3GPP TSG-RAN WG2 Meeting #116bis Electronic R2-22xxxxx

Elbonia, January 2022

**Agenda item: 8.10.1**

**Source: ZTE corporation, Sanechips**

**Title: List of 38.304 open issues (ZTE)**

**Document for: Discussion and Decision**

# 1 Introduction

This is the summary of the following email discussion after RAN2#116bis-e meeting.

* [Post116bis-e][108][NTN] 38.304 running CR and list of open issues (ZTE)

Scope: Update the 38.304 running CR and define the list of 38.304 open issues

Intended outcome: Endorsed RRC running CR and list of open issue

Deadline (for companies' feedback): Friday 2022-01-28 0800 UTC

Deadline (for updated running CR in R2-2201897 and list of open issues in R2-2201898): Friday 2022-01-28 1600 UTC

# 2 Contact information

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| --- | --- |
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# 3 Open issue list

* **Each open issue** should be associated with **suggested treatment/handling**.
	1. **Company input into Pre117-e-offline (i.e. no company tdocs)**
	2. Company tdocs invited.
	3. CR rapporteur handled issue (CR rapporteur will propose resolution as input to next meeting).
	4. Other, e.g. immature area, reference to dependency, unclear status etc.

**Open issue 1:** Which option to adopt for location-based reselection?

- Option 1: only neighbor cells with distance shorter than a threshold will be considered during cell reselection;

- Option 1b: exclude neighbor cells too far away i.e., distance longer than a threshold will not be considered during cell reselection;

- Option 2: distance based ranking is used together with legacy R criteria.

- Other options?

**Open issue 2:** For cell selection and reselection in NTN, the satellite/HAPS ephemeris may be used by UE. The ephemeris is divided into serving cell’s ephemeris and neighbor cells’ ephemeris. FFS on the definition of satellite/HAPS ephemeris, under what circumstance UE will perform cell selection/reselection based on satellite/HAPS ephemeris and how would the serving cell’s ephemeris and neighbor cells’ ephemeris differ regarding e.g. the required accuracy or signaling impact.

**Open issue 3:** Whether Time-based and location-based reselection can be configured simultaneously? If Yes, what is the expected UE behavior when configured together?

**Open issue 4:** Any further enhancement on cell reselection priority configuration in NTN?

**Open issue 5:** Whether the timing information about new upcoming cell is needed for quasi-earth fixed cell and/or earth moving cell? FFS if such information is known from system information and/or the ephemeris. FFS on the utilization of such information.

**Open issue 6:** Regarding UE-based solution for SMTC adjustments in idle and inactive mode, UE autonomously adjust the SMTCs based on location and ephemeris. FFS whether NW assistance information is provided.

**Open issue 7:** Any enhancement on the SMTC broadcast for measurements in idle and inactive mode?

**Open issue 8:** Any enhancement on TN prioritization over NTN?

**Open issue 9:** How to prevent non-NTN capable UEs from accessing an NTN cell?

**Q: Please list more open issues**

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| Company | Issues |
| Huawei, HiSilicon | Issue 10: How to determine whether an NTN cell is quasi-fixed or moving?If neither t-Service nor reference location is broadcast, how can the UE know whether it is quasi-fixed cell or moving cell?If the cell is a moving cell, UE may need to predict the reference location by combing the moving trajectory and the coverage information, in order to perform location-based reselection or location-based CHO.Issue 11: Solving the FFS in the following agreement:1. The ntnUlSyncValidityDuration applies to the whole SIBX. UE acquires the updated SIBX when the timer expires. FFS whether to also include it in the LS to RAN1. FFS if this applies only to Connected mode or to idle mode UE as well

In our understanding, the validity timer for UL sync information is only for Connected mode UEs. Because the UL sync information (ephemeris, common TA) is mainly used for pre-compensation and timer adjustment. Other information like t-Service and reference location are useful for idle mode UEs, but these information does not change frequently so Idle mode UEs don’t need to re-acquire the SIBx whenever validity timer expires. |
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# 4 Updated Open issue list

**Open issue 1:** Which option to adopt for location-based reselection?

- Option 1: only neighbor cells with distance shorter than a threshold will be considered during cell reselection;

- Option 1b: exclude neighbor cells too far away i.e., distance longer than a threshold will not be considered during cell reselection;

- Option 2: distance based ranking is used together with legacy R criteria.

- Other options?

**Open issue 2:** For cell selection and reselection in NTN, the satellite/HAPS ephemeris may be used by UE. The ephemeris is divided into serving cell’s ephemeris and neighbor cells’ ephemeris. FFS on the definition of satellite/HAPS ephemeris, under what circumstance UE will perform cell selection/reselection based on satellite/HAPS ephemeris and how would the serving cell’s ephemeris and neighbor cells’ ephemeris differ regarding e.g. the required accuracy or signaling impact.

**Open issue 3:** Whether Time-based and location-based reselection can be configured simultaneously? If Yes, what is the expected UE behavior when configured together?

**Open issue 4:** Any further enhancement on cell reselection priority configuration in NTN?

**Open issue 5:** Whether the timing information about new upcoming cell is needed for quasi-earth fixed cell and/or earth moving cell? FFS if such information is known from system information and/or the ephemeris. FFS on the utilization of such information.

**Open issue 6:** Regarding UE-based solution for SMTC adjustments in idle and inactive mode, UE autonomously adjust the SMTCs based on location and ephemeris. FFS whether NW assistance information is provided.

**Open issue 7:** Any enhancement on the SMTC broadcast for measurements in idle and inactive mode?

**Open issue 8:** Any enhancement on TN prioritization over NTN?

**Open issue 9:** How to prevent non-NTN capable UEs from accessing an NTN cell?

**Open issue 10:** Does UE need to be aware whether an NTN cell is quasi-fixed or earth moving? If Yes, how?

**Open issue 11:** 1. The ntnUlSyncValidityDuration applies to the whole SIBX. UE acquires the updated SIBX when the timer expires. FFS whether to also include it in the LS to RAN1. FFS if this applies only to Connected mode or to idle mode UE as well.

# Annex – Agreements for idle/inactive mode in NTN

## RAN2#111e

Agreements:

1. Cell selection / reselection in NR is the baseline in NTN idle mode procedure.
2. Satellite/HAPS ephemeris based cell selection and reselection should be defined for NTN (FFS what the term satellite/HAPS ephemeris actually means). FFS when this ephemeris based cell selection / reselection can be used. FFS whether UE location (and/or other information) based cell selection and reselection should be introduced for NTN
3. The satellite ephemeris should be provided to UE, at least for Satellite/HAPS ephemeris based cell selection and reselection (FFS what the term satellite/HAPS ephemeris actually means).
4. The network type (i.e. TN or NTN) should be known to UE. FFS whether to achieve this in an implicit or explicit way.
5. The existing cell reselection priority configuration can be taken as a baseline in NTN. FFS on any further enhancement.
6. Postpone the discussion on whether to introduce a new SIB until we have more progress on the content of NTN specific system information.

## RAN2#112e

Agreements:

1. Existing cell reselection principles are considered as baseline and that information about when a cell is going to stop serving the area and information about new upcoming cell can be further considered. In which form and how this is exactly implemented in the cell reselection principles is FFS.

## RAN2#113e

Agreements:

1. In NTN, the UE determines the TA based on the broadcast information (the use of other information is not excluded). In any case RAN2 will not go in a different direction than other groups
2. In NTN, the network may broadcast more than one TACs per PLMN in a cell, which is to up to network implementation.
3. The NTN ephemeris is divided into serving cell’s ephemeris and neighbour’s ephemeris. FFS how would they differ regarding e.g. the required accuracy or signalling impact.
4. Consider pre-configuration in uSIM, NAS, SIB and RRC signalling for providing the NTN ephemeris. Further discussion depends on the agreed ephemeris contents.
5. RAN2 thinks that a UE needs to know whether the network is a TN or NTN no later than SIB1 reception
6. The information on when a cell is going to stop serving the area and/or the timing information (e.g. timer or absolute time) about new upcoming cell is supported at least in Earth-fixed NTN scenario. FFS if both types of information are needed. FFS if this is known from system information and/or the ephemeris.

## RAN2#114e

Agreements:

1. At least in the quasi-earth fixed case (FFS for moving case), the timing information on when a cell is going to stop serving the area is needed to assist cell reselection in NTN for earth fixed scenario.
2. At least in the quasi-earth fixed case (FFS for moving case), the timing information on when a cell is going to stop serving the area is used to decide when to perform measurement on neighbor cells.
3. At least in the quasi-earth fixed case (FFS for moving case), the timing information on when a cell is going to stop serving the area for earth fixed scenario is broadcast to UE via system information.

## RAN2#115e

Agreements via email - from offline 108:

1. Broadcast of cell stop time in SIB is only applicable to quasi earth fixed cell (not to moving cell). No further work in this release to address any moving cell specific details on using the cell stop time to assist measurements or cell reselection
2. For quasi-earth fixed cell, the reference location of the cell (serving cell or the neighbor cells) is broadcast in system information
3. For quasi-earth fixed cell, UE should start measurements on neighbour cells before the serving cell stops covering the current area.
4. For quasi-earth fixed cell, the broadcast “timing information on when a cell is going to stop serving the area” refers to the time when a cell stops covering the current area.
5. For quasi-earth fixed cell, specify that UE should start measurements on neighbour cells before the broadcast stop time of the serving cell, i.e. the time when the serving cell stops covering the current area, and the exact time to start measurements is up to UE implementation.

Working Assumption:

Location assisted cell reselection, with the distance between UE and the reference location of the cell (serving cell and/or neighbor cell) taken into account, is supported for quasi-earth fixed cell, if UE has valid location information, which means location acquisition will not be triggered at UE side only for location assisted cell reselection. FFS on the details.

## RAN2#116e

Agreements:

Location assisted cell reselection, with the distance between UE and the reference location of the cell (serving cell and/or neighbor cell) taken into account, is supported for quasi-earth fixed cell. FFS on how UE performs location acquisition.

Agreements via email - from offline 102:

1. When UE uses location based cell reselection enhancements, it's up to UE implementation to guarantee that a valid location information is available

2. For quasi-earth fixed cell, same as legacy, UE shall perform neighbour cell measurements of “higher priority NR inter-frequency or inter-RAT frequencies” regardless of the distance between UE and serving cell reference location.

Agreements via email - from offline 102 - second round:

For quasi-earth fixed cell, UE should start measurements on neighbour cells before the serving cell stops covering the current area, regardless of (the distance between UE and serving cell reference location) or (if legacy Srxlev/Squal condition is met, i.e., serving cell’s Srxlev/Squal is better than a threshold).

Agreements online:

Distance based cell reselection criteria for quasi-earth fixed cell is supported

For quasi-earth fixed cell, the cell stop time of neighbour cell(s) is NOT broadcast

## RAN2#116bis-e

Agreements:

1. A new NTN-specific SIB is introduced (SIBx), scheduled by SIB1

2. Introduce the following serving cell information to the corresponding SIBx (scheduled by SIB1):

 - Ephemeris;

 - common TA parameters;

 - validity duration for UL sync information;

 - t-Service;

 - cell reference location;

 - Epoch time.

 Also send a LS to RAN1 asking whether some parameters might be sent more frequently.

1. For quasi-earth fixed cell, same as legacy, UE shall perform neighbour cell measurements of “higher priority NR inter-frequency or inter-RAT frequencies” regardless of the remaining serving time.

5. RRC\_INACTIVE mode is supported for NTN.

Agreements via email - from offline 102 - second round:

1. Regarding UE-based solution for SMTC adjustments, UE autonomously adjust the SMTCs based on location and ephemeris. FFS whether NW assistance information is provided.

2. UE can know the NW type implicitly no later than SIB1 reception, there is no explicit NW type indication in SIB1.

3. No LS is sent to RAN3 on the support of RRC\_INACTIVE.

Agreements via email - from offline 103 - third round

1. Update of ephemeris and common TA information does not affect the value tag and does not trigger SI modification procedure.

2. The ntnUlSyncValidityDuration applies to the whole SIBX. UE acquires the updated SIBX when the timer expires. FFS whether to also include it in the LS to RAN1. FFS if this applies only to Connected mode or to idle mode UE as well

3. Location information can be used to determine when to start measurement.

4. UE may choose not to perform neighbour cell measurements of “NR intra-freq or inter-freq with equal or lower priority, or inter-RAT freq with lower priority”, if (the distance between UE and serving cell reference location is shorter than a threshold) and (legacy Srxlev/Squal condition is met, i.e., serving cell’s Srxlev/Squal is better than a threshold).

5. Location-based measurement initiation is only applied if the cell broadcasts location-related parameters (e.g. a threshold) and by implementation the UE has location information.

6. Before the stop-time based measurements are triggered, the UE measurements follow Legacy behaviour (i.e., based on Srxlev/Squal) and there is no measurement relaxation.

7. Cell stop time is not applied to cell ranking in determining the target cell for reselection.