**3GPP TSG RAN2 #121bis-e R2-23xxxxx**

**Electronic, 17th – 26th April, 2023**

**Agenda Item:**  **7.14.4**

**Source: China Unicom (email rapporteur)**

**Title:** [**AT121bis-e][220][QoE] SRB5 configuration and usage (China Unicom)**

**Document for: Discussion and Decision**

# 1 Introduction

This is the email report of [AT121bis-e][220]:

* **[AT121bis-e][220][QoE] SRB5 configuration and usage (China Unicom)**

Scope: Discuss how the SRB5 is configured by MN/SN, e.g. how switching the reporting leg and QoE pause work. Attempt to provide proposal on agreeable details as well as details requiring further discussion.

Intended outcome: Discussion report in R2-2304395

Deadline: Deadline 2 (Comment deadline: Friday W1, 0900 UTC, Rapporteur proposed outcome: Monday W2)

Companies providing input to this email discussion are requested to leave contact information below.

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# 2 Discussion

## 2.1 SRB5 Configuration and procedures

To decide whether to use explicit indication for QoE reporting in NR-DC, two cases are mentioned in the contributions:

Case 1: whether to indicate the reporting leg by implicit indication (MN or SN)?

Case 2: whether to indicate the changed leg by implicit indication (MN -> SN or SN->MN)?

For case 1, [6] supports both SRB4 and SRB5 are configured simultaneously, and [6][10] propose that UE can be explicitly indicated the reporting leg in the case of both SRB4 and SRB5 are configured, then QoE reports can be reported to the corresponding leg. However, [7] supports to use implicit indication when only one SRB (SRB4 or SRB5 are configured). The case that both SRB4 and SRB5 are configured simultaneously are not considered in [7]. [11] also supports only one bearer, i.e. either SRB4 or SRB5 is configured at a given time.

From Rapp perspective, it's common to report QoE reports to the corresponding leg when only one of SRB4 or SRB5 is configured at a given time. In addition, as QoE supports more and more metrics and service types for measurement, the use of SRB4 and SRB5 can help reduce the AS buffer pressure under RAN overload and reduce the probability of QoE reports being discarded due to the buffer is full. Before deciding whether to use implicit indication for QoE reporting, RAN2 needs to discuss the SRB4 and SRB5 configuring. [7] also propose that the case that both SRB4 and SRB5 are not configured need to be considered.

**Q1a: Do you agree with that RAN2 should consider both SRB4 and SRB5 are configured simultaneously?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | We think it is natural that both of them can be configured simultaneously, since both MN and SN can have their own QoE configurations, e.g. for RAN visible QoE and it is usually beneficial that the results are reported directly to the node which configured the measurements. Also, in case the reporting leg is indicated per QoE configuration (as proposed in Proposal 4) it is possible to share the reporting load between MN and SN flexibly.  In summary, we see no technical obstacles with allowing such flexibility. For UE capability aspect, we can address it later. |
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**Q1b: If the answer of Q1a is “Yes”, do you agree to explicitly indicate the QoE reporting leg (to MN or SN)?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | We support to have explicit indication due to two reasons:   * It is not complex * It is clear between UE and network   Some companies also proposed some implicit rules for the UE to decide the reporting leg. However, we are not sure what the benefits are (is it to save 1 or 2 bits in the RRC configuration?). We think this would mean RAN2 has to discuss rules one by one. We are not sure whether it is a good way, because for now we have seen couple of rules, and it will become more and more. Perhaps in the end, we will have quite a lot of rules.  In general, we observe that the benefit of implicit indication is not so attractive and the costs are considerable. |
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**Q1c: Do you agree with that QoE reports can be forwarded to the MN (only SRB4 is configured) and QoE reports can be forwarded to the SN (only SRB5 is configured)?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes, details up to RAN3 | In our view, for m-based QoE, if only one SRB (either SRB4 or SRB5), the QoE reports can be forwarded to another entity, e.g. from MN to SN, or from SN to MN. The forwarding itself is RAN3 related, and RAN2 can focus on Uu part. |
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**Q1d: Do you think RAN2 needs to discuss the case that both SRB4 and SRB5 are not configured? If the answer is yes, how to handle the measured QoE reports?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | If both SRB4 and SRB5 are not configured, QoE features are not enabled, like we did for Rel-17 QoE. So we wonder what issue we are going to discuss. |
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For case 2, [1][7][10][11] support to use the implicit indication, while [2][4][6] support to use explicit indication. In detail, [7] propose that if SRB5 is configured, the UE reports QoE reports to SN, if SRB5 is not configured but SRB4 is configured, it reports QoE reports to MN. [10] propose that if pause indication is set to true, the MN leg can be changed to SN to mitigate MN’s overload status. Or it can be changed from SN to MN if the SN is released. [11] propose that QoE reporting leg changing can be achieved by existing bearer type change. For explicit indication, [4] also propose to use 1-bit indication per QoE configuration (i.e., per measConfigAppLayerId) to indicate the switching leg for QoE reporting (MN or SN). [8] propose that if the reporting leg is changed for a QoE/RVQoE configuration, the change takes effect immediately, i.e., also for an ongoing application layer measurement session.

To summarize, some companies support to use implicit indication thinks that leg changing can be implicitly indicate by bearer type changing, pause indication, SRB added/released action, the others support to use explicit indications. And one company also propose the ongoing APP layer measurement session can be changed. From Rapp perspective, different companies have different opinions, but the signalling overhead can be reduced with implicit indication for leg changing. As for can we change the ongoing QoE session, it can be discussed further.

**Q2a: Do you agree to indicate the changed leg by implicit indication (MN -> SN or SN->MN)? If the answer is yes, please provide the detailed procedures how can implicit indication be used?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | As indicated in our reply to Q1a, we do not think we need to spend time on specifying complex rules for leg selection. |
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**Q2b: Do you think that an ongoing application layer measurement session is also changed for reporting when the reporting leg is changing?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | There should be no impact on ongoing application layer session from leg switching. |
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After leg changing, [8] propose the session start and stop indications are sent to the node which configured the UE with QoE, even if the QoE/RVQoE reports are sent to the other node.

**Q2c: Do you agree with that the session start and stop indications are sent to the node which configured the UE with QoE, even if the QoE/RVQoE reports are sent to the other node?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | We wonder about the benefits.  It seems easy to let UE send all reports for a RRC ID to one node and the nodes can forward the reported information to each other, if needed (details up to RAN3). |
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For SRB5 handling, [1][6] propose that SRB5 handling (setup, modification, release) is configured via SN RRC Reconfiguration message. [6][8] propose that when SCG is released, SRB5 should be released as well. And in TS 37.340, SRB3 definition needs to be updated due to SRB5 introduction [6].

In Rapp’s view, SRB5 is defined for QoE reporting to SN, which is similar with SRB3 defined for SN. So it’s common to handle SRB5 via SN RRC message and SRB5 should be released when the SCG is released. Then the SRB5 should be updated to the TS 37.340.

**Q3a: Do you agree with that SRB5 handling (setup, modification, release) is configured via SN RRC Reconfiguration message, and SRB5 should be released when the SCG is released?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent |
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**Q3b: Do you agree to update TS 37.340 based on the introduction of SRB5?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | Some changes may be needed. |
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## 2.2 RRC spec impacts with SRB5 introduced

As for the detailed RRC aspects related with SRB4 and SRB5, [3][5][8][10] propose that if SRB5 is not configured or the SCG is deactivated, UE transmits the QoE reports related to SCG in MeasurementReportAppLayer message embedded in ULInformationTransferMRDC via SRB4 to the MN, [8] also propose in this case the MN can forward the embedded SN-related QoE reports to SN. [3] [7] agree with that if SRB5 is configured and the SCG is not deactivated, UE transmits the QoE report related to SCG in MeasurementReportAppLayer message via SRB5.

In Rapp’s view, all the QoE reports (include both MN-related and SN-related QoE reports) are required to be uploaded to MN if SRB5 is not configured, and SN-related QoE reports can be transfer to SN via SRB5 if SCG is not deactivated and SRB5 is configured. How can MN handle the SN-related QoE reports involves with Xn or NG interface, which is out of RAN2 scope.

**Q4a: Do you agree that if SRB5 is not configured or the SCG is deactivated, UE transmits the QoE reports related to SCG in *MeasurementReportAppLayer* message embedded in *ULInformationTransferMRDC* via SRB4 to the MN?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | Reasons are provided in our paper [6]:  Also, according to the agreements of RAN3, both nodes may be interested in knowing the RAN visible QoE results. In such case, if the SN *MeasurementReportAppLayer* is included in the MN *ULInformationTransferMRDC* message, MN needs to send the SN *MeasurementReportAppLayer* to SN and only then SN sends the RAN visible QoE results back to MN. It will increase the delay of RAN visible QoE results and increase signaling over Xn interface.  Our preference is:  **If SRB5 is not configured, UE sends the SN QoE results in MeasurementReportAppLayer message via SRB4 and MN forwards them to SN.** |
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**Q4b: If the answer of Q3a is yes, do you agree with that RAN2 should wait for RAN3’s decision on how to handle the SN-related QoE reports received in MN?**

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**Q4c: Do you agree that if SRB5 is configured and the SCG is not deactivated, UE transmits the QoE report related to SCG in *MeasurementReportAppLayer* message via SRB5?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Not sure | We think explicit leg indication should be provided per QoE configuration and the UE just follows the configuration. We are not sure what “related to SCG” means. |
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[6] also propose some detailed RRC spec impacts with SRB5 introduced.

1) SRB5 is for RRC messages which include application layer measurement report information (i.e. MeasurementReportAppLayer), all using DCCH logical channel.

2) SRB5 has a lower priority than SRB3 and can only be configured by the network after AS security activation.

3) Once AS security is activated, all RRC messages on SRB5 are integrity protected and ciphered by PDCP.

4) Split SRB is not supported for SRB5.

5) The integrity protection algorithm is common for SRB1, SRB2, SRB3 (if configured), SRB4 (if configured), SRB5 (if configured) and DRBs configured with integrity protection, with the same keyToUse value. The ciphering algorithm is common for SRB1, SRB2, SRB3 (if configured), SRB4 (if configured), SRB5 (if configured) and DRBs configured with the same keyToUse value.

6) SRB5 release is supported, e.g. via srb5-ToRelease IE

7) During RRC connection resume, the UE resumes SRB5 (if configured)

**Q4d: Do you agree all the 1)-7) proposals related with RRC RRC spec impacts when introducing SRB5?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent |
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## 2.3 Reuse Rel-17 QoE mechanism

When considering whether and how to reuse Rel-17 mechanism, QoE reports meassage segmentation, the capability of maximum number of simultaneous QoE configurations, and pause and restart mechanism are discussed.

[2][6] discuss the segmentation for SRB5, [6] propose the SRB5 can be used for transferring of segments of ULDedicatedMessageSegment.

[6][7] discuss the maximum number of simultaneous QoE configurations information exchanging between MN and SN. [7] also propose that RAN2 discuss whether the UE’s maximum number of application layer measurement configurations (i.e., 16) needs extension for DC.

[3][6][7] propose to support pause mechanism in NR-DC, but there are different opinions on how to introduce this mechanism (if MN sends Pause to suspend reporting to both: MN and SN, or to suspend reporting to MN only). In [3], some scenarios are proposed to discuss the RAN overload state for MCG and SCG with considering whether SRB5 is available. However, [6] only propose to reuse Rel-17 principle in NR-DC, e.g. pause all the QoE reports and not pausing RVQoE reports.

In Rapp’s view, reusing Rel-17 segmentation for SRB5 can help to transmit large QoE reports (e.g. XR QoE reports) successfully. For the maximum number of simultaneous QoE configurations information exchanging between MN and SN, it depends on how MN and SN split the QoE configurations by RAN3. If MN is responsible to split all the QoE configurations to MN-trigged or SN-trigged, the maximum number of simultaneous QoE configurations information exchanging seems not needed. For pause mechanism, there are a lot of issues need to be discussed: pause which node, if not paused how to handle the QoE reports?

**Q5a: Do you agree SRB5 can be used for transfer of segments of *ULDedicatedMessageSegment*?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent |
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**Q5b: Do you agree to leave the “maximum number of simultaneous QoE configurations information exchanging between MN and SN” as FFS until RAN3 decide how to split the QoE configurations?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | In our paper [6] we proposed the following.:  **To ensure MN and SN do not use the same set of QoE configuration RRC identities and that UE capabilities are not exceeded, MN indicates the maximum number of QoE configurations and QoE configuration RRC identities that can be used by SN using inter-node RRC message.**  However, it seems RAN3 agreed that if SN wants to configure something, it needs to ask MN for permission. When MN gives feedback, there is a natural chance for MN to notify SN the RRC ID to use. This seems very straightforward, so we can wait for RAN3 progress on this issue. They are discussing this during this meeting to the best of our knowledge. |
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**Q5c: Do you agree to reuse Rel-17 pause mechanism for NR-DC? If the answer is Yes, which option do you support?**

Option 1: all the QoE reports are paused when receiving pause indication.

Option 2: MN-related and SN-related QoE reports can be paused separately, QoE reports can be transmitted through the node that not at RAN overload.

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| **Company** | **Yes/No** | **Option** | **Comments** |
| Huawei, HiSilicon | Yes |  | We are open for two options.  Option 1 is not a legacy behaviour as the pause indication is per QoE configuration. But when a certain QoE configuration is paused, then the reports should not be sent neither to MN nor SN for this QoE configuration. |
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## 2.4 Other issues about encapsulated QoE

Others issues for NR-DC are also discussed: for RRC IDs splitting, [9] propose that MN is responsible to pre-configure the SN specific RRC ID list and MN specific RRC ID list, and MN sends the SN specific RRC ID list to SN in advance.

For QoE configurations configured in NR-DC, in [1], it’s proposed the UE may receive two independent AppLayerMeasConfig in NR-DC.

[2] propose that for both MN and SN can configure m-based QoE configuration to UE through an RRC message, while only MN can configure s-based QoE configuration to UE through an RRC message, e.g., RRCReconfiguration and RRCResume). [6] propose that RAN visible QoE configuration is generated by the same node which generates the configuration for container based QoE. The other node will not send the RRC message to update/modify the RAN visible QoE configuration which was not configured by this node.

In Rapp’s view, for RRC IDs splitting, the issue are same as Q5b, and can be based on RAN3 decision. For QoE configuraing in NR-DC, the UE may receive two independent QoE configuration when the m-based QoE measurement are activated in NR-DC.

**Q6a: Do you agree with that the UE may receive two independent AppLayerMeasConfig in NR-DC?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | According to RAN3 agreements, for m-based QoE, MN or SN can generate QoE configurations and then send them to UE, so we think this was already agreed. |
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**Q6b: Do you agree with that both MN and SN can configure m-based QoE configuration to UE through an RRC message, while only MN can configure s-based QoE configuration to UE through an RRC message, e.g., RRCReconfiguration and RRCResume)?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | For s-based QoE, we are fine use SRB1 to provide all the QoE configurations to UE (like proposed by China Unicom). And we are also fine to use RRCReconfiguration and RRCResume.  For m-based QoE, it is related to Q6a, and we think it is possible for both MN and SN to send QoE configuration. |
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## 2.5 Support RVQoE for NR-DC

[2][6][9][10][11] propose to consider RVQoE configurations and reporting for NR-DC.

For RVQoE configurations, [2] propose SN can configure the QoE configuration to UE through SRB3, [10] propose two options for SN to send the RVQoE configuration directly via SRB3 or split SRB1, or to MN and MN forward to UE with or without modification. [6] also propose that RAN visible QoE configuration is generated by the same node which generates the configuration for container based QoE. The other node will not send the RRC message to update/modify the RAN visible QoE configuration which was not configured by this node.

**Q7a: Do you agree with that SN can configure the QoE configuration to UE? If the answer is Yes, which option do you prefer to configure SN-related RVQoE configuration?**

Option 1: send the RVQoE configuration directly via SRB3.

Option 2: send the RVQoE configuration directly via split SRB1.

Option 3: send the RVQoE configuration via SRB1 (to MN and MN forward to UE with or without modification).

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| **Company** | **Yes/No** | **Option** | **Comments** |
| Huawei, HiSilicon | Yes |  | We think RAN3 has already agreed:  SN can send an RVQoE configuration to the UE.  Firstly, we think Q7a is relevant to Q7b and Q7c.  Secondly, in Q7b, we are the proponent so we are positive. If Q7b is agreeable, it should be possible to use option 1/2/3 for the configuration transmission. |
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**Q7b: Do you agree with that RVQoE configurations can only be generated by the same node which generates the configuration for container based QoE?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent |
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**Q7c: Do you agree with that the other node will not send the RRC message to update/modify the RAN visible QoE configuration which was not configured by this node?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent |
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For RVQoE reports, [11] propose the UE AS layer can directly send the RV QoE reports to configuration initialled node separately or send the RV-QoE reports with node indication to one node according to the reporting leg indication. [9] also propose that UE may differentiate the RV-QoE configuration and report of MN and SN according to the node indication. However, [6] propose that a common reporting leg indication is used to indicate reporting leg that is used by the UE for both container-based and RAN visible QoE if both have been configured by the network.

In Rapp’s view, whether a new indication for RVQoE reporting is needed for leg selection need to be focused firstly.

**Q7d: Do you agree with that RVQoE reports and encapsulated QoE reports are reported together to the separate node (MN or SN) in NR-DC?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | In Rel-17, both RVQoE and container-QoE are reported to a single node (i.e. MN), and we think it will be easy to follow this logic in Rel-18, i.e. for the same RRC ID, both reports are transmitted to the same node as network indicated.  We should also remember that RAN3 agreed that QoE reports can be forwarded between the nodes if needed and that reporting leg can be changed, .e.g. so that reports are sent to the node which serves the application.  For Q7d, we wonder the meaning of “sent together to the separate node”. If it means for the same RRC ID, the UE can report RVQoE and container-QoE to different node, we would like to see how it works and the benefit (compared with our proposal). |
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## 2.6 Others

Please provide comments below if any other views are missed in the above discussion.

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# 3 Conclusion

[To be added]

# 4 References

[1] R2-2302951 Discussion on SRB5 configuration and procedure NEC discussion Rel-18 NR\_QoE\_enh-Core

[2] R2-2303109 Discussion on QoE measurement for NR-DC ZTE Corporation, Sanechips discussion Rel-18 NR\_QoE\_enh-Core

[3] R2-2303309 Support of QoE measurements for NR-DC LG Electronics Inc. discussion Rel-18

[4] R2-2303320 Discussion on switching reporting leg in NR-DC Samsung discussion Rel-18

[5] Views on QoE Reporting for NR-DC Apple discussion Rel-18 NR\_QoE\_enh-Core

[6] R2-2303598 Discussion on QoE measurements in NR-DC Huawei, HiSilicon discussion Rel-18 NR\_QoE\_enh-Core

[7] R2-2303643 QoE configuration and reporting in NR-DC Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_QoE\_enh-Core

[8] R2-2303678 QoE measurements in NR-DC Ericsson discussion Rel-18 NR\_QoE\_enh-Core

[9] R2-2304038 Discussion on support of QoE measurement for NR-DC CATT discussion Rel-18 NR\_QoE\_enh-Core

[10] R2-2304085 Discussion on QoE configuration and reporting for NR-DC China Unicom discussion NR\_QoE\_enh-Core

[11] R2-2303511 RAN2 issues to support QoE collection in NR-DC Qualcomm Incorporated discussion NR\_QoE\_enh-Core