**3GPP TSG-RAN WG2 Meeting #113-e R2-210xxxx**

**Online, January 25th – February 5th 2021**

**Agenda Item: 8.14**

**Source: China Unicom**

**Title: Summary of [AT113-e][039][eQoE] RAN2 conclusions on QoE (China Unicom)**

**Document for: Discussion and decision**

# Introduction

This document is intended to summarize the offline discussion on NR QoE SI.

* [AT113-e] [039][eQoE] RAN2 conclusions on QoE (China Unicom)

Scope: Continue the discussion based on R2-2102243. Prioritize items that are believed to be needed in the TR, e.g. address the open points as listed by R3, e.g. it was commented online that Mobility is such a topic. Generally include RAN2 parts that would go into a WID. Attempt to define in more detail what is the expected Reuse of LTE solution, i.e. elaborate P1 in the summary so it becomes agreeable. For technical discussion, can prioritize parts where agreement/progress seems possible.

Intended outcome: Report with Points worded in such way that they can be easily agreed online, the points being technical agreements, items that should be addressed in the WI, and can also be points for which we cannot conclude.

Initial deadline (for companies' feedback):  2nd week Mon, UTC 1200

Initial deadline (for rapporteur's summary):  2nd week Tue, UTC 1200

RAN2 GTW session agreements:

* Management based QoE configuration should not override signaling based QoE configuration. Details can be discussed during the WI phase.
* QoE reports are sent via a separate SRB (separate from current SRBs) in NR, as this reporting is lower priority than other SRB transmissions.
* Configuration and Reporting for multiple simultaneous QoE measurements for a UE can be supported (can determine whether there is AS impact in the WI phase)
* RRC signaling is used by the gNB to indicate the UE to pause or resume the QoE reporting.
* The details of pause/resume mechanism need to be resolved in potential WI phase, e.g. is pause/resume for all QoE reports or per QoE configuration, how long can the UE store the reports, limit for stored reports size etc. (these points can be captured in TR 38.890)
* Whether the UE stores its QoE configuration when going to RRC INACTIVE state for potential use when the UE moves back to RRC Connected state will be decided in the WI phase.

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# Discussion

## Points being technical agreements

Based upon the email discussion R2-2102243 the below proposals have been drafted.

**Proposal 1: RAN2 agree NR QoE can take LTE QoE solution as baseline. Details can be discussed during the WI phase.**

**LTE QoE solution includes the following key parts:**

1. **Both signaling based and management based initiated cases are allowed**
2. **The LTE QoE feature is activated by Trace Function from the MDT frame work**
3. **Application layer measurement configuration received from OAM or CN can be encapsulated in a transparent container, which is forwarded to UE in a downlink RRC message. Application layer measurements received from UE's higher layer can be encapsulated in a transparent container and sent to network in an uplink RRC message**

**Question: Do companies agree with the above proposal 1?** **Can also provide comments if any.**

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| **Company** | **Yes/No** | **Comments** |
| CMCC | Yes, but | Take LTE as baseline, but not preclude other enhancement for RAN optimization.  For bullet 2, we think current QoE configuration (UE APP layer configuration) is configured in parallel with MDT configuration within Trace Activation, so the statement in bullet 2 might not be so precise. Modification on bullet 2 may be needed. |
| Huawei, HiSilicon | Yes | With these clarifications about the “LTE baseline”, the proposal is OK to us. |
| Qualcomm | Yes | I believe all above should be included as the baseline for NR QoE. |
| OPPO | Yes |  |
| LGE | Yes |  |
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**Proposal 2: Collection of radio related measurements, if needed, should be done by existing methods when they exist such as MDT. There is no intention to duplicate any such functionality from RAN2 point of view.**

**Question: Do companies agree with the above proposal 2? Can also provide comments if any.**

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| **Company** | **Yes/No** | **Comments** |
| CMCC | Remove the second sentence, and then Yes | We are OK with the first sentence, but have concern with the second sentence.  Regarding the second sentence, a question is needed to be considered: whether radio related measurements are always able to be configured.  There’s a condition that a UE supports QoE functionality but doesn’t support MDT functionality, then there’s no MDT measurement result available to be correlated with the QoE report. Under such circumstances, there might be no space for RAN to perform potential RAN optimization.  The most straight-forward way to guarantee the availability of radio related measurement is to conditionally add those MDT measurements in QoE configuration if UE doesn’t support MDT functionality, but it contradicts the second sentence in the proposal.  So our proposal is to remove the second sentence, discuss the availability issue during WI phase, and agree the first sentence for this meeting. |
| Huawei, HiSilicon | Yes | Duplication of an already existing functionality is a very inefficient use of our time. We are not sure that not having an MDT support by the UE is a good reason to duplicate the functionality. It would be better for the UE to simply support the MDT measurements which should have the same implementation complexity. In the WI phase, we could, e.g. discuss whether the UE supporting QoE should also support MDT or some particular MDT functionalities/measurements. Furthermore, at least immediate MDT does not require almost nothing other than normal RRM measurements which the UE has to support anyway. |
| Qualcomm | Yes | The collection for the RRM measurement should be done using the existing MDT framework, where the UE capability is checked before RRM measurement reporting. QoE is developed for application layer measurements, therefore RRM measurement collection is beyond the scope of QoE SI and WI. |
| OPPO | Needs further clarification | Only when UE consent is available and the UE is equipped with the MDT related capability, collection of radio related measurement is allowed. Such principle should be followed and is preferred be reflected in the TR . |
| LGE | Yes | We already have MDT procedure to collect the radio related measurements. To avoid duplicated UE effort/reporting, the radio related measurements should not be included in QoE reporting. We may need to discuss whether further information is required to indicate the correlation between the QoE report and MDT report. |
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**Proposal 3: Discuss the collection of radio related measurements and QoE measurements.**

In summary, there are two options:

**Option 1:** QoE reports are extended to include radio measurements (e.g. MDT measurements, L2 measurements), [18]

**Option 2:** Enable time alignment between MDT and QoE measurement, e.g. QoE reference ID can be used to bind the MDT measurements to the QoE measurements. [13]

**Option 3:** UE should inform the network when starting a QoE measurement session to allow the network to trigger gathering of additional information, e.g. radio measurements or other radio information. [10]

Option 4: UE can collect the radio measurements upon some trigger condition is met at the application layer. For example, if QoE falls below certain threshold, the radio measurements can be obtained. In such scenario, a trigger can be sent from application layer to AS for the collection of radio measurement and reporting.

**The following contributions are about the colletion of radio measurements and QoE measurements:**

[13] R2-2101273 Analysis of QoE measurements at OAM and RAN Ericsson discussion FS\_NR\_QoE

[18] R2-2101806 Discussion on NR QoE management CMCC discussion Rel-17

[10] R2-2101191 Discussion on other QoE aspects Huawei, HiSilicon discussion Rel-17 FS\_NR\_QoE

**Question: Which option do companies prefer? Can also provide comments if any.**

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| **Company** | **Preferred option** | **Comments** |
| CMCC | Option1 & Option2 | First of all, we would like to point out that the statement ‘RAN can make the correlation between the two measurements’ is talking about another issue on which node to perform correlation, and we should focus on how to make correlation for this question. Therefore, we just remove the statement mentioned above.  If MDT functionality is supported by UE, in our contribution, we observe that radio related measurement and QoE report may be transmitted through different SRBs, so it would be more appropriate for RAN to make correlation between two measurements. Under such condition, there’s no need for QoE report to be extended to include radio related measurements, and Option 2 is needed.  However, if MDT functionality is not supported by UE, then QoE reports can be extended to include radio related measurements including those defined in MDT or L2. Then Option 1 is needed. |
| Huawei, HiSilicon | Option 3 | We have added Option 3 above as per our contribution in [10]. It also falls into the family of allowing a correlation between MDT and/or other radio information and QoE report, but it is done on the network side in this case, hence it is a bit different than option 2.  Option 1 goes against the spirit of Proposal 2 and would require functionality duplication. |
| Qualcomm | Radio measurement shiukdn’t be configured by QoE and no need for timing alignment from the configuration. | Configuration of MDT should be independent of QoE measurements configuration. In our understanding, the configuration for the QoE measurements and RRM measurements should be handled independently and QoE shouldn’t have authority over configuring MDT measurements. Furthermore, in the majority of scenario, MDT may already have been configured to the UE prior to the QoE configurations. Another issue with both options may be that there are many QoE service types, we do not want to change MDT configuration every time a QoE is configured at the UE. Additionally, we do not want alignment in terms of MDT and QoE, i.e. when UE is configured with signaling based QoE, it should not be the case that UE can only be configured with signaling based MDT, and vise versa.  Considering all these, we believe, QoE and MDT configuration should be independent and we proposed option 4. |
| OPPO | Option 2 or Option 4 | Agree with Qualcomm’s intention.  Regarding Option 1, If MDT is configured and activated, in RRC\_Connected state, the MDT measurement results are definitely reported to network via SRB1, according to the current specification. On the other hand, if QoE reports are extended to include radio measurements, duplication transmission of MDT report on SRB4 is required, which is redundant and energy inefficient, which is definitely unacceptable.  Regarding Option 3, it seems not feasible for Idle/inactive state UE, where UE has no way to send notification of QoE session started towards the network if state transition is not assumed. |
| LGE | Option 2 with comments. | The time alignment is not needed in terms of MDT and QoE measurements. The UE should be able to perform the MDT and QoE measurement independently. However, if some information that can be used for correlation is reported in QoE reporting, the network could bind the MDT results and QoE results. |
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## FFSs in the TR related with RAN2

**Proposal 4: If the UE is configured with MR-DC, Secondary Node can provide QoE configuration directly to the UE and receive QoE reports directly from the UE.**

For P4, company view are encouraged to input.

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| **Company** | **Yes/No** | **Comments** |
| CMCC |  | For QoE configuration with signalling based solution, not sure the benefit for SN node to provide QoE configuration;  For QoE configuration with management based solution, maybe up to RAN3 and SA5 to decide whether QoE configuration can be directly provided to SN.  For QoE report, it might be some benefits for SN to receive QoE reports directly from the UE for RAN optimization. |
| Huawei, HiSilicon | Yes | We think this should be enabled, similarly as in MDT. We can also reuse the MDT principles for the QoE configuration provision to the SN as we clarified in our paper in R2-2101189, but the detailed discussion on this can be done in WI phase. |
| Qualcomm | No | We are against the QoE configuration and reporting through the secondary node in MR-DC. Unlike MDT, QoE measurements are collected at the application layer instead of RAN, therefore, I have the following concerns with supporting QoE measurements in MR-DC:   1. QoE measurements are not configured for the RAN or CN optimizations, thus, there is no clear use case for supporting the reception of QoE configuration from the Secondary node. 2. What happens when SN is released? Will the configuration received over SN will be released too? 3. If No, how MN will know where to send the QoE report upon receiving it from UE? 4. what if a QoE session is started in the MR-DC but UE never comes back to the MR-DC during the active session?   Therefore, considering the complexity and not having the proper use case, I am wondering if this is needed. |
| OPPO | No | Agree with Qualcomm |
| LGE | No | Agree with Qualcomm |
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**Proposal 5: The details of QoE handling in MR-DC need to be resolved in a potential WI phase, e.g. how does SN receive QoE configuration from CN/OAM, which SRB is used by SN, whether/how MN-SN coordination is needed (these points can be captured in TR 38.890).**

For P5, company view are encouraged to input.

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| **Company** | **Yes/No** | **Comments** |
| CMCC | Yes | OK to discuss during WI phase. |
| Huawei, HiSilicon | Yes | We think there is no time in the SI for RAN2 to discuss these points properly, but capturing in the TR will help in scoping the WID properly. |
| Qualcomm | No | See above comment. |
| OPPO | No |  |
| LGE | No |  |
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TR 38.890 contains an exemplary procedure for RAN visible QoE information reporting, but contains the following FFS;

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| Editor's NOTE: It is FFS whether RAN awareness of QoE information is useful, and whether UE reporting is needed. |

Since companies have different views on the potential mechanism for RAN aware QoE, it is proposed to discuss and agree a Text Proposal capturing advantages and disadvantages as well as specifications impact of different approaches for RAN visible QoE from RAN2 perspective.

**Proposal 6: RAN2 tries to agree on the TP capturing advantages and disadvantages as well as specifications impact of different approaches for RAN visible QoE from RAN2 perspective.**

**Option 1:**  The otherConfig IE of the RRCReconfiguration message can carry the RAN visible QoE Configuration (if support) and QoE measurement configuration container for the QoE configuration transfer.

**Option 2:** Include some high level light QoE metrics (e.g., QoE score per metric of interest or a binary flag per metric of interest) outside the QoE measurement container as part of measReportAppLayer visible to RAN. The light QoE metrics indicate whether QoE requirements are fulfilled or not.

**Option 3:** UE reports two containers: one legacy QoE container and one RAN aware QoE container. RAN aware container is derived from the current QoE container using SA4 defined rule. UE reports the RANaware QoE measurement in the MeasurementReport together with RRM measurements when event-trigger conditions are met and reports the detailed traditional QoE measurements for application optimizations over SRB4 in a similar fashion as LTE QoE reporting.

**Option 4:** There is no requirement towards UE and gNB to extract information from QoE XML Config and Report for the RRC message.QoEConfig and QoEReport should be handled in a transparent manner in RAN. Otherwise, the additional tasks in the UE Access Stratum and gNB, would require tremendous efforts to translate or maintain the XML file in RRC layer (e.g. any changes in the XML file could require additional encoding rules).

**Option 5:** Other options if not included above.

For P6, company view are encouraged to input.

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| **Company** | **Preferred Option** | **Comments** |
| CMCC | Option1,2,3 | In our opinion, Option1 is the solution related to QoE configuration; while Option 2, 3 are solutions related to QoE reporting. Option4 is more like an evaluation than a solution.  All feasible solutions can be considered and discussed during WI phase. |
| Huawei, HiSilicon | Neither | We think the most important thing to clarify would be the FFS point captured in the TR and mentioned above, i.e. is this is information really useful for RAN and how is it utilized? We have some serious doubts about that as observed in our Tdoc in R2-2101191:  **Observation 1: RAN performs radio resource management procedures based on QoS requirements received from CN for a data flow currently. Usefulness of QoE reports utilization for RRM is unclear.**  **Observation 2: RAN can already obtain a lot of information allowing it to meet the QoS requirement of the service such as radio measurements, packet latency measurements, buffer status of a logical channel etc. It is unclear how QoE data could be used on top of it and whether it provides any additional useful information.**  **Observation 3: If the intention of RAN visible QoE reporting is for RAN to perform real-time actions at AS layer, then it is unclear why such mechanism was to be specified as part of the QoE framework and not as a separate reporting mechanism different from the one used for QoE reporting for upper layers which is currently transparent to RAN.**  Since the QoE reports are supposedly used by the gNB for RRM, then it should be clarified first how they can be included in the current QoS framework and this is the question RAN2 should focus.  For P6, we do support capturing some comparison table, but maybe it is better to focus on high level solutions as agreed by RAN3 for now. We should also identify specifications impact to be able to fill section 7 of the TR for this feature from RAN2 perspective (most of these options have RAN2 impact and some very big one). Our more detailed views can be found in our paper in R2-2101191. |
| Qualcomm | Option 3 | While option 3 provides the framework for RAN optimization to achieve better UE QoE, it avoids unnecessary wastage of precious UE memory and provides feedback to the RAN in a timely fashion. Furthermore, this framework avoids network effort to correlate the RAN aware QoE measurements and RRM measurements, which can be significantly useful. |
| LGE |  | It should be decided first whether RAN awareness of QoE information is useful by other WG, e.g. RAN3. Unless or until an official input related to this is received, RAN2 doesn’t need to have the solution-level discussion.  Even if it is decided that the RAN awareness of QoE information is useful, gNB should be responsible for decoding XML. |
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**Proposal 7: RAN2 should discuss whether RAN is allowed to release an ongoing QoE measurement configuration and reporting. Details can be discussed during the WI phase.**

For P7, company view are encouraged to input.

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| **Company** | **Yes/No** | **Comments** |
| CMCC | Yes | Since no consensus can be foreseen on this issue, we prefer to discuss it during WI phase. And the proposal is acceptable. |
| Huawei, HiSilicon | Yes | RAN should have such flexibility, even though in most of the cases ongoing measurements should not be interrupted. |
| Qualcomm | No | In our understanding, RAN shouldn’t be allowed to release the ongoing QoE measurement configuration, as it does not have much impact on RAN. However, reporting can be paused by the network in the overloading scenario considering possible impacts at the RAN. |
| OPPO | No strong view |  |
| LGE | Yes | It is already captured in TR 38.890:   |  | | --- | | In case of RAN overload in standalone connectivity, RAN can stop new QoE measurement configurations, release existing QoE measurement configurations and pause QoE measurement reporting. |   It does no harm to support it from RAN2 perspective. |
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## Progress on candidate solutions

**Proposal 8: RAN2 discuss how to capture the solutions about mobility.**

**Option 1:**

- UE indicates to the gNB when the QoE measurement session starts and source gNB forwards this information to target gNB upon handover.

- When the UE leaves the measurement area, QoE configurations for this measurement area are released during handover by the target gNB unless the measurement session is ongoing.

- In case the UE is configured with a QoE configuration, the UE always assumes to be in the measurement area scope and is allowed to trigger a measurement session.

**Option 2:**

- Upon handover, the target gNB includes withinArea indication for QoE configurations which are valid under its coverage.

- The UE is allowed to trigger QoE measurement only for QoE configurations with withinArea indication.

- The UE is allowed to continue ongoing QoE measurements even without withinArea indication.

**Option 3:**

- The gNB configures the UE with the area configuration for each QoE configuration.

- The UE checks the configuration before triggering the QoE measurement.

- The UE continues an ongoing QoE measurement even when leaving the configured measurement area.

For P8, company view are encouraged to input.

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| **Company** | **Comments** |
| CMCC | Option 1& 2 can only be applied when UE is in connected mode; while Option 3 may also applied to UE in inactive/idle mode. Since the proposal here is discussing mobility scenario, and SA5 has sent an LS to RAN2 which expects RAN2 to implement WithinArea indication (without mentioning NR or LTE), we slightly prefer Option 2, but have no strong view at this stage. |
| Huawei, HiSilicon | Our preference is option 1 (at least for Connected mode QoE collection), but if companies have different vies, then we are OK with capturing all these three solutions in the TR for down-selection during WI phase.  In SA5 LS, it is said that:  “**ACTION: SA5** asks RAN2 and RAN3 groups to implement the WithinArea functionality according to TS 28.405 in Rel-16.”  Since in Rel-16 QoE was specified for LTE only, we understand this refers to LTE only, which is not in the scope of the SI. |
| Qualcomm | Considering the same solution for all of the RRC states, option 3 is our default choice. |
| OPPO | Option 2 is preferred. We have not seen any problem to reuse the LTE mobility solution for 5G NR. It is preferred to storing area configuration and leaving the area check task at the gNB. |
| LGE | We are OK to capture all possible solutions in TR, but according to TR 38.890, option 2 is inconsistent with SA4 requirements:   |  | | --- | | In addition, the SA4 requirements for QoE measurements stipulate that the client shall check the QoE configuration only when a session starts. This means that the client shall continue the QoE measurements for an ongoing session even if the UE moves out of the configured area. The SA4 requirements are RAT-independent and shall therefore be applied to the mobility solution for QoE measurement in NR, as well. |   Regarding option 3, Why does UE check the configuration before triggering the QoE measurement? |
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**Proposal 9: RAN2 to discuss whether QoE measurements in RRC IDLE/INACTIVE state should be supported, e.g. for MBS.**

For P9, company view are encouraged to input.

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| **Company** | **Yes/No** | **Comments** |
| CMCC | Yes | MBMS has been adopted as one of the service types supported for NR QoE management. So it is OK to have some primary discussion; but our preference is to de-prioritize such discussion. |
| Huawei, HiSilicon | Yes | We think it is useful. However, the work may be significant. In our opinion, NR QoE for streaming services can follow LTE QMC, but NR QoE for MBS may need a new solution and it may be more like “logged MDT”. If so, we see that there may be considerable work for RAN2, RAN3 and SA5. In general, such workload/complexity should be taken into account when planning future work. |
| Qualcomm | Yes | SA4 has previously sent an LS (S4-201576, R2-2100075) requesting to support QoE measurements for MBMS services. As the traffic can be received by the UE in MBS, therefore, supporting QoE measurements in IDLE/INACTIVE is necessary. |
| OPPO | Yes |  |
| LGE | Yes |  |
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**Proposal 10: RAN 2 can discuss whether RRC segmentation is needed for transmission of QoE reports. Details can be discussed during the WI phase.**

For P10, company view are encouraged to input.

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| **Company** | **Yes/No** | **Comments** |
| CMCC |  | Our feeling is that RRC segmentation is not just a QoE-specific problem, considering there is ongoing discussion on RRC segmentation in RAN2 and RAN3. We may need to firstly identify if there’s any additional issues caused by QoE reports, and we are open to discuss it at any time during WI phase. |
| Huawei, HiSilicon | No strong view | This seems to be a stage-3 level detail which we can discussed in the WI phase. |
| Qualcomm | Yes | It may be useful to avoid unnecessary delay to other high priority SRBs. |
| OPPO | Yes |  |
| LGE | No strong view | Prefer to discuss this issue in WI phase. |
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## Text Proposal

RAN2 agreements of this meeting are assumed to be captured as a TP to the TR, to be integrated by RAN3.

# 4 Conclusions

*To be added…*

# 5 References

1. R2-2100597 Generic requirements for QMC in NR Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_NR\_QoE
2. R2-2100598 QMC procedures principles Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_NR\_QoE
3. R2-2100706 Discussion on QoE configuration and reporting vivo discussion Rel-17 FS\_NR\_QoE
4. R2-2100846 Discussion on QoE measurement collection in NR OPPO discussion Rel-17 FS\_NR\_QoE
5. R2-2100879 Discussions on the QoE SI Metrics and Collection Procedures Apple discussion Rel-17 FS\_NR\_QoE
6. R2-2100967 Discussion on NR QoE CATT discussion FS\_NR\_QoE
7. R2-2100995 QoE measurements in NR LG Electronics Inc. discussion Rel-17
8. R2-2101189 Discussion on QoE configuration and report aspects Huawei, HiSilicon discussion Rel-17 FS\_NR\_QoE
9. R2-2101190 Discussion on QoE handling during UE mobility Huawei, HiSilicon discussion Rel-17 FS\_NR\_QoE
10. R2-2101191 Discussion on other QoE aspects Huawei, HiSilicon discussion Rel-17 FS\_NR\_QoE
11. R2-2101271 Solution for QoE Management Ericsson discussion FS\_NR\_QoE
12. R2-2101272 Mobility Support for NR QoE Management Ericsson discussion FS\_NR\_QoE
13. R2-2101273 Analysis of QoE measurements at OAM and RAN Ericsson discussion FS\_NR\_QoE
14. R2-2101338 Handling of NR QoE measurements QUALCOMM INCORPORATED discussion Rel-17
15. R2-2101339 Handling of NR QoE reporting QUALCOMM INCORPORATED discussion Rel-17
16. R2-2101496 Ranking and prioritization of QoE enhancement features QUALCOMM Incorporated discussion Rel-17
17. R2-2101581 Discussion on the RAN2 related work on NR QoE China Unicom discussion FS\_NR\_QoE
18. R2-2101806 Discussion on NR QoE management CMCC discussion Rel-17
19. R2-2101878 Transport of NR QoE report Samsung discussion Rel-17
20. R2-2101879 RRC signaling for NR QoE Samsung discussion Rel-17
21. R2-2101880 Alignment with RAN3 agreements for NR QoE Samsung discussion Rel-17
22. R2-2101917 Miscellaneous discussion on QoE ZTE Corporation, Sanechips discussion Rel-17 FS\_NR\_QoE
23. R2-2101918 Discussion on NR QoE continuity during handover ZTE Corporation, Sanechips discussion Rel-17 FS\_NR\_QoE
24. R2-2101919 Stop an ongoing QoE measurement reporting ZTE Corporation, Sanechips discussion Rel-17 FS\_NR\_QoE