3GPP TSG-RAN WG3 #114-e R3-21586[9](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23113-e.exe/Meetings/RAN3%23113/chairnotes/Inbox/R3-214141.zip)

Online, 1st – 11th Oct 2021

Agenda Item: 15.3

Source: Qualcomm Incorporated (moderator)

Title: SoD on CB: # QoE5\_RAN Visible

Document for: Approval

# Introduction

**CB: # QoE5\_RANVisible**

**- Further discussion on RVQoE metrics and other open issues**

**- QoE value based solution?**

**- QoE information should be transmitted on F1 for scheduling purpose? F1 impact?**

**- TPs if agreeable**

**- Capture agreements and open issues**

**- LS to other groups?**

(Qualcomm - moderator)

Summary of offline disc [R3-215869](https://qualcomm-my.sharepoint.com/personal/shakrish_qti_qualcomm_com/Documents/Desktop/Dropbox/Pentari%20Systems/RAN3/114-e/CB/CB%20%23%20QoE5_RANVisible/Inbox/R3-215869.zip)

# For the Chair’s Notes

TBD

# Round-1 Discussion

## RVQoE metrics

The following RVQoE metrics were discussed in the contributions referenced within and support or not was mentioned.

|  |  |  |  |
| --- | --- | --- | --- |
| **RVQoE metric** | **Positive** | **Negative** | **FFS** |
| Buffer Level | [1], [3], [7] |  | [10] |
| Play List (simplified version) | [1], [7] | [3], [10] | [12] |
| Playout Delay for Media Startup | [1], [3] |  | [10], [12] |
| Buffer level alarm | [1] |  |  |
| Interaction latency or Comparable quality viewport switching latency metric | [7] | [1], [3] | [12] |

Also [6] proposed that further RAN3 discussion on RVQOE metric definition will need to wait for RAN2's reply. Further, buffer level alarm is considered as part of RVQoE values (see section 3.2.3).

Considering those metrics which received most positive and least negative votes during contribution, the following is proposed:

**Moderator Proposal 1:** Buffer level and Playout delay for Media startup is considered as RVQoE metric for DASH and VR service types

**Moderator Proposal 2:** Interaction latency or comparable quality viewport switching latency metric is not considered as RVQoE metric in Rel-17

**Companies are requested to provide their inputs on the following:**

**Q1: Whether Moderator proposal 1 and 2 are acceptable? If not, please provide your concerns**

**Q2: Whether a simplified version of playlist (e.g., when video representation changes or when stalling occurs) should be considered as RVQoE metric? If yes, please address concerns raised in [3] that this event might happen too often and might cause a lot of overhead**

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| --- | --- | --- |
| **Company** | **Responses to Q1 and Q2** | **Comment** |
| Qualcomm | Q1 – Yes  Q2 - No | Q2 – Could be too frequent (e.g., wouldn’t video representation change quite often, say from 1080p to 720p) and might cause a lot of overhead |
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## RVQoE values

**[10], Proposal 1**: To introduce RAN-visible QoE values to indicate the quality of the ongoing service, where QoE values could be a number range, e.g, 0 to10. where 10 represents excellent quality and 0 represents poor quality, or QoE values could be an enumerated type to indicate the quality, e.g, (poor, medium, good). RAN can receive RAN-visible QoE values for UE or QoE server.

**[3], Observation 1**: Defining a buffer level alarm indication instead of reporting an absolute buffer level seems to be under the scope of RVQoE values where UE can represent qualitative representation of RVQoE metrics.

**[3], Proposal 2:** The discussion on whether to define a buffer level alarm should happen under RVQoE values as this is a qualitative representation of a RVQoE metric and not an absolute value.

**[3], Observation 6:** Qualitative representation of QoE metrics in terms of a numerical value or an objective representation requires a model/function to be defined for each RAN visible QoE metric

### Whether to support RVQoE values

**Q3: Should RVQoE values be supported in addition in RVQoE metrics? If yes, which out of i) and ii) should be considered?**

1. **Qualitative representation of QoE metrics in terms of a numerical value e.g., 0 to 10**
2. **Objective representation of QoE metrics e.g., poor, medium, good**

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| --- | --- | --- |
| **Company** | **Yes/No**  **(If yes, which out of i) and ii))** | **Comment** |
| Qualcomm | Depends on Q4 | We can first discuss Q4 i.e., who generates the RVQoE values (UE or NG-RAN). If NG-RAN generates the RVQoE value, we are OK to support both i) and ii) |
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### Who should generate the RVQoE values (UE or NG-RAN)?

**[7], Observation 1:** UE performs the QoE value calculation is **not preferred** by SA4 as it has many limitations.

**[7], Observation 2:** **new mechanism is needed** if UE performs the QoE value calculation.

**[7], Observation 3:** RAN visible QoE value can be obtained by RAN visible QoE metrics **without extra specification impact.**

**[7], Proposal 2:** RAN visible QoE value should be **generated in gNB** based on the RAN visible QoE metrics and the existing models defined by SA4.

**[3], Proposal 16:** RAN3 to down select from the 3 options before deciding whether and how to support RVQoE values:

Option 1: Pre-defined formula in SA4 specs (**UE generated**)

Option 2: Configurable by NG-RAN (**UE generated**)

Option 3: Implementation specific to NG-RAN (**NG-RAN generated**)

**Q4: Who should generate the RVQoE values (UE or NG-RAN)? If UE generated, please provide comments to the concerns raised in [7].**

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| --- | --- | --- |
| **Company** | **UE or NG-RAN** | **Comment** |
| Qualcomm | NG-RAN | If UE has to generate RVQoE value, there will be the following spec impacts:   1. **CT1 impact**: Enhancements to AT commands needed to support RVQoE value 2. **SA4 impact**: The application has to compute the RVQoE value based on the instantaneous/average QoE in the measurement period. Also pre-defined formula in SA4 specs might be needed if there is no configurable RVQoE target 3. **RAN2 impact:** In case we decide to have a configurable RVQoE target, this needs to be configured over Uu   Alternatively, gNB can simply compute the RVQoE value based on the received RVQoE metric and its own QoE target. E.g., if buffer level sent by UE is less than 10 ms, gNB can classify this as “good” or have a RVQoE value as “10/10” etc. We don’t see the need to impact UE and different WGs when this can be easily done by implementation at gNB |
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### Configurability in case of UE generated RVQoE values

[1], Proposal 5: A RAN node can configure the UE to either report the Buffer Level or to report a Buffer Level Alarm based on a **configurable** threshold.

[3], Proposal 16: RAN3 to down select from the 3 options before deciding whether and how to support RVQoE values:

**Option 1: Pre-defined formula in SA4 specs**

**Option 2: Configurable by NG-RAN**

Option 3: Implementation specific to NG-RAN

[10], Proposal 2: To introduce **RAN-visible QoE value target** at RAN side. This RVQoE value target indicates the QoE value that needs to be guaranteed by RAN for UE.

[10], Proposal 3: For Signalling-based QoE, the CN signals the RVQoE value target to NG-RAN together with the QoE configuration. For Management-based QoE, the OAM configures the RVQoE value target to NG-RAN together with the QoE configuration.

An example could be Buffer level alarm e.g., if buffer level is greater or less than a threshold “X”

**Q5: If UE generates the RVQoE value (based on your answer to Q4), whether it should be a pre-defined formula in SA4 specs or configurable by NG-RAN?**

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| --- | --- | --- |
| **Company** | **Pre-defined formula or Configurable by NG-RAN** | **Comment** |
| Qualcomm | No need | UE should not generate RVQoE values (see comments to Q4) |
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## RVQoE configuration

### Basic principles

[9], Proposal 4: In split scenarios, CU should generate the RVQoE configurations.

[3], Proposal 5: RVQoE and legacy QoE can be configured independently i.e., RVQoE can be configured at a later time after configuring legacy QoE by using the same measConfigAppLayerID

**Q6: Do companies agree on the above two proposals on RVQoE configuration?**

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| --- | --- | --- |
| **Company** | **Yes/no** | **Comment** |
| Qualcomm | Yes |  |
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### RVQoE release

**[3], Proposal 6:** NG-RAN can release a list of RVQOE configurations while not releasing corresponding legacy QoE configurations

**[3], Proposal 7:** If the legacy QoE configuration is released, the corresponding RVQOE configuration is released as well

**Q7: Do companies agree on the above two proposals on RVQoE release ?**

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| --- | --- | --- |
| Company | Yes/no | Comment |
| **Qualcomm** | **Yes** |  |
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### RVQoE configuration IE details

RVQoE configuration can include the following (the ones in red indicate no support, ones in green indicate support)

1. Metrics to be reported [3]
2. Service Type [4]
3. QoE measurement ID [4], [9]
4. Start Time [2], [3], [12]
5. Duration [2], [3], [12]
6. Reporting Interval for periodic case [2], [7], [3], [12]
7. Triggering Event [2], [7], [12], [3]
8. Indication to report QoE value [9]
9. Sample Percentage (**FFS by [2]),** [3], [12]

**Moderator Proposal 3:** RVQoE configuration can include the RVQoE metrics to be reported, service type and a measurement ID for the RVQoE. Whether existing IEs can be reused for service type and measurement ID and the signaling design is up to RAN2

Considering the limited interest and more negative votes towards Start Time, Duration and Sample Percentage, it is also proposed the following:

**Moderator Proposal 4:** There is no need to consider Start Time, Duration and Sample Percentage in the RVQoE configuration in Rel-17

**Moderator Proposal 5:** Whether to include Triggering Event (e.g., an indication when video representation changes or stalling occurs or when a QoE metric e.g., buffer level, changes beyond a threshold) in RVQoE configuration depends on the final list of RVQoE metrics and whether RVQoE values are supported and should be discussed post agreements on those topics.

**Q8: Do companies agree with Moderator proposals 3-5?**

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| --- | --- | --- |
| **Company** | **Yes/no** | **Comment** |
| Qualcomm | Yes |  |
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Regarding whether to support Reporting Interval, it is moderator’s understanding that this is closely related to whether RVQoE and legacy QoE can be reported separately or should be reported together (we can discuss this in section 3.4.1) and RAN2 pending reply on whether a high priority SRB can be used for RVQoE report.

Meanwhile, we could discuss the use case of RVQoE and its priority w.r.t legacy QoE to achieve some common understanding.

[3], Proposal 4: RVQOE has the same priority as legacy QoE. The main purpose of RVQOE is to expose QoE metrics to RAN and not for enabling QoE aware real-time use cases

**Q9: Does RVQoE have the same priority or higher priority than legacy QoE and why? If higher priority, is it necessary to have i) separate reporting periodicities and ii) a higher priority SRB (or can SRB4 still work)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Same or Higher priority** | **Comment** |
| Qualcomm | Same priority  Reporting Interval – Not needed  SRB4 for RVQoE report | To keep it simple, we think RVQoE can have the **same priority** as legacy QoE in Rel-17 at least till we identify RVQoE metrics which are absolutely needed with a higher frequency to enable real-time use cases.  Enabling separate reporting periodicities for RVQoE will add to the processing complexities and increase storage requirements at UE Application to handle RVQoE and legacy QoE independently. We therefore propose to not define a **Reporting Interval** for RVQoE configuration.  Also, if RVQoE has same priority as legacy QoE, **SRB4 can be reused** for RVQoE reporting and we won’t need to define a higher priority SRB (e.g., SRB1/SRB2) for RVQoE reporting. |
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## RVQoE report

### Relation with legacy QoE report

[2], Proposal 4: The RAN visible QoE reports and legacy QoE reports may be delivered in separate messages.

[3], Observation 3: If RVQoE and legacy QoE are to be reported separately, it might increase the processing complexity and storage requirements at UE Application to handle RVQoE and legacy QoE independently

[3], Proposal 10: RVQOE and legacy QoE should be reported together

[4], Proposal 2: RVQoE and legacy QOE can be reported separately or together

[9], Proposal 5: RVQoE and legacy QoE should be reported together.

[12], Proposal 3: The RAN visible QoE metrics are reported together with the QoE report container in the interface between the application layer and the AS

**Summary from contributions:**

RVQoE and legacy QoE can be reported separately [2], [4]

RVQoE and legacy QoE should be reported together [3], [9], [12]

**Q10: Whether RVQoE and legacy QoE can be reported separately or should be reported together. If can be reported separately, please provide justifications in the potential increase in processing complexity and storage requirements at UE APP as highlighted by [3]**

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| --- | --- | --- |
| **Company** | **Together or Separate** | **Comment** |
| Qualcomm | Together | Justifications provided in Q9. |
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### PDU session information

[2], Proposal 5: RAN3 to discuss the feasibility of including PDU session information into the RVQoE report.

[3], Observation 4: QoE support for MR-DC is not supported in Rel-17 i.e., QoE is always configured and reported over MN in Rel-17

[3], Proposal 11: There is no need to include PDU session information (e.g., DRB ID, PDU session ID, QoS Flow ID) in the RVQoE report

[6], Proposal 2: The gNB should be able to identify the DRB concerned by RVQOE reports, which will require reporting of PDU session and QoS flow information from the UE to the gNB.

[7], Proposal 4: The DRB information (or QoS flow information) should be included in the QoE report for QoS aware scheduling.

[12], Proposal 6: The PDU session information and QoS flow information are reported together with the RAN visible QoE.

**Q11: Whether PDU/DRB/QoS flow information should be included in RVQoE report? Should this be deferred to Rel-18 as QoE for MR-DC is not supported in Rel-17?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Qualcomm | No | Can be discussed in Rel-18 |
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## Mobility Support for RVQoE

[2], Proposal 6: RAN3 to agree that the RAN visible QoE configuration can be propagated via Xn from the source to target node upon mobility in RRC\_CONNECTED and during context retrieval upon resumption from RRC\_INACTIVE. The target/new RAN node may assemble a different RAN visible QoE configuration.

[3], Proposal 12: RVQoE configuration can be propagated from the source to target node upon mobility in RRC\_CONNECTED and during context retrieval upon resumption from RRC\_INACTIVE. The target/new RAN node may assemble a different RVQoE configuration

[4], Proposal 3: RVQoE configuration **will not be transferred** to target node during mobility or resumption

**Q12: Whether RVQoE configuration can be propagated from the source to target node upon mobility and during context retrieval? If not, please provide justifications.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Qualcomm | Yes |  |
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Further, the following proposals were made on propagation of RVQoE report:

[2], Proposal 7: The RAN visible QoE report can be signalled from the target to the source node after a successful handover.

[4], Proposal 4: RVQoE report can be signalled from the target to the source node after a successful handover

[7], Proposal 5: RAN visible QoE report should be transmitted on Xn for scheduling optimization or handover optimization.

[3], Proposal 13: RVQoE report can be signaled from the target to the source node after a successful handover

[12], Proposal 9: Sending the RAN visible QoE report from the target node to the source node can be discussed in SON/MDT WID.

Since companies have consensus, the following is proposed.

**Moderator Proposal 6:** The RAN visible QoE report can be signalled from the target to the source node after a successful handover.

**Q13: Whether Moderator Proposal 6 is agreeable?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Qualcomm | Yes |  |
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## Which RVQoE metrics can NG-RAN configure?

[2], Observation 1: The OAM can configure the UE to collect a subset of the QoE metrics and not necessarily all the supported QoE metrics, meaning that the set of RVQoE metrics that are allowed to be collected is a subset of the legacy and RVQoE metrics that the UE is capable of collecting for the given service type.

[2], Proposal 1: The OAM sends a list of the available RVQoE metrics to the RAN node, outside the legacy QoE configuration container.

[12], proposal 2: For the RAN visible metrics, it should explicitly indicate to RAN the metrics which could be visible in RAN and are also configured in the container.

[3], Proposal 14: NG-RAN can conclude which RVQoE metrics are available to be collected from the UE via UE capability signaling and the service type configured for the UE (no need for OAM to configure this explicitly in the QoE configuration container)

[4], Proposal 1: RAN can conclude the metrics from the UE capability indication and the service type configured for the UE

**Q14: Which option do you prefer?**

**Option 1: NG-RAN configures RVQoE for only those metrics which are configured as part of legacy QoE configuration (needs OAM indication to NG-RAN)**

**Option 2: NG-RAN can configure any RVQoE metric without the knowledge of legacy QoE metrics configured**

An example is provided below:

* Suppose UE indicates capability to collect RVQoE metrics 1, 2 and 3 for service Type A.
* OAM configures legacy QoE metrics 1, 2 for service Type A
* Can NG-RAN configure UE to provide RVQoE metric 3 or only should be a subset of legacy QoE metrics 1 and 2?

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| --- | --- | --- |
| **Company** | **Option 1 or 2** | **Comment** |
| Qualcomm | See comments | Option 1 is probably better in that it doesn’t introduce new requirements at UE to measure a QoE metric just for RVQoE (e.g., RVQoE metric 3 in the above example), but reduces flexibility at NG-RAN (i.e., it can’t configure RVQoE metric 3 in the above example).  We seek some clarifications on Option 1 as well:   1. Is there a security issue as NG-RAN is informed which legacy QoE metrics were configured by the OAM inside the QoE configuration container? (e.g., that OAM configured QoE metrics 1 and 2 in the above example) 2. This list of RVQoE metrics will need to be sent with each QoE configuration, right? So, some signalling impact is foreseen. |
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## Misc topics

### RVQoE handling at RAN overload

[3], Proposal 7: If the legacy QoE configuration is paused/resumed, the corresponding RVQOE configuration is paused/resumed as well

[3], Proposal 8: A common indicator is used to pause/resume both legacy QoE and RVQoE configurations i.e., there is no support to pause/resume a list of RVQoE configurations while not pausing/resuming corresponding legacy QoE configurations

**Q15: Do companies agree on the above two proposals on RVQoE handling at RAN overload?**

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| --- | --- | --- |
| **Company** | **Yes/no** | **Comment** |
| Qualcomm | Yes |  |
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### Other topics

[2], Proposal 2: The alignment between radio-related measurements and RVQoE measurements is supported.

[2], Proposal 3: RAN3 to discuss the support for per-slice RVQoE and RVQoE handling at RAN overload once the basic solution (for QoE measurements) has been defined.

[3], Proposal 17: Per-slice RVQOE and alignment of RVQOE with radio-related measurements can be discussed post progress on the corresponding topics for the legacy QoE

**Moderator Proposal 7:** Alignment between radio-related measurements and RVQoE measurements and Per-slice RVQoE can be discussed post progress on the corresponding topics for the legacy QoE.

**Q16: Do companies agree on Moderator Proposal 7?**

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| --- | --- | --- |
| **Company** | **Yes/no** | **Comment** |
| Qualcomm | Postpone | Can be discussed in the next meeting |
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### Stage-3

QoE information transfer over F1 was already agreed last meeting. We can discuss the draft CR this meeting.

[7], Proposal 6: QoE information should be transmitted on F1 for scheduling purpose.

[7], Proposal 7: RAN3 agree the CR for TS 38.473 in [8] to support QoE information transfer.

**Q17: Any comments on the draft CR for TS 38.473?**

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| --- | --- | --- |
| **Company** | **Yes/no** | **Comment** |
| Qualcomm | Yes | OK in general to introduce a class-2 message QOE INFORMATION TRANSFER over F1. IE details (whether to include RVQoE values, DRB ID) can be FFS and based on agreements this meeting. |
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## LSs to other groups

The following LSs to other groups have been proposed. In the 1st round, we can confirm which of the following LSs are needed and **can work on the draft LSs in the 2nd round** based on agreements achieved this meeting.

**Q18: Which of the following LSs are needed to be sent?**

1. **LS to CT1 requesting to provide the AT commands for RVQoE configuration and report between the UE Application layer and UE AS**
2. **LS to SA4 to check if any spec impact is needed to support RVQoE**
3. **LS to RAN2 on further agreements on RVQoE configuration and RVQoE metrics and RVQoE values (if agreed)**
4. **LS to SA4/CT1 to check whether the application layer can know the QoS flows of the service [13]**

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| --- | --- | --- |
| **Company** | **Yes/No on LSs i)-iv)** | **Comment** |
| Qualcomm | Except iv) | OK on LS i)-iii). Details can be decided in Phase-II.  **Not clear on LS iv)** which states the following:  *The motivation of RAN visible QoE is to optimize the radio resource allocation. In NR, the radio resource are configured per DRB. The packets belonging to different PDU sessions are mapped to different DRBs by the RAN, and the packets from different QoS flows belonging to the same PDU session can be mapped to different DRBs. According to the last reply LS from SA4, RAN3’s understanding is that the UE APP can know the PDU session information of the concerned service type, but RAN3 are not sure whether the APP can know the QoS flow information belonging to each PDU session.*  **Question to SA4**: T*herefore, RAN3 would like to check with SA4 if the APP can also know the QoS flows of the concerned service, so that RAN is able to know the correspondence between the service type with the reported visible metrics and the PDU session/QoS flows, and take potential optimizations of radio resource usage for corresponding DRB.*  Is this related to section 3.4.2 on PDU session information? If so, this can be postponed to Rel-18 as commented before. |
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# Conclusion, Recommendations [if needed]

If needed

# References

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| [1] | [R3-214730](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-214730.zip) | RAN Visible QoE Metrics (Ericsson) |
| [2] | [R3-214731](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-214731.zip) | Configuration and Reporting of RAN Visible QoE (Ericsson) |
| [3] | [R3-214911](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-214911.zip) | RAN Visible QoE (Qualcomm Incorporated) |
| [4] | [R3-215119](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215119.zip) | Discussion on RAN visible QoE configuration and reporting (CATT) |
| [5] | [R3-215120](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215120.zip) | TP for 38.423 on RAN visible QoE configuration and reporting (CATT) |
| [6] | [R3-215312](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215312.zip) | Handling of open points for RAN visible QoE (Nokia, Nokia Shanghai Bell) |
| [7] | [R3-215546](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215546.zip) | RAN visible QoE (Samsung) |
| [8] | [R3-215547](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215547.zip) | (CR for TS38.473) Support of QoE information transfer (Samsung) |
| [9] | [R3-215641](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215641.zip) | Discussion on configuration and reporting of RVQoE (ZTE, China Telecom) |
| [10] | [R3-215644](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215644.zip) | Consideration on RAN visible QoE (ZTE, China Telecom) |
| [11] | [R3-215647](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215647.zip) | [draft] LS on the support for RAN visible QoE (ZTE, China Telecom) |
| [12] | [R3-215659](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215659.zip) | Further discussions on RAN visible QoE metrics (Huawei) |
| [13] | [R3-215660](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114-e/Docs/R3-215660.zip) | Draft LS on RAN visible QoE conclusions (Huawei) |