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Agenda Item: 9.2.4.1

Source: Ericsson

Title: Summary of AI 9.2.4.1 “TA and Mobility related” (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

In RAN#86, a SI was approved to determine and evaluate the minimum necessary specification updates to introduce NB-IoT/eMTC support for non-terrestrial networks (NTN), The description for the SI was updated in RAN#90 [1] and it was agreed to use the existing work on NR NTN captured in TR 38.821 [2] as a baseline. In RAN#92-e, a follow up WI was approved to specify NB-IoT/eMTC support for Non-Terrestrial Networks.

This document summarizes the contributions, submitted to the AI 9.2.4.1, on tracking area update and mobility mechanisms for NB-IoT and LTE-M devices in NTN.

# 2 Discussion

### 2.1 Idle mode mobility

The following proposals have been made regarding the discussion on idle mode mobility:

|  |  |
| --- | --- |
| Tdoc | Proposals |
| [3] R2-2107084 | Proposal 1 Timing-based enhancement is introduced for IoT over NTN idle mode procedure.  Proposal 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 needed to assist cell reselection in NTN for earth fixed scenario and can be used to decide when to perform measurement on neighbor cells.  Proposal 3 UE location-based enhancement is not considered for IoT over NTN idle mode procedure. |
| [5] R2-2107322 | Proposal 1: RAN2 consider NB-IoT/eMTC UE abandon the cell reselection mechanism in IoT NTN system. UE camp on the cell based on the cell selection criteria. |
| [7] R2-2107426 | Proposal 4: The satellite ephemeris is provided to UE to assist cell selection.  Proposal 5: 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. |
| [9] R2-2107767 | Proposal 1a: The timing information on when a cell is going to stop serving the area is needed to assist cell reselection in IoT NTN.  Proposal 1b: 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 in IoT NTN.  Proposal 1c: The timing information on when a cell is going to stop serving the area is broadcast to UE in IoT NTN.  *eDRX*  Proposal 2: In IoT over NTN, especially for NTN LEO, UE configured with eDRX cycle can apply the cell selection procedure immediately at the beginning of PTW in an eDRX cycle.  *Relaxed monitoring*  Proposal 3a: In the quasi-earth fixed case, static or low mobility IoT UE can relax monitoring under the serving cell and just start neighbor cell measurement when the camping cell is going to stop serving this area.  Proposal 3b: In the quasi-earth fixed case, before applying the relaxed monitoring, UE can determine its mobility state based on whether its GNSS position changes. |
| [10] R2-2107813 | Proposal 3: Satellite assistance information of serving cell is provided as separate system information block for IoT NTN.  Proposal 4: RAN2 to consider including assistance information about neighbour cell ephemeris information in system information to support location-based cell reselection decision.  Proposal 5: RAN2 to consider minor modification for cell reselection measurements for eDRX operations in moving cell scenario.  Proposal 6: RAN2 to analyze the impact to the paging operation in TN and NTN network before concluding on supporting NTN-TN mobility for IoT-NTN UE based on existing cell reselection procedures. |
| [13] R2-2108172 | Proposal 5: Rel-16 cell selection/reselection mechanisms for NB-IoT/eMTC is the baseline for IoT-NTN.  Proposal 6: The timing information on when a cell is going to stop serving the area is needed to assist cell reselection in IoT-NTN for quasi-earth fixed scenario.  Proposal 7: The network type indication can be used for the network to indicate UE to reselect to the specific network type. |
| [14] R2-2108338 | Proposal 1: Legacy eMTC and NB-IoT cell selection procedures and intra frequency measurements could be reused in IoT-NTN.  Proposal 2: Legacy eMTC and NB-IoT priorities and frequency specific offsets can be reused to control TN-NTN cell re-selection.  Proposal 3: Legacy eMTC and NB-IoT cell ranking schemes could be reused to trigger fast cell re-selection of upcoming neighbour cells in IoT-NTN.  *Discontinuous coverage*  Proposal 4: In NTN coverage holes associated with cell re-selection could be informed to the UEs by using satellite’s long-term (coarse-grained) ephemeris. UEs can use this information for acquiring knowledge about coverage holes (out-of-coverage) and cell re-selection. |

Rapporteur’s summary

Two companies, [13] [14], have proposed to use the legacy mechanisms, e.g., cell (re)selection, for NB-IoT and LTE-M as the baseline. Considering that no issues regarding legacy mechanisms have been brought up by other companies and companies preferred rather to discuss enhancements such as using timing and location information, rapporteur proposes the following:

1. Cell selection / reselection procedures for NB-IoT and LTE-M in TN is the baseline in NB-IoT/LTE-M NTN.

Two companies, [7] [10], have proposed that the network provides satellite assistance information to assist idle mode procedures such as cell (re)selection. During the SI phase RAN2 agreed that cell selection/re-selection mechanism in IoT-NTN can be enhanced by using satellite assistance (e.g., ephemeris) information similar to NR-NTN, so the rapporteur assumes that a similar agreement can also be made for the WI phase:

1. Satellite assistance information, e.g., ephemeris, is provided to UE.

In [10], providing neighbour cell satellite assistance information is also brought up. Considering that, RAN2 has agreed that satellite assistance information is divided into serving cell and neighbour cell satellite assistance information for NR-NTN rapporteur thinks that the following proposal can be acceptable for IoT NTN:

1. Satellite assistance information is divided into serving cell and neighbour cell satellite assistance information.

In [10] it is proposed that satellite assistance information is broadcast in a separate information block:

1. Discuss if satellite assistance information is broadcast in a separate information block.

Four companies, [3] [7] [9] [13], proposed to introduce timing information-based enhancements for idle mode procedures. Note that the following agreements were made for NR-NTN:

* 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.
* 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 neighbour cells.

Rapporteur proposes the following:

1. The timing information on when a cell is going to stop serving the area is broadcast at least for the quasi-earth fixed case (FFS for the moving case).

The following aspects are also brought up companies listed above in the table regarding the idle mode mechanism in IoT NTN: location information based enhancements, the need for cell reselection mechanism especially when eDRX is configured, triggering conditions for relaxed monitoring, TN-NTN mobility, and discontinuous coverage.

1. Discuss whether location information is used to enhance idle mode mobility mechanisms.
2. Discuss whether cell selection procedure is used instead of cell reselection procedure when a UE is configured with an eDRX cycle.
3. Discuss whether the time when a cell is going to stop serving an area can be a triggering condition for relaxed monitoring.
4. Discuss the impact of NTN-TN mobility on the paging mechanism based on the existing cell reselection procedures.
5. Discuss whether it should be possible for the UE to be informed about the coverage holes using the satellite assistance information.

### 2.2 Tracking area update

The following proposals have been made regarding the discussion on tracking area update:

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| --- | --- |
| Tdoc | Proposals |
| [2] R2-2107083 | Proposal 3 The same TAC update procedures as in NR NTN are adopted in IoT NTN. |
| [7] R2-2107426 | Proposal 1: The following applies for TA handling in IOT NTN:   * The network may broadcast more than one TACs per PLMN in a cell, which is to up to network implementation. * The UE determines the TA based on the broadcast information (the use of other information is not excluded). * When the network stops broadcasting a TAC, the UE needs to know it. * UE does not do TAU if one of the currently broadcasted TAC belongs to UE’s registration area.   Proposal 2**:** The system information modification notification procedure is not used in NB-IoT NTN to signal changes of TAC(s) in the earth moving beam scenario.  Proposal 3**:** RAN2 to discuss how UEs become aware of TAC change in NB-IoT NTN. |
| [8] R2-2107562 | Proposal 1 SI notification procedure is not used to update the TAC change in IoT NTN.  Proposal 2 Time information for TAC update is broadcast in SIB. FFS which SIB.  Proposal 3 To reduce signalling overhead due to TAC update in SIB, a reference time is specified (e.g., SFN = 0) and length of remaining time for the next TAC update is signalled in SIB.  Proposal 4 The remaining time information is provided in terms of number of H-SFN and location in the H-SFN. |
| [10] R2-2107813 | Proposal 1: TA soft switch option is only considered for IoT-NTN earth fixed tracking area configuration.  Proposal 2: RAN2 to consider changes to paging in cell broadcasting multiple tracking areas for IoT-NTN. |
| [13] R2-2108172 | Proposal 1: In IoT-NTN, the network may broadcast more than one TACs per PLMN in a cell, which is up to network implementation.  Proposal 2: Change in TAC in SIB1 triggers SI update notification procedure as legacy behaviour.  Proposal 3: Regarding the broadcasting TAC update time, we can wait the NR NTN progress.  Proposal 4: AS indicates all received TAC(s) for one PLMN to NAS layer if IoT NTN network broadcasts more than one TAC per PLMN in a cell. |
| [15] R2-2108339 | Proposal: To implement tracking areas fixed on earth with moving cells, the “soft switch” option is used, i.e. each cell can broadcast more than one TAC per PLMN. The TACs that the cell is broadcasting are updated as the cell moves between TAC regions. |
| [17] R2-2108548 | Proposal 2: it is proposed to prefer the implicit manner to let the UE be aware of the network stops broadcasting a TAC.  Proposal 3: The possible approach is as follows:  - The UE only to receive and decode a SI update information for TAU when it’s position is changing, i.e. a stationary UE can ignore the a SI update information for TAU;  - CN only paging the UE according to the TAC mapping to the UE’s actual geographical location, not the TAs advertised in the SIB; meanwhile, the UE can determine whether to update the TA to CN via deriving the overlapped TA from at least two TA lists in SIB advertised in different time occasions. |

In NR NTN the following agreements were made:

* The network may broadcast more than one TACs per PLMN in a cell, which is to up to network implementation.
* The UE determines the TA based on the broadcast information (the use of other information is not excluded).
* When the network stops broadcasting a TAC, the UE needs to know it.

Even though it may not be explicitly stated, three companies, [2] [7] [13], have proposed to adopt the agreements above made for NR NTN. Considering that other companies have contributions discussing mainly the enhancements, rapporteur proposes the following:

1. The network may broadcast more than one TAC per PLMN in a cell, which is to up to network implementation.
2. The UE determines the TA based on the broadcast information (the use of other information is not excluded).
3. When the network stops broadcasting a TAC, the UE needs to know it.
4. UE does not do TAU if one of the currently broadcasted TAC belongs to UE’s registration area.

Two companies, [10] [15], proposed that only the “soft switch” mechanism is used.

1. Discuss whether only “soft switch” mechanism is used when broadcasting TACs.

One company [13] proposed using the legacy system information update mechanism to inform about the TAC update whereas three companies, [7] [8] [17], proposed not to use that procedure. In [8] and [17] alternative mechanisms have been proposed.

1. Discuss whether system information modification notification procedure is used to inform TAC updates and if not the alternative mechanisms.

One company [13] prefers that AS indicates all received TAC(s) for one PLMN to NAS layer if IoT NTN network broadcasts more than one TAC per PLMN in a cell.

1. Discuss whether AS should indicate all received TAC(s) for one PLMN to NAS layer if IoT NTN network broadcasts more than one TAC per PLMN in a cell.

### 2.3 Connected mode mobility

##### 2.3.1 Handover mechanism

The following proposals have been made regarding the discussion on handover mechanism:

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| --- | --- |
| Tdoc | Proposals |
| [2] R2-2107083 | Proposal 1 For CHO enhancement in eMTC NTN, RAN2 consider only timer based CHO triggering event, in addition to the legacy triggering events. |
| [4] R2-2107321 | Proposal 2: RAN2 can reuse the NTN CHO for both moving cell and fixed cell scenarios.  Proposal 3: RAN2 can reuse the NR NTN agreement for IoT NTN measurement mechanism. |
| [10] R2-2107813 | Proposal 7: Enhancements to connected mode mobility and RLF/Re-establishment procedures are not considered in Rel-17.  Proposal 8: RAN2 to check with RAN4 on the RRM impacts for supporting CHO and related measurements for eMTC in extended coverage scenarios. |
| [12] R2-2108018 | Proposal 1: CHO can be used for eMTC NTN and Rel-16 LTE CHO procedure should be the baseline for eMTC NTN.  Proposal 2: Minor enhancements for CHO can be considered in eMTC NTN, such as supporting A4 event for CHO. |
| [18] R2-2108757 | Proposal 1 No procedural update is required to support mobility for LTE-M in IoT NTN.  Proposal 2 The value range for the parameter t304 is extended. The values to be specified are FFS.  Proposal 3 Rel-16 LTE CHO procedure is supported for LTE-M in IoT NTN as the baseline. |

Four companies [2] [4] [12] [18] have proposed that Rel-16 LTE CHO mechanism is supported for LTE-M devices in IoT NTN.

1. Rel-16 LTE CHO mechanism is supported for LTE-M devices in IoT NTN.

One company [10] proposed that RAN2 should check with RAN4 on the RRM impacts for supporting CHO and related measurements for eMTC in extended coverage scenarios.

1. Discuss whether RAN2 should check with RAN4 on the RRM impacts for supporting CHO and related measurements for LTE-M in enhanced coverage scenarios.

Two companies [2] [12] proposed to consider enhancements for CHO such as introducing a timer-based triggering event and supporting A4 event, respectively. One company [10] proposed no enhancements for connected mode mobility should be introduced.

1. Discuss whether timer-based triggering event is introduced for Rel-16 CHO mechanism for LTE-M devices.
2. Discuss whether A4 event is supported for Rel-16 CHO.

One company [18] proposed that no procedural update is required to support mobility for LTE-M in IoT NTN and value range for the parameter t304 is extended where values to be specified are FFS.

1. No procedural update is required to support mobility for LTE-M.
2. The value range for the parameter t304 is extended. The values to be specified are FFS.

##### 2.3.2 RLF/RRC re-establishment

The following proposals have been made regarding the discussion on RLF/RRC re-establishment:

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| Tdoc | Proposals |
| [1] R2-2108328 | Proposal 1: Prioritize RLF/RRC-reestablishment enhancement discussion over handover enhancement discussion  Proposal 2: RAN2 discuss solution to avoid RLF/Handover during a short data transmission session at least. |
| [2] R2-2107083 | Proposal 2 Rel-17 enhancements to reduce the time taken for RRC re-establishment are not considered in Rel-17 NB-IoT NTN. |
| [4] R2-2107321 | Proposal 1: RAN2 can study the conditional RRC re-establishment procedure for IoT UE fast RLF recovery |
| [6] R2-2107371 | Proposal 1: A time-based trigger condition for triggering RLF can be considered in IOT over NTN.  Proposal 2： Assistance information of the candidate target cell can be provided for UE before RLF occur.  Proposal 3: The group Reestablishment can be postponed until next Release. |
| [7] R2-2107426 | Proposal 6: The cell information (e.g. the frequency, PCI) of the upcoming cell is broadcast to UE via system information. |
| [10] R2-2107813 | Proposal 7: Enhancements to connected mode mobility and RLF/Re-establishment procedures are not considered in Rel-17. |
| [11] R2-2107916 | Proposal 1: RAN2 to consider conditional RRC re-establishment for NB-IoT mobility in NTN. |
| [12] R2-2108018 | Proposal 3: Legacy (Rel-16) RLF/reestablishment mechanisms can be the baseline for IoT NTN mobility. Minor enhancements can be considered.  Proposal 4: When configuring T310, the value of T310 should be less than the remaining service time of the serving cell in IoT NTN. |
| [16] R2-2108546 | Proposal 1: it is proposed to introduce the conditional RRC connection re-establishment procedure which configures the procedure triggering condition and target cells to the UE beforehand.  Proposal 2: the conditional RRC connection re-establishment condition setting and execution, can base on the ephemeris information and UE’s location, which can be clarified as the following conditions to trigger the RRC connection re-establishment procedure as for CHO:  • Time, timer or time range based C-Re-establishment triggering event  • Location based C-Re-establishment triggering event  Proposal 3: the group Re-establishment mechanism as for group HO is required to study for NB-IoT UEs as well. |
| [18] R2-2108757 | Proposal 4 No procedural update is required to support RLF and RRC connection re-establishment procedures in IoT NTN.  Proposal 5 RAN2 to discuss whether UE specific timers and constants for RLF and RRC connection re-establishment require any changes in IoT NTN.  Proposal 6 Rel-16 RLF / connection re-establishment mechanisms are supported in IoT NTN assuming that minor adjustments to UE specific timers and constants would be sufficient. |

Four companies, [4][6][11][16]; proposed to enhance the RLF/RRC re-establishment procedures; but two of those companies [6] [16] have proposed mechanisms based on introducing time and/or location based triggering mechanisms. The rapporteur has the following proposal:

1. Discuss whether timer and/or location based triggering event is introduced for Rel-16 RLF/RRC-reestablishment mechanism.

Two companies [6] [7] proposed to provide assistance information via broadcast for the upcoming cell and two companies, [2] [10], proposed to introduce no enhancements.

1. Discuss whether providing information, e.g., the frequency, PCI, of the upcoming cell via broadcast is supported.

One company [16] would like to study the group RRC re-establishment mechanism and another one [18] proposed that no procedural update is required to support RLF and RRC connection re-establishment procedures, however RAN2 should discuss whether UE specific timers and constants for RLF and RRC connection re-establishment procedure require any changes in IoT NTN. The same company also proposes to capture that Rel-16 RLF / connection re-establishment mechanisms are supported in IoT NTN assuming that minor adjustments to UE specific timers and constants would be sufficient.

1. No procedural update is required to support RLF and RRC connection re-establishment procedures.
2. Discuss whether UE specific timers and constants for RLF and RRC connection re-establishment procedure require any changes.
3. Rel-16 RLF / connection re-establishment mechanisms are supported in IoT NTN assuming that minor adjustments to UE specific timers and constants would be sufficient.

##### 2.3.3 Other

One company [9] has provided also the following proposals:

1. Discuss whether RSRP criteria and pur-TimeAlignmentTimer for timing alignment validation need to be configured for PUR for LEO and GEO scenarios.
2. Discuss whether for mobile UEs, TA value needs to be validated during retransmission of PUR for LEO and GEO scenarios.
3. Discuss whether UE initiates RRC establishment or resume procedure when serving cell is going to stop serving soon, in order to avoid the redundant RRC procedure or interrupted data transmission, or the UE can postpone till it camps on a new cell.
4. Discuss whether RRC can only initiate the RRC procedure for EDT or PUR in the serving cell when serving cell is going to stop serving soon.
5. Discuss whether RRC can delay other RRC procedures until a new cell is selected when serving cell is going to stop serving soon.

# 3 Conclusion

This document summarizes the contributions, submitted to the AI 9.2.4.1, on tracking area update and mobility mechanisms for NB-IoT and LTE-M devices in NTN. Based on the discussion in the section above the following proposals are made:

[Proposal 1 Cell selection / reselection procedures for NB-IoT and LTE-M in TN is the baseline in NB-IoT/LTE-M NTN.](#_Toc80317419)

[Proposal 2 Satellite assistance information, e.g., ephemeris, is provided to UE.](#_Toc80317420)

[Proposal 3 Satellite assistance information is divided into serving cell and neighbour cell satellite assistance information.](#_Toc80317422)

[Proposal 4 Discuss if satellite assistance information is broadcast in a separate information block.](#_Toc80317423)

[Proposal 5 The timing information on when a cell is going to stop serving the area is broadcast at least for the quasi-earth fixed case (FFS for the moving case).](#_Toc80317424)

[Proposal 6 Discuss whether location information is used to enhance idle mode mobility mechanisms.](#_Toc80317425)

[Proposal 7 Discuss whether cell selection procedure is used instead of cell reselection procedure when a UE is configured with an eDRX cycle.](#_Toc80317426)

[Proposal 8 Discuss whether the time when a cell is going to stop serving an area can be a triggering condition for relaxed monitoring.](#_Toc80317427)

[Proposal 9 Discuss the impact of NTN-TN mobility on the paging mechanism based on the existing cell reselection procedures.](#_Toc80317428)

[Proposal 10 Discuss whether it should be possible for the UE to be informed about the coverage holes using the satellite assistance information.](#_Toc80317429)

[Proposal 11 The network may broadcast more than one TAC per PLMN in a cell, which is to up to network implementation.](#_Toc80317430)

[Proposal 12 The UE determines the TA based on the broadcast information (the use of other information is not excluded).](#_Toc80317431)

[Proposal 13 When the network stops broadcasting a TAC, the UE needs to know it.](#_Toc80317432)

[Proposal 14 UE does not do TAU if one of the currently broadcasted TAC belongs to UE’s registration area.](#_Toc80317433)

[Proposal 15 Discuss whether only “soft switch” mechanism is used when broadcasting TACs.](#_Toc80317434)

[Proposal 16 Discuss whether system information modification notification procedure is used to inform TAC updates and if not the alternative mechanisms.](#_Toc80317435)

[Proposal 17 Discuss whether AS should indicate all received TAC(s) for one PLMN to NAS layer if IoT NTN network broadcasts more than one TAC per PLMN in a cell.](#_Toc80317436)

[Proposal 18 Rel-16 LTE CHO mechanism is supported for LTE-M devices in IoT NTN.](#_Toc80317437)

[Proposal 19 Discuss whether RAN2 should check with RAN4 on the RRM impacts for supporting CHO and related measurements for LTE-M in enhanced coverage scenarios.](#_Toc80317438)

[Proposal 20 Discuss whether timer-based triggering event is introduced for Rel-16 CHO mechanism for LTE-M devices.](#_Toc80317439)

[Proposal 21 Discuss whether A4 event is supported for Rel-16 CHO.](#_Toc80317440)

[Proposal 22 No procedural update is required to support mobility for LTE-M.](#_Toc80317441)

[Proposal 23 The value range for the parameter t304 is extended. The values to be specified are FFS.](#_Toc80317442)

[Proposal 24 Discuss whether timer and/or location based triggering event is introduced for Rel-16 RLF/RRC-reestablishment mechanism.](#_Toc80317443)

[Proposal 25 Discuss whether providing information, e.g., the frequency, PCI, of the upcoming cell via broadcast is supported.](#_Toc80317444)

[Proposal 26 No procedural update is required to support RLF and RRC connection re-establishment procedures.](#_Toc80317445)

[Proposal 27 Discuss whether UE specific timers and constants for RLF and RRC connection re-establishment procedure require any changes.](#_Toc80317446)

[Proposal 28 Rel-16 RLF / connection re-establishment mechanisms are supported in IoT NTN assuming that minor adjustments to UE specific timers and constants would be sufficient.](#_Toc80317447)

[Proposal 29 Discuss whether RSRP criteria and pur-TimeAlignmentTimer for timing alignment validation need to be configured for PUR for LEO and GEO scenarios.](#_Toc80317448)

[Proposal 30 Discuss whether for mobile UEs, TA value needs to be validated during retransmission of PUR for LEO and GEO scenarios.](#_Toc80317449)

[Proposal 31 Discuss whether UE initiates RRC establishment or resume procedure when serving cell is going to stop serving soon, in order to avoid the redundant RRC procedure or interrupted data transmission, or the UE can postpone till it camps on a new cell.](#_Toc80317450)

[Proposal 32 Discuss whether RRC can only initiate the RRC procedure for EDT or PUR in the serving cell when serving cell is going to stop serving soon.](#_Toc80317451)

[Proposal 33 Discuss whether RRC can delay other RRC procedures until a new cell is selected when serving cell is going to stop serving soon.](#_Toc80317452)

# References

1. [1] R2-2108328 Mobility enhancement for IoT-NTN NEC Telecom MODUS Ltd.
2. [2] R2-2107083 Discussion on CP impact for IoT over NTN OPPO
3. [3] R2-2107084 Discussion on idle mode procedures for IoT over NTN OPPO
4. [4] R2-2107321 Discussion on connected mode UE of IoT NTN CATT
5. [5] R2-2107322 Discussion on IDLE mode UE of IoT NTN CATT
6. [6] R2-2107371 Discussion on the issue of mobility for IoT over NTN Spreadtrum Communications
7. [7] R2-2107426 TA and mobility for IOT NTN Huawei, HiSilicon
8. [8] R2-2107562 TAC update procedure Qualcomm Incorporated
9. [9] R2-2107767 Mobility issues of IoT NTN ZTE Corporation, Sanechips
10. [10] R2-2107813 Analysis on mobility aspects for IoT-NTN Nokia, Nokia Shanghai Bell
11. [11] R2-2107916 Considerations on NB-IoT mobility for IoT NTN Lenovo, Motorola Mobility
12. [12] R2-2108018 Discussion on connected mode mobility for IoT NTN Xiaomi
13. [13] R2-2108172 Discussion on TA and idle mode mobility enhancement Xiaomi
14. [14] R2-2108338 On Cell Re-selection in IoT-NTN MediaTek Inc.
15. [15] R2-2108339 On Improving Tracking Area Updates in IoT NTN MediaTek Inc.
16. [16] R2-2108546 Enhanced RRC re-establishment for mobility in IoT-NTN CMCC
17. [17] R2-2108548 Discussion on TA Update for IoT-NTN CMCC
18. [18] R2-2108757 Mobility for NB-IoT and LTE-M in NTN Ericsson