3GPP RAN WG2 Meeting #117-e R2-2203533

eMeeting February 21st – March 3rd, 2022

Agenda Item: 8.10.3.1.1

Source: ZTE corporation,Sanechips

Title: Report of [AT117-e][102][NTN] Idle mode open issues

Document for: Discussion, Decision

# Introduction

This document is intended address a subset of remaining idle mode open issues as per the following email discussion guidelines:

* [AT117-e][102][NTN] Idle mode open issues (ZTE)

Initial scope: Discuss Idle open issues based on the report in [R2-2203386](file:///C:\Data\3GPP\Extracts\R2-2203386_%5bPre117-e%5d%5b102%5d%5bNTN%5d%20Idle%20mode%20open%20issues%20(ZTE)_v25_Rapporteur.docx)

Initial intended outcome: Summary of the offline discussion with e.g.:

* + - List of proposals for agreement (if any)
    - List of proposals that require online discussions
    - List of proposals that should not be pursued (if any)

Initial deadline (for companies' feedback): Monday 2022-02-21 1700 UTC

Initial deadline (for rapporteur's summary in R2-2203533): Monday 2022-02-21 2000 UTC

Please note the following deadlines:

* Initial deadline (for companies' feedback): **Monday 2022-02-21 1700 UTC**
* Initial deadline (for rapporteur's summary in R2-2203533): Monday 2022-02-21 2000 UTC

Please also note the following chair guidance:

* Proposals marked "for agreement" in R2-2203533 not challenged until Tuesday 2022-02-22 1000 UTC will be declared as agreed via email by the session chair (for the rest the discussion will continue during the GTW session on Tuesday).

# Discussion

## [Pre117e] proposals – Agreeable part

In pre-meeting discussions [11], the following proposals have in general received the majority’s support:

**[14/23] Proposal 1: A threshold of the distance between UE and the cell reference location should be introduced and only neighbor cells with distance shorter than this threshold will be evaluated by UE during cell reselection.**

Contribution input on proposal 1:

* + Nokia(R2-2202466):
    - Distance-based ranking is not supported for cell reselection in NTN.
    - There is no UE behavior specified for location-based cell reselection in NTN IDLE mode.
  + Samsung(R2-2203049): Apply RSRP/RSRQ criteria at first then apply distance criteria to the candidate cells which passed RSRP/RSRQ criteria when distance criteria are configured.
  + Vivo(R2-2202774)
    - If the distance between the UE and the reference location of a cell on a higher priority frequency is less than a configured threshold, cell reselection to a cell on a higher priority frequency than the serving frequency shall be performed.
    - If the distance between the UE and the reference location of the serving cell is larger than a configured threshold, and the distance between the UE and the reference location of a cell on a lower priority frequency is less than another configured threshold, cell reselection to a cell on a lower priority frequency than the serving frequency shall be performed.

**[14/23] Proposal 2: Satellite ephemeris based cell reselection is represented by time and location based cell reselection. No further enhancement in this release for ephemeris based cell reselection.**

**[23/23] Proposal 4: No further enhancement on cell reselection priority in NTN. Remove the corresponding FFS from 38.304 CR.**

**[14/23] Proposal 5: No need to provide the timing information about the new upcoming cell for either earth fixed scenario or earth moving scenario.**

**[13/23] Proposal 7: No further enhancement on the SMTC broadcast for measurements in idle and inactive mode.**

**[19/23] Proposal 8: No further enhancement on cell reselection procedure to support TN prioritization over NTN in Rel-17.**

To avoid repeat discussion, companies are invited to comment on the above proposals *only* if there are serious technical objections. If a company does not comment on a proposal is it implicitely assumed to be acceptable.

**Question 1) If you object to one or more of the above proposal(s), please: 1) Indicate which proposal(s) is unnacceptable; 2) Provide technical justification why the above proposal is unacceptable; and 3) Suggest an alternative acceptable wording (if available).**

**Note: If a company does not comment on a proposal, it is assumed to be aggreable.**

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| **Company** | **Comments** |
| Lenovo, Motorola Mobility | For Proposal 5 we would like to add “in Rel-17” or “in this release”, as in future releases we may consider this for optimization if necessary. |
| vivo | For P1, we think the following two questions should be clarified before it is agreed:  1. The proposal says “A threshold” (in the 1st part). Does it mean that only one threshold will be introduced irrespective of different sizes of different neighbour cells?  2. The proposal says the threshold will impact how the UE “evaluates” neibour cells (in the 2nd part). Since cell reselection evaluation (5.2.4) includes many subclauses, corresponding to different specific features, we wonder which specific feature within cell reselection evaluation process is actually impacted. |
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## [Pre117e] proposals – Controversial part

**[11/23] Proposal 3: It is up to NW implementation to either configure time based cell reselection or location based reselection or both of them. If both location and time base cell reselection are configured, it is up to UE implementation to apply either one or both of them.**

**[12/23] Proposal 6: For UE-based SMTC adjustment in idle and inactive mode, apart from the ephemeris, no other assistance information will be provided from NW side.**

**[12/23] Proposal 9: No need to define a mechanism in RAN2 to prevent non-NTN capable UE from accessing an NTN cell in Rel-17.**

**[12/23] Proposal 10: No explicit indication to show whether a cell is earth fixed or earth moving.**

### **OI 3:** Configuration of time and location based cell reselection

During the pre-meeting email discussion, 23 companies commented on OI 3:

Support simultaneous configuration:11 companies, i.e. Huawei, HiSilicon/CMCC/Lenovo/Google/Transsion/vivo/CATT/Apple/OPPO/NEC/Thales

Object simultaneous configuration: 11 companies, i.e. Samsung/Nokia/Sony/MediaTek/QC/Xiaomi/Intel/ChinaTelecom/Spreatrum/LG/Sequans

No strong view: 2 companies, i.e.Ericsson/ZTE

Since the supporters and opponents are half to half, the rapporteur provided the following proposal as a compromise but further comments

**[11/23] Proposal 3: It is up to NW implementation to either configure time based cell reselection or location based reselection or both of them. If both location and time base cell reselection are configured, it is up to UE implementation to apply either one or both of them.**

Further comments on proposal 3:

* + OPPO/LG: Do not support simultaneous location-based and time-based cell reselection configuration
  + HW: Support simultaneous location-based and time-based cell reselection configuration and up to UE implementation to decide which one to apply or apply both.

Contribution input on proposal 3:

* + Nokia(R2-2202466):The configuration of simultaneous location-based and time-based cell reselection is not supported in Rel-17 NTN.

**Question 2.1) Do companies support proposal 3 as a compromise? If not, please: 1) Provide technical justification why the above proposal is unacceptable; and 2) Suggest an alternative acceptable wayforward (if available).**

**Note: If a company does not comment on a proposal, it is assumed to be aggreable.**

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| **Company** | **Yes/No** | **Comments** |
| vivo | Yes | For simplicity, we are fine to accept this compromised way. |
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### **OI 6:** NW assistance information for SMTC adjustments in idle and inactive mode

During the pre-meeting email discussion, 23 companies commented on Q6:

* Support to provide other assistance information for UE-based SMTC adjustments in idle and inactive mode: - 8 companies
  + Samsung/vivo: The feeder link delay information
  + Google:a drifting rate indicating the amount of time shift per time unit regarding the SMTC offset, a validity timer associated with an SMTC, or a start/end time pair associated with an SMTC.
  + Nokia:Broadcasting the threshold which will tell the UE when it shall shift the SMTC configuration and by how much (i.e. the size of such step).
  + QC/Intel: Common common TA parameters would be needed as the feeder link will be drifting at a rate, which could be 25us/s.
  + Intel:Neighbour cell list associated to this satellite.
  + Spreadtrum: Epoch time.
  + Ericsson:SMTC drift information (time derivative) and drift variation information (second time derivative) of the feeder link delays of the relevant neighbor cells.
* Object: 12 companies
  + Huawei, HiSilicon/CMCC/Lenovo/Transsion/Sony/MediaTek/CATT/Xiaomi/Apple/LG/NEC/ZTE
* Other:
  + OPPO:If feeder link delay is compensated by NW, then it would require more SMTC to be signaled in SIB, in such case, no other assistance information is needed. Otherwise, existing SMTC would be sufficient, but serving/neighbor cell’s feeder link delay are needed.

The following proposal is given based on the majority’s preference:

**[12/23] Proposal 6: For UE-based SMTC adjustment in idle and inactive mode, apart from the ephemeris, no other assistance information will be provided from NW side.**

Contribution input on proposal 6:

* + Nokia(R2-2202466): provided via system information and contains the threshold and size of the step by which the UE shifts SMTC window.
  + Samsung(R2-2203049):
    - In idle/inactive mode, if the feeder link delays of the serving cell/satellite and the neighbour cell(s)/satellite(s) are not compensated by the network, they are provided as assistance information to the UE for UE-based SMTC adjustment.
    - adjustment periodicity and offset threshold(s) for UE-based SMTC adjustment.
    - list of PCIs to be measured in SMTC window.

**Question 2.2) Do companies support proposal 6? If not, please: 1) Provide technical justification why the above proposal is unacceptable; and 2) Suggest an alternative acceptable wayforward (if available).**

**Note: If a company does not comment on a proposal, it is assumed to be aggreable.**

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| **Company** | **Yes/No** | **Comments** |
| vivo | Yes | For simplicity, we are fine to accept this compromised way. In our understanding, the consequence would be that for a given frequency, only cell reselection on the same satellite orbit may be supported (since SMTC is broadcast per frequency for measurements in idle and inactive mode). |
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### **OI 9:** Prevent non-NTN capable UEs from accessing an NTN cell

During the pre-meeting email discussion, 23 companies commented on Q9:

* Support to define a mechanism in RAN2 to prevent non-NTN capable UE from accessing an NTN cell: -10 companies
  + Huawei, HiSilicon/CMCC/vivo/: The For non-NTN capable UEs, cellReservedForOtherUse IE and cellReservedForFutureUse-r16 IE in SIB1 can be set true. For NTN capable UEs, cellReservedForOtherUse IE and cellReservedForFutureUse-r16 IE should be ignored, and a new IE should be introduced in SIB1, e.g., cellReservedForFutureUse-r17.
  + Samsung: Yes if we consider TN and NTN cells in a given carrier/band
  + Transsion: RAN#2 can introduce new indication in MIB or SIB1 to indicate cell type.
  + QC/Intel/ZTE: Similar approach can be adopted like IOT-NTN.
  + Spreadtrum: The presence of SIBX indicates the NTN cell.
  + NEC: A new single bit to solve this issue for future NTN band allocations.
* Object: - 10 companies
  + Google/MediaTek/CATT/Xiaomi/Apple/ChinaTelecom/OPPO/LG/Thales
  + Nokia: Not in this release when the band overlapping happens.
* Open
  + Lenovo/Sony: May not be that essential in this release, as for now NTN and TN have no overlap in frequency.

Since the supporters and opponents are half to half, while two companies open to this discussion understand this issue is not essential in this release, the following proposal is given based on the majority’s preference:

**[12/23] Proposal 9: No need to define a mechanism in RAN2 to prevent non-NTN capable UE from accessing an NTN cell in Rel-17.**

**Question 2.3) Do companies support proposal 9? If not, please: 1) Provide technical justification why the above proposal is unacceptable; and 2) Suggest an alternative acceptable wayforward (if available).**

**Note: If a company does not comment on a proposal, it is assumed to be aggreable.**

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| **Company** | **Yes/No** | **Comments** |
| vivo | No | Even though NTN and TN have no overlap in frequency in Rel-17, non-NTN capable UE can measure the NTN frequency and may erroneously attempt access to an NTN cell as per the current Spec. |
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### **OI 10:** UE awareness of whether an NTN cell is quasi-fixed or earth moving

During the pre-meeting email discussion, 23 companies commented on Q10: -9 companies

* Support that UE should be aware of whether the serving cell and/or neighbour cell is quasi-earth fixed or earth moving:
  + Huawei, HiSilicon/Google/OPPO/LG/Thales
  + QC/Intel/Ericsson/NEC:Cell stop time can indicate the cell is quasi-fixed cell.
* Object: -12 companies
  + Samsung/CMCC/Lenovo/vivo/Nokia/Sony/MediaTek/CATT/Xiaomi/Apple/ChinaTelecom/ZTE
* Other:
  + Transsion:RAN#2 should consider moving cell scenarios and usages first, it there is a new configuration is needed, then it can be used to indicate, implicit or explicit, cell type.

12 companies understand UE does not need to be aware whether a cell is earth fixed or moving. 9 companies understand such knowledge would be useful while 4 of them understand it can be inferred implicitly via the cell stop time.

With the above understanding and preference from companies, the following proposal is given:

**[12/23] Proposal 10: No explicit indication to show whether a cell is earth fixed or earth moving.**

**Question 2.4) Do companies support proposal 10? If not, please: 1) Provide technical justification why the above proposal is unacceptable; and 2) Suggest an alternative acceptable wayforward (if available).**

**Note: If a company does not comment on a proposal, it is assumed to be aggreable.**

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| **Company** | **Yes/No** | **Comments** |
| vivo | Yes |  |
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## Contribution input not coverd by the pre-meeting email discussion

### **OI 11:** Information about the incoming new cell

Contribution input:

* QC(R2-2202566):The network can provide the information of the next candidate cell(s) for cell reselection.
* Samsung(R2-2203049):For quasi-earth fixed NTN system, a network can configure the incoming neighbouring cell which will replace the serving cell coverage at t-Service expiry in system information.

**Question 3.1) Do companies support to provide information, e.g. the PCI, about the incoming new cell to assist cell reselection? If Yes, what kind of information should be provided?**

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| **Company** | **Yes/No** | **Comments** |
| vivo | No |  |
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### **OI 12:** Orbital parameters and timing drift parameters of the neighbor satellites

Contribution input:

* QC(R2-2202566):The list of orbital parameters and timing drift parameters of the neighbor satellites are broadcast in the SIB as delta to the orbital parameters of the serving satellite.

**Question 3.2) Do companies support to broadcast the list of orbital parameters and timing drift parameters of the neighbor satellites as delta to the orbital parameters of the serving satellite?**

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| **Company** | **Yes/No** | **Comments** |
| Lenovo, Motorola Mobility | Yes | We think providing the delta values can reduce signalling overhead. |
| vivo | No | Such signaling optimization can be postponed to the future releases. |
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### **OI 13:** SIB4 enhancement

Contribution input:

* Apple(R2-2202548):SIB4 be enhanced by geographic tags, with each tag corresponding to a set of (legacy) cell reselection information.
* QC(R2-2202566):An indication is provided in the inter frequency list in SIB4 to associate the frequency with the corresponding satellite in the neighbor satellite list.

**Question 3.3) Do companies support to enhance SIB4 to provide more assistance information to assist cell reselection? If Yes, what kind of information should be provided, the geographic tag associated with a set of cell reselection information, asscociation between the frequency and the neighbour satellite or some other information?**

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| **Company** | **Yes/No** | **Comments** |
| vivo | No |  |
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### **OI 14:** Another alternative to capture the location based measurement related agreements in idle mode

The following text proposal has been provided by OPPO(R2-2203004) as another alternative to capture the location based measurement related agreements in idle mode and the rapporteur understand the suggested change is reasonable.

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| CHANGE START |

5.2.4.2 Measurement rules for cell re-selection

Following rules are used by the UE to limit needed measurements:

- If the serving cell fulfils Srxlev> SIntraSearchP and Squal > SIntraSearchQ

- If *distanceThresh* is broadcasted in SIBxx, and if UE supports location-based measurement initiation and has valid UE location information:

- If the distance between UE and the serving cell reference location is shorter than *distanceThresh*, the UE may choose not to perform intra-frequency measurements;

- Otherwise, the UE shall perform intra-frequency measurements;

- Otherwise, the UE may choose not to perform intra-frequency measurements;- Otherwise, the UE shall perform intra-frequency measurements.

- The UE shall apply the following rules for NR inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1:

- For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency, the UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8].

- For a NR inter-frequency with an equal or lower reselection priority than the reselection priority of the current NR frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current NR frequency:

- If the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ ; and

- If *distanceThresh* is broadcasted in SIBxx, and if UE supports location-based measurement initiation and has valid UE location information:

- If the distance between UE and the serving cell reference location is shorter than *distanceThresh*, the UE may choose not to perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority;

- Otherwise, the UE shall perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority according to TS 38.133 [8];

- Otherwise, the UE may choose not to perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority;- Otherwise,the UE shall perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority according to TS 38.133 [8].

- If the UE supports relaxed measurement and *relaxedMeasurement* is present in *SIB2*, the UE may further relax the needed measurements, as specified in clause 5.2.4.9.

If the t-Service of the serving cell is present in SIBX, UE should start to perform intra-frequency, inter-frequency or inter-RAT measurements before the t-Service, regardless of the distance between UE and the serving cell reference location or whether the serving cell fulfils Srxlev > SIntraSearchP and Squal > SIntraSearchQ, or Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ . For quasi earth fixed cell, UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8] regardless of the remaining service time of the serving cell.

NOTE: Whether the UE has valid location information is up to UE implementation.

Editor’s note: FFS on 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.

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| CHANGE END |

**Question 3.4) On capturing the location based measurements related agreements in idle mode, which option do companies prefer:**

* + **Option 1: The changes in running 304 CR (R2-2203385) by introducing a separate paragraph.**
  + **Option 2: The above changes proposed in OPPO(R2-2203004) by merging with the existing paragraphs.**
  + **Other option?**

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| **Company** | **Option1/2/**  **other** | **Comments** |
| vivo | Option 2 | Furthermore, we think whether the *distanceThresh* for intra-frequency measurements and inter-frequency measurements is same or different should be further discussed. |
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### Any other idle mode issues not covered in pre-meeting discussion or this offline discussion

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| **Company** | **Any other idle mode issues not covered in pre-meeting discussion or this offline discussion** |
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# Conclusions

<To be generated based on company input>

# References

[1] [R2-2202235](file:///C:\Data\3GPP\Extracts\R2-2202235_UE%20location%20during%20initial%20access_v04.doc) WF for UE location during initial access in NTN THALES, Leonardo, Avanti, ESA, Sateliot, Omnispace, Novamint, Hispasat, Gatehouse, Hughes network systems, Inmarsat, Viasat, CTTC, Intelsat, Kepler, Ligado, Magister solutions, SES, Airbus

[2] [R2-2202422](file:///C:\Data\3GPP\Extracts\R2-2202422%20Discussion%20on%20SIB%20X%20acquiring%20procedure.doc) Discussion on the SIBX acquiring procedure Spreadtrum Communications

[3] [R2-2202423](file:///C:\Data\3GPP\Extracts\R2-2202423%20Acquiring%20the%20ephemeris%20of%20neighbour%20cell.doc) Acquiring the ephemeris of neighbour cell Spreadtrum Communications

[4] [R2-2202466](file:///C:\Data\3GPP\Extracts\R2-2202466%20Remaining%20Rel-17%20NTN%20open%20issues%20for%20IDLE%20mode.docx) Remaining Rel-17 NTN open issues for IDLE mode Nokia, Nokia Shanghai Bell

[5] [R2-2202548](file:///C:\Data\3GPP\Extracts\R2-2202548%20NTN-TN%20idle%20mode%20mobility.docx) NTN-TN idle mode mobility Apple

[6] [R2-2203049](file:///C:\Data\3GPP\Extracts\R2-2203049.docx) Measurements and cell reselection Samsung Research America

[7] [R2-2202566](file:///C:\Data\3GPP\Extracts\R2-2202566%20Idle%20mode.docx) Assistance information for IDLE mode measurements Qualcomm Incorporated

[8] [R2-2202586](file:///C:\Data\3GPP\Extracts\R2-2202586%20Epoch%20time%20and%20validity%20time%20for%20neighbour%20satellite%20ephemeris.docx) Epoch time and validity time for neighbour satellite ephemeris Lenovo, Motorola Mobility

[9] [R2-2202774](file:///C:\Data\3GPP\Extracts\R2-2202774%20Remaining%20issues%20on%20location-based%20cell%20reselection.docx) Remaining issues on location-based cell reselection vivo

[10] [R2-2203004](file:///C:\Data\3GPP\Extracts\R2-2203004%20-%20Discussion%20on%20measurement%20rules%20for%20cell%20re-selection%20in%20NTN.doc) Discussion on measurement rules for cell re-selection in NTN OPPO

[11] [R2-2203386](file:///C:\Data\3GPP\Extracts\R2-2203386_%5bPre117-e%5d%5b102%5d%5bNTN%5d%20Idle%20mode%20open%20issues%20(ZTE)_v25_Rapporteur.docx) Report of [Pre117-e][102][NTN] Idle mode open issues (ZTE) ZTE corporation,Sanechips