**3GPP TSG-RAN WG2 Meeting #117-e R2-22xxxxx**

**Online, Feb 21st – March 03rd, 2022**

**Agenda item: 9.2.3.2**

**Source: MediaTek Inc.**

**Title: [IoT-NTN] AI summary of 9.2.3.2 Invited tdoc input (MediaTek)**

**Document for: Discussion and Decision**

# 1 Introduction

This document is aimed at providing a summary of contributions, related to “AI 9.2.3.2 Invited tdoc input”. As mentioned in R2-117-e Agenda [1], company Tdocs are invited on the following major agenda items:

* [Pre117-e][015][IoT-NTN] AI summary of 9.2.3.2 Invited tdoc input (MediaTek)

Table 1: List of Open Items in IoT-NTN Agenda

|  |  |  |
| --- | --- | --- |
| Category | OI Number | Open Item (OI) Issue |
| User Plane | OI 1.10 | Whether SR can be triggered if there is no available or sufficient UL-SCH resources for the triggered TA reporting? |
| Control Plane | OI 2.2 | Decide on Location Reporting by NAS and Coarse location report |
| OI 2.3 | Whether existing offset are sufficient to prioritize TN vs NTN frequencies |
| OI 2.8 | Configuration of event-triggered TA report |
| OI 2.9 | Signalling of multiple TACs per PLMN in eMTC and NB-IoT |
| Discontinuous Coverage | OI 3.5 | Decide on whether additional new parameters like satellite footprint reference point on ground, satellite coverage radius can be used? |

 The following 31 contributions [2] ~ [32] are used for making the summary. However, emphasis is given to the Open Item issues, mentioned in *Table 1* above.

|  |  |  |
| --- | --- | --- |
| **Tdoc Number** | **Tdoc Title** | **Company Name** |
| [**R2-2202352**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202352.zip) | Discussion on the additional new parameters for supporting discontinuous coverage for IoT over NTN | Transsion Holdings |
| [**R2-2202414**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202414.zip) | Discussion on the remaining issue of IoT over NTN | Spreadtrum Communications |
| [**R2-2202458**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202458.zip) | Discussion on additional parameters for Non continuous coverage | Intel Corporation |
| [**R2-2202549**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202549.zip) | Location reporting in NAS | Apple |
| [**R2-2202550**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202550.zip) | Support of discontinuous coverage | Apple |
| [**R2-2202559**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202559.zip) | Additional issues on the support of the discontinuous coverage | Qualcomm Incorporated |
| [**R2-2202562**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202562.zip) | Signalling of multiple TACs per PLMN in eMTC and NB-IoT | Qualcomm Incorporated |
| [**R2-2202589**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202589.zip) | Satellite assistance information and exchange for discontinuity Prediction in IoT NTN | Lenovo, Motorola Mobility |
| [**R2-2202615**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202615.zip) | UP leftover issues for IoT-NTN | CMCC |
| [**R2-2202621**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202621.zip) | Discussion on open issues for support of Non continuous coverage | CMCC |
| [**R2-2202729**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202729.zip) | Remaining Issues of CP Impact of IoT over NTN | CMCC |
| [**R2-2202746**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202746.zip) | Remaining issues of user plane in IoT NTN | ZTE Corporation, Sanechips |
| [**R2-2202747**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202747.zip) | Remaining issues of control plane in IoT NTN | ZTE Corporation, Sanechips |
| [**R2-2202748**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202748.zip) | Remaining issues of discontinuous coverage in IoT NTN | ZTE Corporation, Sanechips |
| [**R2-2202749**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202749.zip) | Remaining issues of UE capabilities in IoT NTN | ZTE Corporation, Sanechips |
| [**R2-2202931**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202931.zip) | Discussion on discontinuous coverage | Xiaomi |
| [**R2-2203000**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203000.zip) | Discussion on UP open issues in IoT NTN | OPPO |
| [**R2-2203001**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203001.zip) | Discussion on the open issues of discontinuous coverage for IoT over NTN | OPPO |
| [**R2-2203002**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203002.zip) | Discussion on Control Plane open issues for IoT NTN | OPPO |
| [**R2-2203052**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203052.zip) | On remaining control plane issues for IoT-NTN | Nokia Solutions & Networks (I) |
| [**R2-2203080**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203080.zip) | Further Discussion on the Open Issues of IoT-NTN Control Plane | CATT |
| [**R2-2203081**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203081.zip) | Open Issue on UP and Discontinous Coverage | CATT |
| [**R2-2203192**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203192.zip) | Issues related to IOT NTN RRC running CR | Xiaomi |
| [**R2-2203193**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203193.zip) | Remaining issues of IOT NTN RRC | Xiaomi |
| [**R2-2203222**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203222.zip) | OI 2.9: Signalling of multiple TACs per PLMN in eMTC and NB-IoT | Huawei, HiSilicon |
| [**R2-2203223**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203223.zip) | OI 3.5: Discussion on non continuous coverage | Huawei, HiSilicon |
| [**R2-2203258**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203258.zip) | On IoT NTN open issues for Discontinuous Coverage and User plane | Nokia, Nokia Shanghai Bell |
| [**R2-2203293**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203293.zip) | (O1 3.5) Parameters for coverage gap prediction and Idle mode behaviour | Interdigital, Inc. |
| [**R2-2203453**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203453.zip) | Control plane and discontinuous coverage aspects of IoT NTN | Ericsson |
| [**R2-2203483**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203483.zip) | User plane aspects of NB-IoT and LTE-M in NTNs | Ericsson |
| [**R2-2203**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203530.zip)**530** | On GNSS validity duration reporting | Ericsson, Nokia, Nokia Shanghai Bell, Turkcell, NEC, Qualcomm, ZTE |

# 2 Discussion

2.1 User Plane

The major open issue in User Plane is “***whether SR can be triggered if there is no available or sufficient UL-SCH resources for the triggered TA reporting***”.

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| --- | --- | --- |
| Category | OI Number | Open Item (OI) Issue |
| User Plane | OI 1.10 | Whether SR can be triggered if there is no available or sufficient UL-SCH resources for the triggered TA reporting? |

Out of 6 contributions (R2-2202615, R2-2202746, R2-2203000, R2-2203081, R2-2203248 and R2-2203483), 3 contributions in R2-2202615, R2-2202746 and R2-2203000 supported SR triggering if there is no available or sufficient UL-SCH resources for the triggered TA reporting. On the other hand, 2 contributions in R2-2203248 and R2-2203483 suggested not to trigger SR, as there could be heavy overhead with no additional benefit. The contribution in R2-2203081 suggested to wait for discussions and progress in NR-NTN.

The rapporteur would like to note and mention that this issue was discussed in NR-NTN during RAN2 116bis-e and is also under discussion in “[Pre117-e][NTN][103] MAC open issues (InterDigital)”, with the report available in R2-2203424 [33]. Hence, the rapporteur suggests waiting for the progress and outcome in NR-NTN before discussing this in IoT-NTN.

**Proposal 1: IoT-NTN will wait for progress in NR-NTN regarding *SR triggering if there is no available or sufficient UL-SCH resources for the triggered TA reporting*.**

2.2 Control Plane

The major open issues in Control Plane are listed in the table below:

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| --- | --- | --- |
| Control Plane | OI 2.2 | Decide on Location Reporting by NAS and Coarse location report |
| OI 2.3 | Whether existing offset are sufficient to prioritize TN vs NTN frequencies |
| OI 2.8 | Configuration of event-triggered TA report |
| OI 2.9 | Signalling of multiple TACs per PLMN in eMTC and NB-IoT |

**OI 2.2 Decide on Location Reporting by NAS and Coarse location report**

Out of total 8 contributions (R2-2202414, R2-2202549, R2-2202729, R2-2203002, R2-2203052, R2-2203080, R2-2203193 and R2-2203453), 3 contributions in R2-2202414, R2-2202729 and R2-2203453 suggested sending coarse location reporting before security establishment and location reporting by NAS. On the other hand, 2 contributions in R2-2202549 and R2-2203193 has suggested not to use location information in Rel-17 as UE reported location could be debatable and may require network verification. 3 contributions in R2-2203002, R2-2203052 and R2-2203080 has suggested to wait for LS response from SA2/SA3 before further progress in IoT-NTN.

The rapporteur would like to note and mention that RAN2 had already spend a lot of time in discussion and making agreements on this issue in NR-NTN session. However, SA3 has mentioned not to use location report before security establishment. An LS is sent from RAN2 (R2-2201881) [34] to SA2/RAN3/SA3 for confirming about this location information report. Hence, the rapporteur suggests waiting for the LS response and check any progress and outcome in NR-NTN before discussing this in IoT-NTN.

**Proposal 2: IoT-NTN will wait for the LS Response from SA2/RAN3 before making any discussion and progress in location reporting in IoT-NTN.**

**OI 2.3 Whether existing offset are sufficient to prioritize TN vs NTN frequencies**

Out of 5 contributions (R2-2202414, R2-2202729, R2-2202747, R2-2203002 and R2-2203453), 4 contributions (R2-2202414, R2-2202729, R2-2203002 and R2-2203453 suggested that the same existing offset are sufficient to prioritize TN over NTN frequencies. Only one contribution R2-2202747 suggested using new offset. The rapporteur also agrees with the majority and believes that for non-overlapping frequency bands, existing Rel-16 priorities could be used and for overlapping bands existing offset are sufficient to prioritize TN vs NTN frequencies.

Note that this is also discussed in NR-NTN offline: “**[Pre117-e][102][NTN] Idle mode open issues (ZTE)**”, with report available in R2-2203386 [35]. Based on this report, all the participating companies unanimously agreed to the following proposal: **“No further enhancement on cell reselection priority in NTN”.** Hence, based on this discussion, the rapporteur suggests reusing the NR-NTN’s proposal:

**Proposal 3: No further enhancement on cell reselection priority in NTN. Existing offset are sufficient to prioritize TN over NTN frequencies.**

**OI 2.8 Configuration of event-triggered TA report**

All the 4 contributions (R2-2203002, R2-2203052, R2-2203080 and R2-2203483) on configuration of event triggered TA report have suggested using of an offset threshold for event triggered TA report configuration.

This is also discussed in NR-NTN offline: “**[****Pre117-e][NTN][101] RRC open issues**”, with report available in R2-2203154 [36].Hence, based on all the Tdoc contributions and progress in NR-NTN, the rapporteur suggests the following proposal:

**Proposal 4: Configuration of event triggered TA report will include TA offset threshold between current TA and the last successfully reported TA (similar to NR-NTN). FFS: The value of the TA offset threshold (consider possible to align with NR-NTN values).**

O**I 2.9 Signalling of multiple TACs per PLMN in eMTC and NB-IoT**

A set of four contributions (R2-2202562, R2-2202729, R2-2203052 and R2-203222) are submitted on multiple TACs and associated signalling. While the contributions in R2-2202562 and R2-2202729 suggested a maximum 12 TACs per PLMN (similar to NR-NTN), the contribution in R2-203222 mentions about RRC signalling details required for supporting multiple TACs in eMTC and NB-IoT. Hence, based on these contributions the rapporteur suggests the following proposals:

**Proposal 5: RAN2 will use the NR-NTN agreements of up to a maximum of 12 TACs per cell for NGSO. RAN2 will discuss the corresponding changes needed in RRC 36.331 CR.**

2.3 Discontinuous Coverage

The major open issue in Discontinuous Coverage is to decide on “**whether additional new parameters like satellite footprint reference point on ground, satellite coverage radius can be used**”.

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| --- | --- | --- |
| Discontinuous Coverage | OI 3.5 | Decide on whether additional new parameters like satellite footprint reference point on ground, satellite coverage radius can be used? |

A set of 13 contributions (R2-2202352, R2-2202458, R2-2202559, R2-2202589, R2-2202621, R2-2202748, R2-2202931, R2-2203001, R2-2203081, R2-2203223, R2-2203258, R2-2203293 and R2-2203453) are submitted on this Discontinuous Coverage. All the contributions suggested use of additional new parameters, like cell coverage or reference point on the ground for supporting Discontinuous Coverage.

The rapporteur agrees and acknowledges that there is a considerable support from many companies to include additional, new parameters for supporting Discontinuous Coverage. However, given the strict TU budget, and completion of IoT-NTN Work Item (WI) in RAN1, the rapporteur feels it is difficult to complete the definition and inclusion of these additional new parameters without RAN1 involvement. Hence, the rapporteur suggests discussing this during the online meeting:

**Proposal 6: RAN2 to discuss if additional new parameters, like satellite footprint reference point on ground, satellite coverage radius can be defined and used.**

2.4 Other Issues

The joint (co-source) contribution in R2-2203530 [32] has mentioned concerns about RAN2 116bis-e agreements on GNSS validity. According to this contribution it would make IoT NTN challenging for network operations if the network is not aware of GNSS validity duration. According to this contribution if the GNSS validity timer is set to a low value by the UE and the UE goes to idle mode without the network being aware and the network then attempts to reach the UE there could be problem. When UE is unreachable, it is difficult for the network to know what to do with the UE resources and there is a risk that significant resources are wasted on UEs that have gone to idle mode. Hence, it is suggested that UE reports the remaining GNSS validity duration to the network. As the related agreements are already made, the rapporteur suggests discussing this issue:

**Proposal 7: RAN2 to discuss if it is necessary for the UE to report the remaining GNSS validity duration to the network.**

# 5 Conclusion

**Proposal 1: IoT-NTN will wait for progress in NR-NTN regarding SR triggering if there is no available or sufficient UL-SCH resources for the triggered TA reporting.**

**Proposal 2: IoT-NTN will wait for the LS Response from SA2/RAN3 before making any discussion and progress in location reporting in IoT-NTN.**

**Proposal 3: No further enhancement on cell reselection priority in NTN. Existing offset are sufficient to prioritize TN over NTN frequencies.**

**Proposal 4: Configuration of event triggered TA report will include TA offset threshold between current TA and the last successfully reported TA (similar to NR-NTN). FFS: The value of the TA offset threshold (consider possible alignment with NR-NTN values).**

**Proposal 5: RAN2 will use the NR-NTN agreements of up to a maximum of 12 TACs per cell for NGSO. RAN2 will discuss the corresponding changes needed in RRC 36.331 CR.**

**Proposal 6: RAN2 to discuss if additional new parameters, like satellite footprint reference point on ground, satellite coverage radius can be defined and used.**

**Proposal 7: RAN2 to discuss if it is necessary for the UE to report the remaining GNSS validity duration to the network.**

# 6 References

1. R2-117-e Agenda v5.0
2. R2-2202352 Discussion on the additional new parameters for supporting discontinuous coverage for IoT over NTN Transsion Holdings
3. R2-2202414 Discussion on the remaining issue of IoT over NTN Spreadtrum Communications
4. R2-2202458 Discussion on additional parameters for Non continuous coverage Intel Corporation
5. R2-2202549 Location reporting in NAS Apple
6. R2-2202550 Support of discontinuous coverage Apple
7. R2-2202559 Additional issues on the support of the discontinuous coverage Qualcomm Incorporated
8. R2-2202562 Signalling of multiple TACs per PLMN in eMTC and NB-IoT Qualcomm Incorporated
9. R2-2202589 Satellite assistance information and exchange for discontinuity Prediction in IoT NTN Lenovo, Motorola Mobility
10. R2-2202615 UP leftover issues for IoT-NTN CMCC
11. R2-2202621 Discussion on open issues for support of Non continuous coverage CMCC
12. R2-2202729 Remaining Issues of CP Impact of IoT over NTN CMCC
13. R2-2202746 Remaining issues of user plane in IoT NTN ZTE Corporation, Sanechips
14. R2-2202747 Remaining issues of control plane in IoT NTN ZTE Corporation, Sanechips
15. R2-2202748 Remaining issues of discontinuous coverage in IoT NTN ZTE Corporation, Sanechips
16. R2-2202749 Remaining issues of UE capabilities in IoT NTN ZTE Corporation, Sanechips
17. R2-2202931 Discussion on discontinuous coverage Xiaomi
18. R2-2203000 Discussion on UP open issues in IoT NTN OPPO
19. R2-2203001 Discussion on the open issues of discontinuous coverage for IoT over NTN OPPO
20. R2-2203002 Discussion on Control Plane open issues for IoT NTN OPPO
21. R2-2203052 On remaining control plane issues for IoT-NTN Nokia Solutions & Networks (I)
22. R2-2203080 Further Discussion on the Open Issues of IoT-NTN Control Plane CATT
23. R2-2203081 Open Issue on UP and Discontinous Coverage CATT
24. R2-2203192 Issues related to IOT NTN RRC running CR Xiaomi
25. R2-2203193 Remaining issues of IOT NTN RRC Xiaomi
26. R2-2203222 OI 2.9: Signalling of multiple TACs per PLMN in eMTC and NB-IoT Huawei, HiSilicon
27. R2-2203223 OI 3.5: Discussion on non continuous coverage Huawei, HiSilicon
28. R2-2203258 On IoT NTN open issues for Discontinuous Coverage and User plane Nokia, Nokia Shanghai Bell
29. R2-2203293 (O1 3.5) Parameters for coverage gap prediction and Idle mode behaviour Interdigital, Inc.
30. R2-2203453 Control plane and discontinuous coverage aspects of IoT NTN Ericsson
31. R2-2203483 User plane aspects of NB-IoT and LTE-M in NTNs Ericsson
32. R2-2203530 On GNSS validity duration reporting Ericsson, Nokia, Nokia Shanghai Bell, Turkcell, NEC, Qualcomm, ZTE.
33. R2-2203424 [Pre117-e][NTN][103] MAC open issues (InterDigital)
34. R2-2201881 LS on UE location during initial access in NTN
35. R2-2203386 Pre117-e][102][NTN] Idle mode open issues (ZTE)
36. R2-2203154 Pre117-e][NTN][101] RRC open issues (Ericsson)