**3GPP TSG-RAN WG2 Meeting #115-e R2-21xxxxx**

**Online, Aug 16th – Aug 27th, 2021**

**Agenda item: 9.2.2**

**Source: MediaTek Inc.**

**Title: Summary of 9.2.2 Non continuous coverage**

**Document for: Discussion and Decision**

# 1 Introduction

This contribution is aimed at providing a summary of contributions submitted in Section 9.2.2 of IoT-NTN, identify potential agreements, (including confirming SI agreements), open points, potential alternatives, and further enhancements. The 16 contributions [2] ~ [17] are summarized.

**Note-1**: RAN Plenary (RP) recommendations are to keep scope small when assessing the proposals, i.e. focus on essential enhancements. Non-essential enhancements should be considered only if impact is small.

* [AT115-e][036][IoT-NTN] Non continuous coverage (Mediatek)

 Scope: Treat documents under 9.2.2. Identify potential agreements (e.g. confirm agreements from SI), Open points, potential alternatives, potential further enhancements.

 Intended outcome: Report

 **Deadline: CB Monday W2**

 Deadline for company’s input: **Friday Aug 20 11:00 UTC**

 Deadline for rapporteur’s summary: **Friday Aug 20, 19:00 UTC**

**Note-2**: As TN-NTN mobility is out-of-scope of this Work Item, any contribution corresponding to TN-NTN mobility is not discussed in this summary.

# 2 Contact Information

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# 3 Non Continuous Coverage

In the RAN2#114-e meeting, the Study Item (SI) on IoT-NTN was concluded with the following agreements on discontinuous coverage and power savings issues.

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| * [032] 9: From RAN2 point of view, the existing power saving mechanisms e.g. DRX, PSM, eDRX, relaxed monitoring, and WUS can be reused without enhancement. Can consider enhancements if found needed, to support discontinuous coverage.
* [032] 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, and that this is applicable for all reference scenarios (GEO, MEO and LEO).
* [032] 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 for GEO may be considered in WI phase. (no major changes for adaptation is assumed).
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Almost all the contributions [2] ~ [17] agree that discontinuous coverage without excessive UE power consumption is a necessary topic. The contribution in [6] has also observed the need for specification work to ensure IoT NTN devices can make use of the brief connection opportunities presented by sparse IoT NTN constellations. Hence, before proceeding into the discussion on discontinuous coverage and associated solutions, the rapporteur would like to confirm the study item agreements, made in RAN2#114-e, regarding the necessity of discontinuous coverage without excessive UE power consumption.

**Question 1: As agreed during the SI (RAN2#114bis-e), do companies confirm that support of discontinuous coverage, without excessive UE power consumption and without excessive failures/recovery actions, is essential, at least for Idle mode?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
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**<Rapporteur Summary>**

3.1 Satellite Assistance and Coverage Prediction

A wide majority (12/16) of the contributions [2], [3], [5], [8], [9], [10], [11], [13], [14], [15], [16] and [17] have mentioned providing some form of satellite assistance to the UEs, so that UE can predict the discontinuity of satellite coverage. Based on these contributions, the rapporteur would like to ask the following question”

**Question 2: Do companies agree that satellite assistance (e.g. ephemeris information) will be useful to the UE for predicting coverage discontinuity and stopping unnecessary cell search in the Idle mode? The details of the assistance information is FFS and RAN2 will use any corresponding agreements made in NR-NTN.**

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| **Company** | **Yes / No** | **Additional comments** |
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**<Rapporteur Summary>**

If the answer to Question 1 is “Yes”, then the UEs should be able to use the assistance information to predict the coverage discontinuity, stop any cell search [2], [5], [13] and enters in the dormant state [3]. The details of UE’s prediction on discontinuous coverage [9], [15], [16], [17] and its ability to detect when it is back in coverage and establish an RRC connection with the network is up to the UE implementation [8], [15]. Based on this information the rapporteur would like to ask the following question:

**Question 3: Do companies agree that the details of UE’s prediction of discontinuous coverage and its ability to detect when it is back in coverage with the network is up to UE implementation?**

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| **Company** | **Yes / No** | **Additional comments** |
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**<Rapporteur Summary>**

3.2 Paging Issues

Contributions in [3], [5], [7], [8], [12], and [14] has mentioned the paging issues. As UEs in discontinuous coverage will be unable to monitor paging occasions, RAN should consider the UE unreachable (e.g., for paging purposes) and network should page the UE only when UE is in the coverage. Contributions in [8], [8] and [14] has raised the point of sending an LS to other groups, like SA2, CT1 and RAN3 for possible alignment work in their specification due to the support of discontinuous coverage as the core network needs to predict UE’s stay in the coverage hole to avoid paging the UE while it is out of coverage. Based on this, the rapporteur would like to ask the following question:

**Question 4: Do the companies agree that RAN2 needs to send an LS to SA2 and CT1 (cc: RAN3) for the possible alignment work in their specification due to the support of discontinuous coverage.**

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| **Company** | **Yes / No** | **Additional comments** |
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**<Rapporteur Summary>**

# 4 Power Savings

During the Study Item phase, power savings was discussed and it was agreed that existing power saving mechanisms, like DRX, PSM, eDRX, relaxed monitoring, and WUS can be reused without enhancement. Enhancements can be considered, if found needed, to support discontinuous coverage. Contributions in [2], [7], [12], [13], [14], [15], and [16] mentioned about power savings. Hence, the rapporteur would like to confirm the study item agreements, made in RAN2#114-e, regarding the power savings.

**Question 5: As agreed during the SI (RAN2#114bis-e), do companies confirm that from RAN2 point of view, the existing power saving mechanisms e.g. DRX, PSM, eDRX, relaxed monitoring, and WUS can be reused without enhancement. Enhancements can be considered, if found needed, to support discontinuous coverage?**

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| **Company** | **Yes / No** | **Additional comments** |
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**<Rapporteur Summary>**

During the Study Item, it was also agreed in RAN2#114bis-e that enhancements to connected mode power savings are not essential. However, minor adaptations for supporting NTN deployments can be considered. Hence, based on this the rapporteur would like to confirm the following question:

**Question 6: As agreed during the SI (RAN2#114bis-e), do companies confirm that enhancements for power saving in connected mode power are not essential? Minor adaptations (no major changes) to enable support in NTN deployment of existing features e.g. EDT, PUR for GEO may be considered.**

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| **Company** | **Yes / No** | **Additional comments** |
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**<Rapporteur Summary>**

# 5 Other Aspects

Other aspects in discontinuous coverage include

* Specifying assistance information that UE can provide to enable the network to detect when and where the UE will be back in coverage [8], [11], [16]
* Extension and updates of related timers, e.g. T301, T320 or T322 [9]
* Details of RRC release initiated by network or by the UE [4]
* Configuring paging windows based on the presence or outage of satellite coverage [12]

However, these details of UE assistance, timer extensions and RRC Release can be discussed once some basic progress and agreements in discontinuous coverage are made.

# 7 Conclusion

**<To be updated after responses from the companies are collected Rapporteur Summary>**

# 8 References

1. RAN2-114-e ChairmanNotes EOM Rev2.
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3. [R2-2107319](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107319.zip), Discussion on discontinuous coverage, CATT.
4. [R2-2107400](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107400.zip), UE behavior for Discontinuous coverage in NTN IoT, Rakuten.
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6. [R2-2107453](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107453.zip), On LEO satellite flyover timing and discontinuous coverage, Eutelsat.
7. [R2-2107559](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107559.zip), Support of non-continuous coverage, Qualcomm Inc.
8. [R2-2107613](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107613.zip), Support of discontinuous coverage, Apple
9. [R2-2107765](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107765.zip), Support of discontinuous coverage in IoT NTN, ZTE, Sanechips
10. [R2-2107913](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107913.zip), Enhancement for idle UE power saving in discontinuous coverage, Lenovo, Motorola Mobility
11. [R2-2107914](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107914.zip), RRC connection handling for discontinuous coverage in IoT NTN, Lenovo, Motorola Mobility
12. [R2-2108116](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2108116.zip), On support of Non-continuous coverage, Nokia, Nokia Shanghai Bell.
13. [R2-210](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105254.zip)8171, Discussion on discontinuous coverage, Xiaomi.
14. [R2-2108325](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2108325.zip), Support of Non continuous coverage, NEC.
15. [R2-2108336](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2108336.zip), On Discontinuous coverage in IoT-NTN, MediaTek.
16. [R2-2108500](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2108500.zip), Discussion on support of Non continuous coverage, CMCC.
17. [R2-2108740](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2108740.zip), Discontinuous coverage in IoT NTN, Ericsson