *[035] 14: RAN2 will use earth-fixed Tracking Area concept of NR-NTN in eMTC/NB-IoT NTN.*
* *[035] 15: RAN2 should wait until agreements regarding TAU are made in the NR-NTN WI, and use those for eMTC/NB-IoT over NTN, if applicable.*
* *(modified P2) The NR-NTN agreements, where the network may broadcast more than one TACs per PLMN in a cell is considered for IoT NTN (other options not excluded for now)*

*Enhancements to tracking area management are essential.*

**Proposal 4:** No additional agreements on “earth-moving cell” are needed in The SI for Tracking Area Handling, as this is included in the already made agreements.

**Proposal 5 (Rapporteur proposal):** Referring to previous agreement, Remove the text “*(other options not excluded for now)”* from previous agreement.

**Proposal 6 (Rapporteur proposal):** Referring to previous agreement, TAU details based on agreements regarding TAU made in the NR-NTN WI is handled in the IoT NTN WI as a part of using the earth-fixed TA concept.

**COMMENTS ON TA: P4, P5, P6 (see above)**

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable | NR NTN solution can be baseline and any IoT specific enhancement can be worked in WI phase. |
| Nokia | Acceptable | Agree as baseline. Further IoT specific enhancements to be considered in WI phase. |
| ZTE | Acceptable |  |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable |  |
| Ericsson | Acceptable but | The wording needs to be improved though, e.g. in P6 it is not clear what is intended with “as a part of using the earth-fixed TA concept.”. Shouldn’t it be easier/clear if P4, P5 and P6 are merged in a single proposal which may be formulated as follows assuming that the intention is captured properly? e.g., “The Tracking Area concept of NR NTN is the baseline and enhancements which may be needed for applicability to IoT can be considered during the WI phase.” |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable |  |

NOTE: Below Already made agreement for Idle Mode Mobility:

* *[035] 12: RAN2 will use cell selection/reselection for NR-NTN as the baseline and discuss further about the detailed solutions in eMTC/NB-IoT NTN.*

Then the following agreement was made at RAN2 #113-e:

* *[036]: RAN2 will use cell selection/re-selection mechanism of NB-IoT/eMTC as a baseline. Enhancements introduced for cell selection/re-selection mechanism in NR NTN will be considered if applicable to IoT-NTN..*

Now, R2-2106168 [7] proposes to not regard NR-NTN enhancements as essential.

**Proposal 7:** Support of legacy (R16) cell selection/reselection mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing etc. can be considered to adapt functionality to NTN. New mechanisms as for NR-NTN are considered not essential.

**Reasoning:** NR NTN TR 38.821 provides neither descriptions why the addressed issues are seen as problems nor which objective characteristics are enhanced by the proposed enhancements, and also no evidence that legacy mechanisms doesn’t work, and this has also not been shown in this SI, so it makes sense to follow proposal in [7].

**COMMENTS ON Idle Mode Mobility: P7:** Support of legacy (R16) cell selection/reselection mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing etc. can be considered to adapt functionality to NTN. New mechanisms as for NR-NTN are considered not essential.

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable with revision | Remove “New mechanisms as for NR-NTN are considered not essential” as previous two sentences say all. The NB-IoT and eMTC in CE mode do not use frequency priority for cell reselection. So suggestion is  “Support of legacy (R16) cell selection/reselection mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing, priorities handling etc. can be considered to adapt functionality to NTN.” |
| Nokia | Acceptable with correction | Last sentence “New mechanisms as for NR-NTN are considered not essential “ to be removed. |
| ZTE | Seems not acceptable | Considering that priority based cell reselection is not supported in NB-IoT, we think there is issue on how to steer NB-IoT UE to the TN cell with priority in TN-NTN deployment. We assume new simple parameter may be needed.  We are a bit confused with Qualcomm’s comment, does it imply we need to consider priority based cell reselection for NB-IoT over NTN? |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable | OK with Qualcomm’s suggestion too. |
| Ericsson | Acceptable |  |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable with correction | Agree with Nokia. |

### Idle mode power saving enhancements

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2104817 [1] | Proposal 3 Idle mode power saving enhancements are essential for IoT over NTN in Rel-17. FFS on which set of power saving enhancements. |
| R2-2104855 [2] | Observation 1: For GEO, the existing PSM mechanisms e.g. eDRX, relaxed monitoring, SI acquisition and WUS could be reused without any further enhancement.  Observation 2: For LEO with continuous coverage, the existing PSM scheme e.g., eDRX, relaxed monitoring, SI acquisition and WUS could be reused with some minor adjustment to search for the new cell according to the ephemeris data to monitor the WUS/Paging signalling.  Observation 3: Coverage holes may not appear regularly for LEO with discontinuous coverage scenario, which may bring the complexity for eDRX cycle configuration.  Proposal 1: eDRX/PSM is not necessary for LEO with discontinuous coverage scenario, the ephemeris data could be the most essential info for a UE to do proper network selection when a satellite comes, and the UE could sleep down or power off when the satellite is gone. |
| R2-2105415 [4] | Observation 1: Power consumption related to Idle mode mobility related procedures can be significantly improved for discontinuous coverage scenario with additional enhancements.  Proposal 4: RAN2 to prioritise the enhancements to the idle mode procedures applicable for discontinuous coverage scenario in Rel-17. |
| R2-2105428 [5] | Proposal 6 Capture in TR that relaxed monitoring is supported without further enhancement in GEO cell. |
| R2-2105664 [6] | Proposal 1: Enhancements for handling of coverage holes or discontinuous coverage in Idle mode in a power efficient way are essential. |
| R2-2106168 [7] | Observation 3 There is no need for generic enhancements for UE power consumption, e.g., to compensate for power consumption due to GNSS, only cases specific to IoT NTN may need to be addressed depending on the adopted concept.  Proposal 3 If enhancements are needed for UE power consumption, it should not be generic but rather justified case by case with a study to conclude whether it would be beneficial to address a particular case specific to IoT NTN. |
| R2-2106359 [8] | Proposal 1 Enhancements for power saving in idle mode for NTN IOT devices, e.g. enhancements to eDRX/PSM (discontinuous coverage) and to relaxed monitoring, SI acquisition and WUS, are considered as essential minimum functionality. |

* (22/25) There is significant interest for Power saving in idle mode for NTN IOT devices, e.g. there is significant interest for enhancements to eDRX/PSM (discontinuous coverage) and to relaxed monitoring, SI acquisition and WUS.

**Proposal 8:** For GEO, the existing power saving mechanisms e.g. PSM, eDRX, relaxed monitoring, SI acquisition and WUS can be reused without any further enhancement.

**Proposal 9:** Discuss to what extent the above is applicable also to LEO, and/or to periods when a UE is in coverage in a discontinuous coverage deployment.

**COMMENTS ON Idle Mode Power Saving: P8 P9 above (expect to CB on-line as this was quite unclear)**

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable\* | It should be clear that discontinuous/intermittent coverage scenario shall be addressed for both LEO/NGSO and GEO/GSO |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable |  |
| Nokia | Acceptable with change | GWUS is more relevant for IoT-NTN considering the paging load on single GEO cell. Please consider updating it with (G)WUS. |
| Sateliot | Acceptable, but | Not clear which is the consequence/follow-up of Proposal 9 if the outcome of the “discussion to what extent the above is applicable also to LEO” is that some of the features are not applicable as such and/or any enhancement may be needed for LEO. Please, clarify. as Inmarsat pointed above, it should be clear that discontinuous/intermittent coverage scenario shall be addressed for both LEO/NGSO and GEO/GSO. |
| ZTE | Acceptable |  |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable, but | Agree to INMARSAT, SATELIOT comments |
| Novamint | Acceptable, but | Agree with comments from Inmarsat and Sateliot - It should be clear that discontinuous/intermittent coverage scenario shall be addressed for both LEO/NGSO and GEO/GSO |
| Ericsson | Acceptable | There seems to be a typo in P9: “…when a UE is in coverage or in a discontinuous coverage deployment” |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable |  |

**Proposal 10:** Support of discontinuous coverage without excessive UE power consumption and without excessive failures / recovery actions, is essential, Expectation that this need to be taken into account at least for Idle mode.

**COMMENTS ON P10 above**

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable | If this is only for LEO, this should be clarified. |
| Nokia | Acceptable but | We agree that only idle mode aspects are considered related to discontinuous coverage. Other features such as RLF/Recovery/Re-establishment improvement can be considered for future release. |
| Sateliot | Acceptable |  |
| ZTE | Acceptable |  |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable |  |
| Ericsson | Acceptable |  |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable |  |

### Connected mode mobility enhancements

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2104855 [2] | Proposal 2: For discontinuous coverage scenario, if RLF is caused by the coverage hole, the handling of RLF in the UE should be adjusted. E.g., abort the cell selection and reestablishment, and retry the cell selection when the next satellite cell is coming if necessary. |
| R2-2105415 [4] | Observation 2: Awareness of coverage continuity for connected mode UE may be beneficial in some scenarios.  Proposal 5: Minor changes to connected mode functionality for discontinuous coverage can be considered for Rel-17. |
| R2-2105664 [6] | Proposal 2: For LEO cell moving scenarios, enhancements using time/location for connected mode mobility are essential. |
| R2-2106168 [7] | Proposal 5 Minor adjustments to existing mobility mechanisms, such as a new parameter, parameter values, timers, timing etc. are considered essential enhancements to adapt functionality to NTN.  Proposal 6 No new mobility mechanisms or major enhancements to existing mechanisms are introduced in Rel-17 for IoT NTN. |
| R2-2106359 [8] | Proposal 4 Enhancements to CHO in eMTC based NTN follow NR NTN can be considered as essential minimum functionality for R17 IOT NTN.  Proposal 5 RLF enhancement is not considered as essential minimum functionality for R17 IOT NTN. |

Connected mode mobility enhancements were discussed at RAN2#113bis-e without conclusions [9]:

***[0] Observation 8****: For NB-IoT, majority of companies think that enhancements to existing connected mode mobility mechanisms are not essential (14/20). There is small interest (6/20) to introduce RLF enhancements.*

***[0] Observation 9****: For eMTC, there is significant interest (11/21) to introduce CHO enhancements.*

* For enhancements to CHO, e.g. location and time based triggering events related to CHO in eMTC-based NTN should follow NR-NTN.

It is proposed that RAN2 discuss the proposals below.

**Proposal 11:** Support of legacy (R16) Handover (incl CHO) and RLF/reestablishment mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing etc. can be considered to adapt functionality to NTN. New mechanisms or new triggers as for NR-NTN are considered not essential.

**Reasoning:** NR NTN TR 38.821 provides neither descriptions why the addressed issues are seen as problems nor which objective characteristics are enhanced by the proposed enhancements, and also no evidence that legacy mechanisms doesn’t work, and this has also not been shown in this SI, so it makes sense to follow proposals in [7].

Details: P2 in R2-2104855 P5 in R2-2105415 should be evaluated according to Proposal 10 above, no need for this further detail in the SI. Rapporteur opinion: On CHO, the most notable benefit is that it removes the need for real time signalling in the source cell, and this benefit is present also without any NTN specific enhancements.

**COMMENTS ON P11:** Support of legacy (R16) Handover (incl CHO) and RLF/reestablishment mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing etc. can be considered to adapt functionality to NTN. New mechanisms or new triggers as for NR-NTN are considered not essential.

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable | For discontinuous coverage, our understanding is that “without excessive failures / recovery actions” as in P10 can be implemented by “change to timing”. Based on this understanding we think P11 is acceptable and further details can be discussed. |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable with revision | CHO is not legacy handover for eMTC. It is a new feature for eMTC and we already have agreements.  So suggestion is  Support of legacy (R16) Handover ~~(incl CHO)~~ and RLF/reestablishment mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing, RLF trigger etc. can be considered to adapt functionality to NTN. |
| Nokia | Acceptable with revision | Agree with QC. CHO is not feature in eMTC. As handover enhancements are not critical for IoT-NTN, this can be considered as non-essential. |
| Sateliot | Acceptable |  |
| ZTE | Not acceptable | We have same view as Qualcomm that CHO is not legacy handover for eMTC. It is a new feature and we already have agreements to support it. We feel the proposal (even with QC’s change) doesn’t reflect this point.  We assume time or timer based and location based CHO triggering events would be introduced for eMTC over NTN. Is there any intention in P11 to revise such agreements? |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable |  |
| Ericsson | Acceptable |  |
| Xiaomi | Not acceptable | CHO is new to eMTC. CHO enhancement from NR NTN can be introduced to eMTC. |
| OPPO | Not acceptable | We share the same view as ZTE and Xiaomi. |

### Connected mode power saving enhancements

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2104817 [1] | Proposal 4 Connected mode power saving enhancements are not essential for IoT over NTN in Rel-17. |
| R2-2104855 [2] | Observation 4: for GEO scenarios and LEO with continuous coverage scenario, enhancements for power saving in connected mode are not essential for NTN IOT devices. |
| R2-2105415 [4] | Proposal 3: RAN2 to agree EDT (without additional specification changes compared to RACH) as essential part for IoT NTN in Rel-17. |
| R2-2105428 [5] | Proposal 1 Capture in TR that EDT is supported in NTN without additional changes compared to random access procedure.  Proposal 2 Capture in TR that PUR in GEO is feasible with minor enhancement to PUR response window and validation criteria.  Proposal 3 Capture in TR that PDCCH-based HARQ ACK can be supported in LEO scenario with minor enhancement.  Proposal 4 Capture in TR that multiple TB scheduling can be supported without needing further enhancement. |
| R2-2105664 [6] | Proposal 3: Enhancements for power saving in connected mode are not essential. |
| R2-2106168 [7] | Proposal 3 If enhancements are needed for UE power consumption, it should not be generic but rather justified case by case with a study to conclude whether it would be beneficial to address a particular case specific to IoT NTN. |

Power saving enhancements in connected mode were discussed at RAN2#113bis-e [9] and the following was captured in the chair’s minutes:

* Chair: Most companies think Enhancements for power saving in connected mode are not essential for NTN IOT devices.

**Proposal 12:** Enhancements for power saving in connected mode power are not essential. Minor adaptations to enable support in NTN deployment of existing features e.g. EDT, PUR in GEO, Multi-TB scheduling and PDCCH-based HARQ in LEO may be considered in WI phase. (NOTE that no major adaptation is assumed).

**COMMENTS on P12 above**

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable | For discontinuous coverage we think connected mode enhancement could be useful. As this has been captured in P10 and P11, we are OK with P12. |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable | However, we should say “Major enhancements for power saving in connected mode power are not essential”. |
| Nokia | Acceptable |  |
| Sateliot | Acceptable |  |
| ZTE | Acceptable |  |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable |  |
| Novamint | Acceptable |  |
| Ericsson | Acceptable |  |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable |  |

## Other

The following proposals are made in documents [1]- [8]:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| R2-2105364 [3] | Observation 1a: If one satellite is mapped to one cell, the network capacity will be limited; if one satellite beam is mapped to one cell, the UE mobility performance and access performance will be negatively impacted.  Observation 1b: In NR NTN, cell beam (e.g. NR SSB) can deal with the contradiction between the mobility performance and cell capacity.  Proposal 2: It’s essential to evaluate whether the current SON report mechanism is still useful for NB-IoT moving cell over LEO NTN.  Proposal 3: It’s essential to discuss whether the channel quality reports in Msg3 and in RRC\_CONNECTED state is still applicable/useful for UE in IoT over LEO NTN  Proposal 4: It’s essential to discuss whether and how to support cell beam (e.g. similar NR SSB) for IoT over NTN.  Proposal 5: If cell beam can be supported for NB-IoT/eMTC over NTN, RAN2 need to further consider how to provide the cell beam related information in system information. |
| R2-2105415 [4] | Proposal 1: 5GC connectivity is not essential functionality for the listed scenarios. |
| R2-2106168 [7] | Observation 1 It is not clear whether use cases other than intermittent delay-tolerant small packet transmissions require significant effort.  Proposal 1 Use cases that can be addressed with minimal effort should not be excluded. |

**Proposal 13:** Enhancements for LEO for SON and channel quality reporting are not essential

**Reasoning:** The WI is expected to be very resource limited. It is not possible to prioritise such enhancements without a more solid justification.

**Proposal 14:** Cell beam is not applicable to NB-IoT or eMTC

**Reasoning:** The WI is expected to be very resource limited. As the concept of common beams doesn’t exist for EUTRA, such change seems very fundamental and cannot be done.

**COMMENTS ON P12 P14 above**

|  |  |  |
| --- | --- | --- |
| Company | Acceptable / not acceptable | Comments |
| Huawei, HiSilicon | Acceptable |  |
| MediaTek | Acceptable |  |
| Inmarsat | Acceptable |  |
| Lenovo | Acceptable |  |
| Apple | Acceptable |  |
| CATT | Acceptable |  |
| LG | Acceptable |  |
| Qualcomm | Acceptable with revision | At least Proposal 14 is not relevant for RAN2. RAN1 should be making agreements on this. We do not need to say this.  Again, we suggest following for the Proposal 13.  **Proposal 13:** Enhancements ~~for LEO~~ for SON and channel quality reporting to adapt to NTN are not identified as essential. |
| Nokia | Acceptable with change | SON is not essential for any scenario (both LEO and GEO) for Rel-17. |
| Sateliot | Acceptable |  |
| ZTE | P13: Acceptable  P14: Acceptable but | If cell beam cannot be supported in IoT over LEO, the UE density of 400UE/km2 may not be able to be supported in the cell with large radius (e.g., 250km).  We are fine to further discuss whether we need different UE density assumption for different cell size. |
| Eutelsat | Acceptable |  |
| Gatehouse | Acceptable | Agree with QC |
| Novamint | Acceptable | Agree with Qualcomm’s suggestion. |
| Ericsson | Acceptable but | Agree with QC that P14 is up to RAN1 to decide, but if companies think that there is a need to capture something in RAN2, one option would be to say that “Cell beam is not applicable to NB-IoT or eMTC from RAN2 standpoint” or “RAN2 assumes that cell beam is not applicable to NB-IoT or eMTC” |
| Xiaomi | Acceptable |  |
| OPPO | Acceptable |  |

**Proposal 15:** Q: Shall R17 IoT NTN support 5GC? Discuss what is the additional effort to support essential enhancements for 5GC additional to those for EPC?

**COMMENTS ON P15 above**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Neutral | It is not essential for Rel-17. However, we do not see any additional effort from RAN2 point of view apart from potential duplication of ASN.1 changes in EPC and 5GC, e.g. in SIB1, thus there is no reason to exclude from RAN2 point of view. |
| MediaTek | Neutral | It is not essential for Rel-17. |
| Inmarsat | Neutral | We agree it is not essential for Rel-17. |
| Lenovo | Neutral | Not essential for Rel-17. |
| Apple | Neutral | Perhaps consider as deprioritized. |
| CATT | Postponed | IoT NTN support 5GC is de-prioritized. RAN2 can focus on essential past first. |
| LG | Neutral |  |
| Qualcomm | Yes | Current working assumption of supporting 5GC should be the baseline. From RAN2 perspective, no additional effort is foreseen to support 5GC. If any issue identified in WI phase, this can be revisited. |
| Nokia | Neutral | Not essential for Rel-17. Eventhough the RAN2 impacts are minimum considering the changes required in other groups (RAN3) related to the duplication efforts. We suggest to de-prioritise if needed. |
| Sateliot | Neutral |  |
| ZTE | Yes |  |
| Eutelsat | Yes | No reason to exclude for now but could be updated during the WI phase if showstoppers (e.g. involving excessive load) are found. |
| Gatehouse | Neutral | Though not seen as essential and should be considered to deprioritize. |
| Novamint | Neutral | Not essential for R17. |
| Ericsson | Neutral | It is not essential for Rel-17 and, if considered, it should be deprioritized. |
| Xiaomi | Neutral |  |
| OPPO | Neutral |  |

# SI conclusion

**Proposal 16:** The SI can be closed from RAN2 perspective.

If you disagree please indicate which essential open issues you see that would block the closing. Note that we expect to treat the remaining points under AI 9.2.3, and update the TR with this meetings agreements.

**COMMENTS ON P16 (will CB also on-line).**

|  |  |  |
| --- | --- | --- |
| Company | Yes No | Comments |
| Huawei, HiSilicon | Yes |  |
| MediaTek | Yes |  |
| Inmarsat | Yes |  |
| Lenovo | Yes |  |
| Apple | Yes |  |
| CATT | Yes |  |
| LG | Yes |  |
| Qualcomm | Yes with properly capturing raised issues. | The Study Item should not be closed in rush without capturing already raised issues such as (1) HARQ feedback disabling in GEO, (2) synchronization issue due to lack of GNSS fix as IoT devices won’t have capability to read SIB in connected mode and won’t have capability to read GNSS without UL/DL transmission/reception interruption. |
| Nokia | Yes |  |
| Sateliot | Yes |  |
| ZTE | Yes | We assume the SI acquisition over LEO with eDRX can be treated under AI 9.2.3. |
| Eutelsat | Yes |  |
| Gatehouse | Yes |  |
| Novamint | Yes |  |
| Ericsson | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |

# Conclusions

# References

1. R2-2106468 [Pre114-e][004][IoT NTN] Summary of 9.2.1 Essential Parts Huawei
2. [R2-2104817](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2104817.zip) Discussion on essential features of IoT over NTN OPPO

1. [R2-2104855](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2104855.zip) Further Consideration on PSM for IoT NTN CATT

1. [R2-2105364](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105364.zip) Further discussion on essential parts of IoT NTN ZTE Corporation

1. [R2-2105415](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105415.zip) Further discussion on essential parts for IoT-NTN functionality for Rel-17 Nokia, Nokia Shanghai Bell

1. [R2-2105428](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105428.zip) Essential features for SI TR Qualcomm Incorporated

1. [R2-2105664](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105664.zip) Discussion on essential parts for IOT NTN Huawei, HiSilicon

1. [R2-2106168](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2106168.zip) Essential functionality in IoT NTN Ericsson

1. [R2-2106359](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2106359.zip) Essential Functionality related to power saving & mobility Beijing Xiaomi Mobile Software
2. R2-2104552 [Offline-027] IOT NTN essential parts (Huawei), RAN2#113bis-e, April 2021