**3GPP TSG RAN WG1 #109-e R1-220xxxx**

**e-Meeting, May 9th – 20th, 2022**

**Agenda item:** 8.14

**Source:** Moderator (MediaTek)

**Title:** Moderator Summary for preparation phase on maintenance of Rel-17 WI on NB-IoT/eMTC support for Non-Terrestrial Network

**Document for:** Discussion and Decision

## Introduction

The issues in contributions submitted to RAN1#109e for Re-17 IoT NTN are summarized in the tables of section 2. An initial assessment on each of the maintenance issues is provided based on the following classification:

* *High priority (H):* high-priority item (essential, pending issues, broken spec components) and proposed editorial changes that either enhance the clarity of the specs or correct mistakes
* *Non-essential (N)*: all other purposes such as spec optimization and low priority issues
* *Editorial (E)*: editorial issues that will be handled as editorial CRs (to be communicated to the editors/chairs)

## Issues for agenda item “8.14 Maintenance on NB-IoT/eMTC support for Non-Terrestrial Network”

**Table 1 – Issues on time/frequency sync**

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| **Issue#** | **Issue** | **References** | **FL initial assessment** | **Company inputs (if any)** |
| 1-1 | [description of the issue]  Capture RAN1#107e agreement on UE behaviour and Single UE capability for UL segmented transmission in specifications  FL Note: Can be discussed in 8.16.14 UE features. RAN2 captures single UE capability (TS 36.306). RAN1 capture UE behaviour (TS 36.211) | R1-2203232, 3386,3632,3722, 3839, 4997 | E | Nokia, NSB: As mentioned in contributions, most companies think this should be specified in RAN1. The detail of UE capability should be firstly discussed and agreed in 8.14 before forward to 8.16.14. The detail of how to apply segment pre-compensation should be captured in spec and should be discussed in 8.14. We think **Issue #1-1 should be with high priority.**  **[ZTE]**: We are supportive of capturing UE behaviour in TS 36.211 as FL drafted in RAN1#108e. And the UE capability should also be discussed in 8.16.14.  **[Thales]:** Agree with FL initial assessment  [**SONY**]: We think this issue should be **high priority**. There was a lot of discussion on this in RAN1#108e so it doesn’t seem to just be an editorial issue. How the gaps are created needs to be discussed (e.g. in section 5.3.4 of TS36.211). We also think that is a necessary to discuss how pre-compensation is applied within a segment.  **[Lockheed Martin]** Agree with the FL.  **[Qualcomm]:** High priority. Needs to be captured in the specifications.  **[Spreadtrum]:** High priority. The detail of how to apply segment pre-compensation should be captured in TS 36.211 and discussed in 8.14.  **[Xiaomi]:** We are supportive of capturing UE behavior in RAN1 spec.  **[Huawei, HiSilicon]**: support to capture the UE behavior in (TS 36.211).  **[Mediatek]**: Single UE capability can be discussed in AI 8.16.14 (and captured in RAN2 spec in TS 36.306). We are fine with RAN1 capture UE behaviour in TS 36.211. |
| 1-2 | NTN SIB accumulation across SI windows  FL Note: Ran1 can discuss if NTN-specific SIB is updated per SI window / accumulated across SI windows | R1-2203232, 3386, 3632,3722 3769 | H | [Companies will fill input their views here]  **[ZTE]**: We are fine to discuss this issue and think SI should be updated per SI window to avoid ambiguity of epoch time indication.  **[Thales]:** Agree with FL initial assessment  [**SONY**] Agree that this is **high priority**. We also discuss this issue in section 3 of 3722  **[Lockheed Martin]** Agree with the FL.  **[Qualcomm]:** OK to discuss.  **[Spreadtrum]:** Agree with the FL.  **[Xiaomi]:** Supportive to discuss this issue.  **[Huawei, HiSilicon]**: Support SIB can be accumulated across SI windows. It can avoid extra restriction to the gNB and align with the current specification design. The end of the first SI window is the epoch time during update period of assistance information  **[Mediatek]**: Agree with priority and FL note. |
| 1-3 | Frequency pre-compensation description in TS 36.211  FL Note: Frequency pre-compensation captured in TS 36.300. RAN1#108e discussed further capture in TS 36.211 without consensus. | R1-2204997 | N | [Companies will fill input their views here]  **[ZTE]**: Agree with FL initial assessment. This is not essential issue in maintenance phase.  **[Thales]:** Agree with FL initial assessment. Frequency pre-compensation was already captured in TS 36.300. Further discussion to capture it in TS 36.211 is not needed.  **[Lockheed Martin]** Agree with the FL. A more detailed description would be desirable.  **[Qualcomm]:** OK to go with consensus (but this eventually needs to be added at some point in the future…)  **[Xiaomi]:** Agree with the FL.  **[Huawei, HiSilicon]**: Support to capture the Frequency pre-compensation captured in TS 36.300.  **[MediaTek]**: We are fine with FL Note. |
| 1-4 | SFN indicating Epoch time  FL Note: RAN1#108-e working assumption is “adopt NR NTN solution for interpretation SFN indicating Epoch time”. **Discuss in 8.4 NR NTN** | R1-2203232, 3289, 3386, 3632, 3722, ~~3769,~~ 3839, 4217 | H | **[Thales]:** Agree with FL initial assessment and FL Note  **[Lockheed Martin]** Agree with the FL.  **[Qualcomm]:** We can follow NR-NTN, I guess.  **[Spreadtrum]:** Agree with the FL.  **[Xiaomi]:** Agree with the FL.  **[Huawei, HiSilicon]**: support to adopt NR NTN solution.  **[MediaTek]**: Agree with FL, support to adopt NR NTN solution. |
| 1-5 | Negative TACommonDriftVariation values  FL Note: RAN1#108-e working assumption is “adopt NR NTN solution for negative TACommonDriftVariation values”. **Discuss in 8.4 NR NTN** | R1-2203386, 3632, 3722, 4997 | H | **[Thales]:** Agree with FL initial assessment and FL Note  [**SONY**] Agree that this can be discussed in 8.4 and is **high priority**.  Please note that this issue is not addressed in 3722. 3722 section 6 discusses Negative TACommon. Can this please be added as issue 1-8. We think **1-8 is high priority**.  Issue 1-8 could read:  Negative TACommon values  FL Note: Need to come to a conclusion for whether Negative TACommon is supported to compensate for TA overestimation as this issue affects other WGs. **The outcome is also applicable to 8.4**.  **[Lockheed Martin]** Agree with the FL.  **[Qualcomm:]** Can follow NR-NTN  **[Spreadtrum]:** Agree with the FL.  **[Huawei, HiSilicon]**: support to adopt NR NTN solution.]  **[MediaTek]**: Agree with FL, support to adopt NR NTN solution.  **[Moderator] On SONY comment, issue of negative common TA / Initial TA over compensation was discussed in 8.4. RAN1#107e concluded not to define TA margin. Issue is still open in 8.4, where Moderator recommended proponent company to have offline discussions with other companies to check/discuss if an enhancement of NTA at initial access is deemed necessary. This issue is being discussed in preparation phase in 8.4 in RAN1#109-e.**  **We can wait for conclusion of preparation phase in 8.4, as FL commented in 8.4 “As long as the UE initial transmission error does not exceed Te\_NTN specified by RAN4 (At FR1: 30% of CP in case of SCS of uplink signals is 30 kHz and only 18% of CP in case of 15 kHz) an over-estimation of Initial TA estimation is not a major issue, at least at FR1.**  **For FR2, anyway the requirement of GNSS accuracy and serving-satellite position estimation error are still to be defined (to be tighter in FR2 than FR1 due to the shorter CP length).**  **This is issue might be discussed as part of Release- 18 package; under sub-AI Other.“.** |
| 1-6 | Common Delay formula in TS 36.213  FL Note: Adopt NR NTN agreement for IoT NTN**. Discuss in 8.4 NR NTN** | R1-2203386, 3722 | H | **[Thales]:** Agree with FL initial assessment and FL Note  [**SONY**] Agree. The SONY Tdoc in IoT-NTN is actually 3722, but the substantial part of the proposal is in 3721.  **[Lockheed Martin]** Agree with the FL.  **[Qualcomm:]** Can follow NR-NTN  **[Spreadtrum]:** Agree with the FL.  **[Huawei, HiSilicon]:** support to adopt NR NTN solution.  **[MediaTek]**: Agree with FL, support to adopt NR NTN solution. |
| 1-7 | Reference Frame for Ephemeris Set 2 – Orbital parameters  FL Note: This is new issue also for NR NTN. Adopt NR NTN agreement for IoT NTN**. Discuss in 8.4 NR NTN** | R1-2203386 | H | **[Thales]:** Agree with FL initial assessment and FL Note  **[Lockheed Martin]** Agree with the FL.  **[Qualcomm:]** Can follow NR-NTN  **[Spreadtrum]:** Agree with the FL.  **[Huawei, HiSilicon]**: support to adopt NR NTN solution.  **[MediaTek]**: Agree with FL, support to adopt NR NTN solution. |
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**Table 2 – Issues on timing relationship**

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| **Issue#** | **Issue** | **References** | **FL initial assessment** | **Company inputs (if any)** |
| 2-1 | NPDCCH Monitoring restrictions (case 1-6)  FL: this issue has been discussed in at least 3 meetings. The spec could be clearer but all companies seemed to agree at last meeting that the spec is not wrong. | R1-2203089, R1-2203386, R1-2203991 | E | **[Qualcomm:]** See comment on 2-4 [can be merged]. |
| 2-2 | NPDCCH Monitoring restrictions (case 7-10) for misaligned UL and DL frame timing  FL: there seems to be a particular issue warranting a second look when UL and DL frame timing is not aligned. | R1-2203089, R1-2203386, R1-2203722 | H | [**Mavenir**] This hasn’t been discussed yet and should be captured in this meeting. |
| 2-3 | Address NPDCCH monitoring restrictions for subframes post-NPUSCH  FL: this is the case in Rel16 and so RAN1 should make sure it is maintained in Rel17 | R1-2204997 | E | [**SONY**] Isn’t this the same issue as 2-2? Even if it were a different issue, shouldn’t 2-2 and 2-3 have the same H/E classification?  **[Qualcomm]** This needs to be captured and is high priority. |
| 2-4 | Consistency of use between logical time and physical time in timing relationship descriptions  FL: this will help make the spec clearer with respect to Issue#2-1 for example. | R1-2204997 | E | **[Lockheed Martin]** Agree with the FL.  **[Qualcomm]** We do not know if “E” is appropriate for this. While many companies agree that the specs are not clear, there needs to be some discussion on possible alternatives to make it clearer/more consistent. To us, at least a discussion on this—to test out the alternative descriptions—should be entertained. |
| 2-5 | Capture RAN1#108e agreement on calculation of UE-eNB RTT  FL: this agreement was made in the last meeting and should be incorporated in the spec. | R1-2203386 | E | **[Lockheed Martin]** Agree with the FL. |
| 2-6 | IoT NTN WI has dealt only with FDD. Maintain legacy behaviour in specs for TDD TS36.213 clauses 16.4.2, 16.5.1, 10.2  FL: Makes sense not to change spec in the case of TDD | R1- 2203632 | E | Ericsson: The spec for 16.4.2 and 16.5.1 also needs to be revised to correctly capture the timing relationship enhancement by Koffset. Therefore, we suggest including an additional issue “2-7” on this topic. |
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## Conclusion

Based on the responses from participating companies during the preparation phase, the final FL recommendation is:

Time and frequency synchronization issues:

Issue 1-1: Capture RAN1#107e agreement on UE behaviour and Single UE capability for UL segmented transmission in specifications (H)

* Single UE capability can be discussed in AI 8.16.14 UE features for IoT NTN, RAN2 can capture single UE capability in RAN2 spec in TS 36.306.
* Capture UE behaviour in RAN1 spec in TS 36.211 can be discussed in AI 8.14 IoT NTN

Issue 1-2 NTN SIB accumulation across SI windows (H)

* RAN1 can discuss if NTN-specific SIB is updated per SI window / accumulated across SI windows

Issue 1-3 Frequency pre-compensation description in TS 36.211 (N)

* Frequency pre-compensation captured in TS 36.300. RAN1#108e discussed further capture in TS 36.211 without consensus. There seems to be reasonable consensus that description in TS 36.300 is sufficient at this stage.

RAN1 can discuss in 8.4 NR NTN issues for time and frequency synchronization aspects common to NR NTN and IoT NTN and adopt conclusions and agreements for these issues for IoT NTN

* Issue 1-4: SFN indicating Epoch time (H)
* Issue 1-5: Negative TACommonDriftVariation values (H)
* Issue 1-6: Common Delay formula in TS 36.213 (H)
* Issue 1-7: Reference Frame for Ephemeris Set 2 – Orbital parameters (H)

Timing relationships issues:

Issue 2-1: NPDCCH Monitoring restrictions (case 1-6) (E)

Issue 2-2: NPDCCH Monitoring restrictions (case 7-10) for misaligned UL and DL frame timing (H)

* RAN1 can further discuss issue when UL and DL frame timing is not aligned.

Issue 2-3: Address NPDCCH monitoring restrictions for subframes post-NPUSCH (H)

* RAN1 can further discuss whether this is same issue as in 2-2.

Issue 2.4: Consistency of use between logical time and physical time in timing relationship descriptions (E)

* RAN1 can further discuss to make the spec clearer with respect to Issue#2-1 for example.

Issue 2.5: Capture RAN1#108e agreement on calculation of UE-eNB RTT (E)

* Adopt editorial change in TS 36.213 Section 6.1 and Section 16.3.1 as proposed by Feature Lead in RAN1#108e

Issue 2.6: IoT NTN WI has dealt only with FDD (E)

* RAN1 should maintain legacy behaviour in specs for TDD TS36.213 clauses 16.4.2, 16.5.1, 10.2 (E)

# References

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| --- | --- | --- | --- |
| 1 | R1-2203089 | Maintenance on NB-IoT/eMTC support for Non-Terrestrial Network | Huawei, HiSilicon |
| 2 | [**R1-2203232**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203232.zip) | Remaining issues on IoT-NTN | ZTE |
| 3 | R1-2203316 | Maintenance on NB-IoT/eMTC support for Non-Terrestrial Network | Spreadtrum |
| 4 | [**R1-2203386**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203386.zip) | Maintenance on NB-IoT/eMTC to support NTN | MediaTek |
| 5 | R1-2203632 | On IoT NTN maintenance issues | Ericsson |
| 6 | R1-2203732 | Maintenance of IoT-NTN | SONY |
| 7 | R1-2203769 | Remaining issues on IoT NTN | Xiaomi |
| 8 | R1-2203839 | Maintenance on NB-IoT/eMTC support for Non-Terrestrial Network | Nokia, Nokia Shanghai |
| 9 | R1-2203991 | Discussion on remaining issues for NB-IOT/eMTC NTN | OPPO |
| 10 | [**R1-2204217**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204217.zip) | On remaining issues of IoT NTN | Apple |
| 11 | [**R1-2204997**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204997.zip) | Maintenance on IoT-NTN | Qualcomm |
| 12 | [R1-2204934](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204934.zip) | Timing Relationship Enhancements | Mavenir |