**3GPP TSG-RAN WG4 Meeting #94-e R4-2002192**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 8.21.1

**Source:** Moderator (CMCC)

**Title:** Email discussion summary for RAN4#94e\_#69\_NR\_SON\_MDT\_RRM

**Document for:** Information

# Introduction

The WI on SON&MDT support for NR was approved in Rel-16 [1]. According to the WID, RAN4 is responsible for specifying the requirements for logged MDT and reporting.

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| * Support of MDT features for identified use cases, including coverage optimization, QoS verification via MDT, indoor MDT improvement, location information reporting, and sensor data collection [RAN2, RAN3] * Specification of Logged MDT for both RRC\_IDLE and RRC\_INACTIVE UEs [RAN2, RAN3, RAN4] * Specification of Immediate MDT for RRC\_CONNECTED UEs[RAN2, RAN3] * Specification of reporting e.g. RLF and accessibility measurements [RAN2, RAN4] |

Last meeting, RAN2 agreed and sent LS to RAN4 on MDT measurements [2].

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| It has been agreed in the Work Item for SON/MDT support for NR (RP-191776) to introduce following measurements for logged MDT for idle state UE and inactive state UE:  ◦ The best beam index (SSB index) of the camped cell.  ◦ Beam RSRP/RSRQ of the best beam of camped cell.  ◦ The ‘number of good beams’ associated to the cells within the range (rangeToBestCell which is configured by network for cell reselection in SIB2) of the R value of the highest ranked cell as part of the beam level measurements in the logged MDT report.  Also, the available uncompensated barometric pressure measurement, UE speed and UE orientation can be reported as sensor information.  Furthermore, similar to LTE, another measurement that potentially has RAN4 impact is the relative time stamp the UE will include for each MDT measurement from idle and inactive state. |

The completion date of this WI is March. The final target of this email discussion is to approve CRs for 36.133 and 38.133. Following is the listed target of email discussion for 1st round and 2nd round

* 1st round:
  + Focus on discussion of open issues, i.e. MDT related RRM requirements for LTE and NR.
  + Comments on CRs are also appreciated.
* 2nd round:
  + Focus on CRs and LS discussion

# Topic #1: MDT related RRM requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2000648**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000648.zip) | CMCC | Proposal 1: it is proposed to reuse the existing measurement requirements in idle and inactive mode for NR MDT in 38.133.  Proposal 2: it is proposed to apply the same relative time stamp accuracy requirements of LTE MDT to NR MDT.  Proposal 3: it is proposed to reuse the existing inter-RAT NR measurement requirements in idle mode for LTE MDT in 36.133. |
| [**R4-2001671**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001671.zip) | Huawei, HiSilicon | Proposal 1: No requirements for beam level RSRP/RSRQ are specified in NR logged MDT measurement in idle/inactive state.  Proposal 2: The serving cell and reselection requirements in idle mode are reused for NR logged MDT measurement.  Proposal 3: The Relative Time Stamp Accuracy of logged MDT measruement shall be not more than ± 2 seconds per hour.  Proposal 4: The LTE relative time stamp accuracy for radio link failure and handover failure log reporting is reused for NR RLF and HOF.  Proposal 5: The LTE Relative time stamp for RRC connection establishment failure log reporting can be reused for NR RRC connection establishment failure log reporting and RRC resume procedure failure reporting. |
| [**R4-2001951**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001951.zip) | Ericsson, CMCC | • Proposal 1: In TS 36.133, cell-level inter-RAT NR measurements are to be added to the list of MDT measurements for RRC\_IDLE.  • Proposal 2: In TS 38.133, a new section for MDT is to be added for RRC\_IDLE and a new section for MDT is to be added for RRC\_INACTIVE, where the new sections will cover cell-level and beam-level measurements for MDT.  • Proposal 3: UE in RRC\_IDLE or RRC\_INACTIVE logs also the information indicating the carrier status of the measurements logged for MDT. |
| [**R4-2001952**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2001952.zip) | Ericsson | LS |
| [**R4-2000649**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000649.zip) | CMCC, Ericsson | 38.133 CR |
| [**R4-2000650**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000650.zip) | CMCC, Ericsson | 36.133 CR |

## Open issues summary

### NR MDT measurement requirements

*Section 5.1.1.2 (Measurement collection) in TS37.320:*

*The measurement quantities for downlink pilot strength measurement logging are fixed and consist of both RSRP and RSRQ for EUTRA, both RSCP and Ec/No for UTRA FDD, P-CCPCH RSCP for UTRA 1.28 Mcps TDD, Rxlev for GERAN, and Pilot Pn Phase, Pilot Strength for CDMA2000 if the serving cell is EUTRAN cell, and both RSRP and RSRQ for NR.*

*For NR, in addition to the logged measurement quantities of the camped cell, the best beam index (SSB Index) as well as best beam RSRP/RSRQ is logged as well as the ‘number of good beams’ associated to the cells within the R value range (which is configured by network for cell reselection) of the highest ranked cell as part of the beam level measurements. Sensor measurements are logged if available.*

According to the description in 37.320 and also RAN2 LS, the following measurements in idle and inactive state are introduced for NR MDT:

* inter-RAT E-UTRA FDD and TDD RSRP,
* inter-RAT E-UTRA FDD and TDD RSRQ,
* SS-RSRP per cell,
* SS-RSRQ per cell,
* SS-RSRP per SSB index of the serving cell,
* SS-RSRQ per SSB index of the serving cell,
* best SSB index of the serving cell,
* the number of SSBs with different SSB index which are above the threshold absThreshSS-BlocksConsolidation for all detected cells whose cell-ranking criterion R value is within rangeToBestCell of the cell-ranking criterion R value of the highest ranked cell.

**Issue 1-1-1: Measurement requirements for NR MDT**

* Proposals
  + Option 1 (CMCC, Huawei, Ericsson): Reuse existing measurement requirements in idle and inactive mode for NR MDT.
* Recommended WF
  + 3 companies discuss issue 1-1-1. All of them propose to reuse existing requirements and do not define new requirements for NR MDT. Moderator would like to suggest the way forward as:
    - Reuse existing measurement requirements in idle and inactive mode for NR MDT.

### NR MDT relative time stamp accuracy requirements

***Section 5.1.6 (Accessibility measurements) in TS37.320:***

*The UE logs failed RRC connection establishments for LTE, UMTS and NR, i.e. a log is created when the RRC connection establishment procedure fails. For NR, UE logs any failed connection establishment attempt, i.e. a log is created when the RRC setup or resume procedure fails. The UE logs failed RRC connection establishments or RRC resume procedure without the need for prior configuration by the network.*

According to the description in 37.320, NR MDT introduce RRC connection establishment failure reporting and RRC resume procedure failure reporting

***Section 5.4.1.2 (Radio Link Failure) in TS37.320:***

*The Radio Link Failure report contains information related to the latest connection failure experienced by the UE. The connection failure can be Radio Link Failure (RLF) or Handover Failure (HOF). The contents of the RLF report and the procedure for retrieving it by a gNB are specified in TS 38.300.*

*NR RLF report content required for MDT includes:*

* *Latest radio measurement results of the serving and neighbouring cells, including SSB/CSI-RS index and associated measurements in the serving and neighbouring cells;*

According to the description in 37.320, NR MDT introduce radio link failure and handover failure report, which is same as LTE.

**Issue 1-2-1: Relative Time Stamp Accuracy for logged measurement**

* Proposals
  + Option 1 (CMCC, Huawei, Ericsson): Reuse the LTE relative time stamp accuracy requirements of logged measurements for NR logged measurements
* Recommended WF
  + 3 companies discuss issue 1-2-1. All of them propose to reuse the LTE relative time stamp accuracy requirements for NR. Moderator would like to suggest the way forward as:
    - Reuse the LTE relative time stamp accuracy requirements of logged measurements for NR logged measurements

**Issue 1-2-2: Relative Time Stamp Accuracy for RRC connection establishment failure log reporting**

* Proposals
  + Option 1 (CMCC, Huawei, Ericsson): Reuse the LTE relative time stamp accuracy requirements of RRC connection establishment failure log reporting for NR RRC connection establishment failure log reporting
* Recommended WF
  + 3 companies discuss issue 1-2-2. All of them propose to reuse the LTE relative time stamp accuracy requirements for NR. Moderator would like to suggest the way forward as:
    - Reuse the LTE relative time stamp accuracy requirements of RRC connection establishment failure log reporting for NR RRC connection establishment failure log reporting

**Issue 1-2-3: Relative Time Stamp Accuracy for RRC resume procedure failure reporting**

* Proposals
  + Option 1 (Huawei): Reuse the LTE relative time stamp requirements for RRC connection establishment failure log reporting for NR resume procedure failure reporting.
* Recommended WF
  + 1 company discuss issue 1-2-3 and propose to reuse the LTE relative time stamp accuracy requirements for NR resume procedure failure reporting. Moderator would like to suggest the way forward as:
    - Reuse the LTE relative time stamp requirements for RRC connection establishment failure log reporting for NR resume procedure failure reporting.

**Issue 1-2-4: Relative Time Stamp Accuracy for Radio Link Failure and Handover Failure Log Reporting**

* Proposals
  + Option 1 (CMCC, Huawei, Ericsson): Reuse the LTE relative time stamp accuracy requirements of Radio Link Failure and Handover Failure Log Reporting for NR Radio Link Failure and Handover Failure Log Reporting
* Recommended WF
  + 1 company discuss issue 1-2-3 and propose to reuse the LTE relative time stamp accuracy requirements for NR resume procedure failure reporting. Moderator would like to suggest the way forward as:
    - Reuse the LTE relative time stamp accuracy requirements of Radio Link Failure and Handover Failure Log Reporting for NR Radio Link Failure and Handover Failure Log Reporting

### LTE MDT requirements

*Section 5.1.1.2 (Measurement collection) in TS37.320:*

*The measurement quantities for downlink pilot strength measurement logging are fixed and consist of both RSRP and RSRQ for EUTRA, both RSCP and Ec/No for UTRA FDD, P-CCPCH RSCP for UTRA 1.28 Mcps TDD, Rxlev for GERAN, and Pilot Pn Phase, Pilot Strength for CDMA2000 if the serving cell is EUTRAN cell, and both RSRP and RSRQ for NR.*

*For NR, in addition to the logged measurement quantities of the camped cell, the best beam index (SSB Index) as well as best beam RSRP/RSRQ is logged as well as the ‘number of good beams’ associated to the cells within the R value range (which is configured by network for cell reselection) of the highest ranked cell as part of the beam level measurements. Sensor measurements are logged if available.*

According to the description in 37.320, except for existing LTE logged measurements, both RSRP and RSRQ for NR are introduced for LTE MDT in Rel-16.

**Issue 1-3-1: LTE MDT measurement requirements**

* Proposals
  + Option 1: Add cell-level inter-RAT NR measurements to the list of LTE MDT in RRC\_IDLE and reuse the existing inter-RAT NR measurement requirements.
* Recommended WF
  + 2 company discuss issue 1-3-1 and propose reuse the existing inter-RAT NR measurement requirements for LTE MDT. Moderator would like to suggest the way forward as:
    - Add cell-level inter-RAT NR measurements to the list of LTE MDT in RRC\_IDLE and reuse the existing inter-RAT NR measurement requirements.

### MDT Measurements from UE Configured with EMR

***Background (details can be found in R4-2001951)***

*The UE can be configured for performing early measurement reporting (EMR) on cells of one or more carriers (EMR carriers) over a very long period e.g. over the time controlled by timer T331 which can be up to 300 seconds. The UE performs the EMR measurement in low activity state (e.g. in RRC idle state, RRC inactive state etc). In low activity state the UE also autonomously performs cell reselection and for which it performs the measurements. The same EMR carrier may also be configured for cell reselection. However, the UE may not perform measurements on EMR carrier concurrently for both EMR and cell reselection. For example, at a given time the configured EMR carrier may be measured only for EMR or for both EMR and cell reselection. The EMR carrier can therefore be overlapping carrier (OC) or non-overlapping carrier (NOC). In general, the same EMR carrier can change from OC to NOC or vice versa over time, for example when the UE measurement configuration is updated after reading system information.*

*The UE may use different measurement procedures (e.g. different measurement rates/sampling) for measuring OC and NOC carriers and are therefore associated with different requirements.*

*The main motivation behind logging the carrier status stems from the fact that the measurement requirements depend on the carrier status. Therefore, without such information the network receiving the logged results cannot adequately interpret and appropriately apply the results for SON function (e.g. network optimization, etc) or positioning.*

**Issue 1-4-1: MDT measurement from UE configured with EMR**

* Proposals
  + Option 1 (Ericsson, CMCC): UE in RRC\_IDLE or RRC\_INACTIVE logs also the information indicating the carrier status of the measurements logged for MDT.
* Recommended WF
  + 2 companies discuss issue 1-4-1 and propose that UE logs the information indicating the carrier status of the measurements logged for MDT. An LS is also submitted related to this issue. Moderator would like to suggest companies provide comments on this issue, as well as the LS (R4-2001952).

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| CMCC | Issue 1-1-1: We support the recommened WF: resue existing measurement requirements in idle and inactive mode for NR MDT  Issue 1-2-1: We support the recommended WF: Reuse the LTE relative time stamp accuracy requirements of logged measurements for NR logged measurements  Issue 1-2-2: We support the recommended WF: Reuse the LTE relative time stamp accuracy requirements of RRC connection establishment failure log reporting for NR RRC connection establishment failure log reporting  Issue 1-2-3: According to 37.320, NR resume procedure failure reporting is supported for NR MDT. We support the recommended WF: Reuse the LTE relative time stamp requirements for RRC connection establishment failure log reporting for NR resume procedure failure reporting.  Issue 1-2-4: We support the recommended WF: Reuse the LTE relative time stamp accuracy requirements of Radio Link Failure and Handover Failure Log Reporting for NR Radio Link Failure and Handover Failure Log Reporting  Issue 1-3-1: According to 37.320, inter-RAT NR RSRP and RSRQ measurement is supported. We support the recommended WF: Add cell-level inter-RAT NR measurements to the list of LTE MDT in RRC\_IDLE and reuse the existing inter-RAT NR measurement requirements.  Issue 1-4-1: Regarding the MDT measurement from UE configured with EMR, since OC carrier and NOC carrier have different requirements in RAN4. Based on the logged measurements, network may think the coverage of the carrier is not good but the actual reason is because the carrier is a NOC carrier. We also understand this issue should be discussed and decided by RAN2. So we support to send LS to RAN2 to inform such observation, and RAN4 will follow RAN2’s decision. |
| Qualcomm | Issue 1-4-1: In our understanding measurements for EMR are not yet included in the MDT logging procedure. RAN2 has not yet agreed to also have logging and reporting for this type of measurements. As such, it is too early to agree any details related to such measurements.  We agree with all other proposals. |
| Ericsson | Issue 1-1-1: agree with the proposed WF  Issue 1-2-1: agree with the proposed WF  Issue 1-2-2: agree with the proposed WF  Issue 1-2-3: agree with the proposed WF  Issue 1-2-4: agree with the proposed WF  Issue 1-3-1: agree with the proposed WF  Issue 1-4-1: agree with the proposed WF. Further clarification on 1-4-1:   * In general, even if there is no explicit RAN2 agreement on that EMR measurements are to be logged, there is no any agreement that the UE shall not do this, so in our view actually some UEs can log measurements also on EMR carrier, and then the problem is that the requirements are different and the UE behavior is different with respect to overlapping and non-overlapping measurements (e.g., it the UE may stop performing measurements on non-overlapping carrier and then at some point again perform such measurements – so how the network would interpret this? That the UE is running out of coverage on that carrier (which is not true)?). * we therefore propose that we at least inform RAN2 about the observed issue, and then it’s up to RAN2. |
| Huawei, HiSilicon | Issue 1-4-1: disagree with the recommended WF. The MDT is a best-effort behavior. When and how network will use the information is left to network implementation. There may no need to provide more additional accurate information in MDT report.  For other issues, we agree with the proposals in the recommended WF |
| Nokia, Nokia Shanghai Bell | Issue 1-4-1: We can discuss the details once the EMR requirements are clear. They are not even defined yet.  For other issue, we agree with the proposed WF making sure all the NR new measurements in RAN2 LS are included. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [**R4-2000649**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000649.zip) | Company A |
| Company B |
|  |
| [**R4-2000650**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000650.zip) | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

5 companies joined the 1st round email discussion. Companies’ views are quite aligned for Issue 1-1-1, Issue 1-2-1, Issue 1-2-2, Issue 1-2-3, Issue 1-2-4, and the recommended WFs from moderator are acceptable for all the companies.

The only open issue is Issue 1-4-1: MDT measurement from UE configured with EMR. 3 companies disagree to consider EMR for MDT. Moderator suggests companies to further discuss Issue 1-4-1 in 2nd round discussion.

The targets for 2nd round discussion:

* **CR on 38.133 and 36.133:** moderator suggests companies to provide comments on the CRs based on the 1st round consensus on Issue 1-1-1, Issue 1-2-1, Issue 1-2-2, Issue 1-2-3 and Issue 1-2-4.
  + - * Discuss based on CR [R4-2000649](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000649.zip), [R4-2000650](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000650.zip)
* **Response LS to RAN2**: moderator suggests to discuss the LS content in 2nd round
  + - * Discuss based on R4-2001952
* **Further discuss the left open issues in 2nd round**
* **Way forward to capture the agreements**

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | Way forward on MDT RRM requirements | CMCC |
| #2 | Response LS on MDT Measurements | Ericsson  revision of R4-2001952 |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| [**R4-2000649**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000649.zip) | *To be revised* |
| [**R4-2000650**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000650.zip) | *To be revised* |

## Discussion on 2nd round (if applicable)

### Open issues

**Issue 1-4-1: MDT measurement from UE configured with EMR**

***Background (details can be found in R4-2001951)***

*The UE can be configured for performing early measurement reporting (EMR) on cells of one or more carriers (EMR carriers) over a very long period e.g. over the time controlled by timer T331 which can be up to 300 seconds. The UE performs the EMR measurement in low activity state (e.g. in RRC idle state, RRC inactive state etc). In low activity state the UE also autonomously performs cell reselection and for which it performs the measurements. The same EMR carrier may also be configured for cell reselection. However, the UE may not perform measurements on EMR carrier concurrently for both EMR and cell reselection. For example, at a given time the configured EMR carrier may be measured only for EMR or for both EMR and cell reselection. The EMR carrier can therefore be overlapping carrier (OC) or non-overlapping carrier (NOC). In general, the same EMR carrier can change from OC to NOC or vice versa over time, for example when the UE measurement configuration is updated after reading system information.*

*The UE may use different measurement procedures (e.g. different measurement rates/sampling) for measuring OC and NOC carriers and are therefore associated with different requirements.*

*The main motivation behind logging the carrier status stems from the fact that the measurement requirements depend on the carrier status. Therefore, without such information the network receiving the logged results cannot adequately interpret and appropriately apply the results for SON function (e.g. network optimization, etc) or positioning.*

Further clarification on 1-4-1:

* In general, even if there is no explicit RAN2 agreement on that EMR measurements are to be logged, there is no any agreement that the UE shall not do this, so in our view actually some UEs can log measurements also on EMR carrier, and then the problem is that the requirements are different and the UE behavior is different with respect to overlapping and non-overlapping measurements (e.g., it the UE may stop performing measurements on non-overlapping carrier and then at some point again perform such measurements – so how the network would interpret this? That the UE is running out of coverage on that carrier (which is not true)?).
* Candidate options:
  + Option 1: Send LS to inform RAN2 about the observed issue
  + Option 2: Send LS to ask RAN2 whether EMR measurements are supported in Rel-16 MDT
  + Option 3: For 38.133, discuss after we have EMR requirements. (note: There are already EMR requirements for LTE, but NR requirements are still under discussion)

### Companies views’ collection for 2nd round

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| **Company** | **Comments** |
| Ericsson | Issue 1-4-1: slightly updated option 3, since it is not relevant for 36.133. |

### CR

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| **CR/TP number** | **Comments collection** |
| [**R4-2000649**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000649.zip) | Ericsson: In Section 5.3.6 in the CR to 38.133, it is sufficient with the first sentence, and then the rest of the text (“Relative time stamp for RRC resume failure log reporting is defined as…-no power off or detach occurs after the RRC resume failure had been detected and until the log is time-stamped.”) can be removed, to be aligned with the sections above. |
| Company B |
|  |
| [**R4-2000650**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000650.zip) | Company A |
| Company B |
|  |

### Responce LS

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| **CR/TP number** | **Comments collection** |
| R4-2001952 | Company A |
| Company B |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |