3GPP TSG-RAN WG3 #119bis-e [R3-2](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)31868

Online, 17th April – 26th April 2023

Agenda Item: 10.2.1.

Source: Qualcomm Incorporated (moderator)

Title: Summary of Offline Discussion on CB: # SONMDT1\_SHRSPR

Document for: Approval

# Introduction

**CB: # SONMDT1\_SHRSPR**

**For Inter-RAT SHR:**

**- Forwarding mechanism for Inter-RAT SHR and R17 intra-NR SHR?**

**- Retrieval of UE context for intra-RAT and inter-RAT SHR?**

**- Correlate of inter-RAT SHR and RLF?**

**- NR to LTE HO - Addition of RACH related information?**

**- SHR collected during inter-RAT HO (LTE to NR)?**

**For SPR:**

**- Which node decides the trigger of T312/310 for MN-initiated classic PSCell change/CPC?**

**- The trigger of T304, whether the objective of SPR is to optimize PSCell change configuration during mobility or the RACH access issue or both?**

**- Which node will trigger PSCell change/CPC first, UE context retrieval while performing SPR optimizations, forwarding mechanism for SPR, the contents of SPR, the correlation between SPR and SCGFailureInformation, SPR availability indication**

**- Capture agreements and open issues**

**- Provide TPs if agreeable**

(moderator - Qualcomm)

Summary of offline disc [R3-231868](file:///D:\3GPP%20Standardization\RAN3\RAN3%23119bis\draft\SON%20SHR%20and%20SPR\Inbox\R3-231868.zip)

# For the Chair’s Notes

# Phase-II Discussion

# Phase-I Discussion

## Inter-RAT SHR

### Xn and NG impacts for forwarding inter-RAT SHR

The following forwarding mechanism was agreed in R3#119 for inter-RAT SHR

The receiving node forwards the inter-RAT SHR to corresponding node which generates the SHR trigger condition that triggers the inter-RAT SHR

Regarding stage-3 signaling, the moderator notes that there is consensus in all contributions submitted this meeting to reuse the ACCESS AND MOBILITY INDICATION to forward the inter-RAT SHR over Xn. Further, it has been proposed in [3] and [12] to use Uplink RAN configuration transfer procedure and Downlink RAN configuration transfer for forwarding inter-RAT SHR over NG. The moderator therefore makes the following proposals:

**Moderator Proposal 1:** Reuse ACCESS AND MOBILITY INDICATION message to forward the inter-RAT SHR to the source NR node if a different NR node (different from source NR node) retrieves the SHR collected during inter-RAT HO (NR🡪 LTE)

**Moderator Proposal 2:** Use the Uplink RAN configuration transfer procedure and Downlink RAN configuration transfer for forwarding inter-RAT SHR over NGAP

**Q1: Are the moderator proposals 1 and 2 agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung | Yes |  |
|  |  |  |

### Forwarding mechanism for intra-NR SHR

The forwarding mechanism for intra-NR SHR is not yet decided. The following options considered before are listed below:

* **Option 1:** The receiving node forwards the intra-NR SHR to source NR node, then source NR node can further forward the intra-NR SHR to target NR node (in case T304 SHR trigger is met)
* **Option 2:** The receiving node forwards the intra-NR SHR to target NR node, then target NR node can further forward the intra-NR SHR to source NR node (in case T310/T312 SHR trigger is met)
* **Option 3:** The receiving node forwards the intra-NR SHR to corresponding node which generates the SHR trigger condition that triggered the intra-NR SHR

**Q2: Which of the above options should be adopted as the forwarding mechanism for intra-NR SHR?**

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| --- | --- | --- |
| Company | Option 1, 2 or 3 | Comment |
| Samsung | Option 3 | To have a consistent forwarding solution for intra-NR SHR and inter-RAT SHR. |
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### Retrieval of UE context at source gNB during inter-RAT HO (NR🡪 LTE) and intra-NR HO

The following FFS was agreed last meeting

Whether the source node needs to know the UE context while performing root cause analysis for inter-RAT SHR and if so, how?

The contributions in [2], [3] and [6] discuss about the benefits of UE context retrieval while performing root cause analysis for both inter-RAT HO (NR🡪 LTE) and intra-NR HO.

From the contributions, mainly three different options have been considered

* **Option 1:** UE includes the “Source C-RNTI” and “Time between HO command and SHR retrieval”. The source gNB can figure out the UE context (up to implementation) with the above information.
* **Option 2:** Mobility Information is sent to the UE together with the SHR configuration, the UE includes the Mobility Information back in the inter-RAT SHR as mentioned in [2]
* **Option 3:** The source node sends C-RNTI or/and Mobility Information to the target node in HANDOVER REQUEST, the target node sends it back to the source node when the target node forwards SHR to the source node **(only in scope for intra-NR SHR)**

**Q3: Which of the above options do you prefer for UE context retrieval at source gNB during inter-RAT HO (NR 🡪 LTE) and intra-NR HO?**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Option 1 or 2 for inter-RAT SHR | Option 1,2 or 3 for intra-NR SHR | Comment |
| Samsung | Option 2 | Option 2 | Option 1 has the following drawbacks.   * The source node has to save the UE context for each UE until 48hrs after the UE moves away, which bring burden for the source node. * The C-RNTI of the UE has been re-assigned to other UEs after the UE moves away. The source node cannot identify a right UE context with the UE reported source C-RNTI. * The source node has to maintain an additional table on the mapping of C-RNTI and time window. E.g. CRNTI:10, UE Context 1 at 10:00-10:05,   UE Context 2 at 10:05-10:15,  UE Context 3 at 10:15-10:35,  …  So Option 1 will bring complex handling in the source node.  For Option 2, the source node does not need to save the individual UE context after the UE has moved away. There is no issue even if the C-RNTI is re-assigned for other UEs. The optimsition of SHR is not for this specific UE because this UE has moved away. The optimisaiton of SHR is for group of UEs which use the same HO strategy. So Mobility Information is enough for identifying the mobility related context.  It’s better to use the same solution for inter-RAT SHR and intra-NR SHR. |
|  |  |  |  |

### Correlation of NR SHR and LTE RLF Report

In case there is a RLF shortly after a successful inter-RAT HO from NR 🡪 LTE (where the T310 or T312 SHR trigger is met), UE generates both LTE RLF Report and NR SHR.

There was a discussion last meeting whether RAN3 should specify mechanisms to correlate the NR SHR and LTE RLF Report in the above scenario (i.e., identify that both reports are originating from the same UE) so that the network doesn’t perform conflicting optimizations for SHR and RLF Report. For example, the network can discard SHR if it knows that there was an RLF shortly after the successful HO.

[2], [3], [5], [6], [9] has provided different solutions on how to correlate the NR SHR and LTE RLF Report in the above scenario whereas the [7], [10], [12] mentioned that there is no need to correlate, some of the reasons mentioned as follows:

* The node performing correlation might not know the presence of both reports and hence might not know how long to store the reports
* The network can decide whether or not to consider SHR based on statistical information e.g., if handover to wrong cell failure type have been detected 100 times from cell A to cell B and SHR due to T310/T312 trigger have also been detected from cell A to cell B 80 times during the same time period, the network might assume that the SHR is due to the frequent HOFs and hence not consider SHR and only perform MRO optimization.

The moderator would like to point out here that the that Rel-17 already supports correlation of NR SHR and NR RLF report (via inclusion of Target C-RNTI in RLF Report and SHR), irrespective of the forwarding mechanism chosen for intra-NR SHR. And hence it is the moderator’s view that Rel-18 should also try to support mechanisms to correlate NR SHR and LTE RLF Report and therefore make the following proposal:

**Moderator Proposal 3:** RAN3 should provide mechanisms to correlate NR SHR and LTE RLF Report in case there is a RLF shortly after a successful inter-RAT HO from NR 🡪 LTE. It is up to network’s implementation how to support correlation (e.g., how long it stores the reports or wait for the other report if retrieved separately)

Further, the moderator notes that majority of the companies supporting correlation prefers the correlation to be done at source gNB. [13] further proposes a UE based solution for correlation e.g., by reporting the time elapsed between NR SHR generation (SHR trigger condition is met) and RLF report generation (RLF occurs in target LTE node) and a correlation indication to the network.

Consider the majority views, the moderator makes the following proposals as well:

**Moderator Proposal 4**: Correlation of NR SHR and LTE RLF Report shall be done at the source gNB

**Moderator Proposal 5**: In order to assist correlation of NR SHR and LTE RLF Report at source gNB, UE shall include Target C-RNTI in SHR collected during inter-RAT HO (NR🡪 LTE), so that it can be used as a reference ID to identify that the SHR and RLF Report are originating from the same UE

**Q4: Are the moderator proposals 3-5 agreeable?**

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| --- | --- | --- |
| Company | Yes/No to moderator proposals 3-5 | Comment |
| Samsung | Yes to 3-5 (some clarification on proposal 5). | In Moderator Proposal 5, it says “…, UE shall include Target C-RNTI in SHR collected during inter-RAT HO (NR🡪 LTE),…”  Actually, RAN2 agreed that the UE records the SHR for inter-RAT mobility in the VarSuccessHO-Report (copied below FYI). Target C-RNTI is already defined in VarSuccessHO-Report. So there is no addition requirement for the UE reporting to support correlation at the source gNB. 3: For HO from NR to LTE, UE records the SHR for inter-RAT mobility in the VarSuccessHO-Report.  Regarding the UE based solution for correlation proposed in [13], the third node receiving RLF Report from the UE should forward it to the source gNB, then to the target ng-eNB. This contradicts the RLF Reporting mechanism in the specification. RLF Report should be forwarded to the last serving node first (it is the ng-eNB in case of RLF shortly after successful handover from gNB to en-eNB). The last serving en-gNB make root cause analysis then sends Handover Report message to the source node (i.e. gNB).  Another drawback of the UE based solution is that new information should be reported from the UE. |
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### RACH related information in inter-RAT SHR (NR🡪 LTE)

[11] has further proposed to include some RACH related information in inter-RAT SHR (NR🡪 LTE) for improving the handover performance of the target (LTE) cell during inter-RAT HO (NR 🡪 LTE).

**Q5: Whether UE should additionally include the following in inter-RAT SHR (NR🡪LTE)**

1. number of RACH attempts made for the successful handover
2. a flag on whether contention was observed for the successful handover

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| --- | --- | --- |
| Company | Yes/No for a) and b) | Comment |
| Samsung |  | Maybe RACH report could solve it already? |
|  |  |  |

### Inter-RAT SHR (LTE🡪 NR)

The following working assumptions and agreements were achieved in the previous meetings:

WA: Support inter-RAT SHR from LTE to NR at least for T304 if no impact on LTE

WA: The content of inter-RAT SHR from LTE to NR includes at least Source LTE cell, Target NR cell

RAN3 sees benefits to support inter-RAT SHR from LTE to NR for T304 trigger with no impact on LTE in Rel-18.

The contributions in [3], [6], [7], [10] propose to support inter-RAT SHR (LTE🡪 NR) and convert the above WAs into agreement.

[6] further identified the principles needed to ensure that there are no impacts to LTE. The moderator summarizes the proposal in [6] and have the following proposal.

**Moderator Proposal 6:** Rel-18 can support collection of SHR during successful inter-RAT HO (LTE 🡪 NR) for T304 trigger without any LTE impacts, if the following principles are used:

* Target gNB can send SHR configuration (T304 trigger) to UE via NR container (*targetRAT-MessageContainer*) in MobilityFromEUTRACommand
* UE stores this SHR configuration in NR format
* If T304 trigger is met, UE records SHR in NR format
* UE reports this SHR to only an NG-RAN node (either the target gNB or another gNB)
* NG-RAN node retrieving this SHR can forward this SHR to the target gNB for SHR optimizations

**Q6a: Is Moderator Proposal 6 agreeable?**

**Q6b: If yes to Q6a, can we convert the WA “The content of inter-RAT SHR from LTE to NR includes at least Source LTE cell, Target NR cell” into agreement?**

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| --- | --- | --- |
| Company | Yes/No to Q6a and Q6b | Comment |
| Samsung | Yes |  |
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If the above in Q6a/Q6b is agreed, whether to further enhance inter-RAT SHR (LTE 🡪 NR) with additional information can be discussed later e.g., in Phase-2.

## Successful PSCell Change Report (SPR)

### SPR triggers

In order to help us decide which node decides the T310/T312 related SPR triggers in section 4.2.2, the moderator proposes to first converge on the representation of SPR triggers in this section.

**Q7. Which of the following representation should be considered for SPR triggers?**

* Option 1: Percentage values similar to SHR (e.g., 20%, 40%)
* Option 2: Absolute values (e.g., 100 ms, 200 ms)
* Option 3: Just a Boolean as proposed in [11]

|  |  |  |
| --- | --- | --- |
| Company | Option 1/2/3 | Comment |
| Samsung | Option 1 | We see the benefit to have similar mechanism for SHR and SPR. |
|  |  |  |

### Which node decides the trigger of T310/T312 for MN-initiated classic PSCell change/CPC?

The following different options were identified last meeting:

* Option 1: MN autonomously decides the T310/T312 SPR triggers
* Option 2: Source SN node decides the T310/T312 SPR triggers
* Option 3: MN decides the T310/T312 SPR triggers based on source SN inputs (e.g., after getting assistance from SN regarding the configured T310/T312 timer values)

Further, [6] has the following observations and **proposes to not consider Option 1**.

Observation 6: **MN doesn’t know the actual values of T310/T312 of SCG** configured by source SN

Observation 7: In case of Option 1 (MN autonomously decides the T310/T312 related SPR triggers), **MN can only provide a blind T310/T312 related SPR trigger which is not optimal for SPR collection at UE**

Proposal 11: Option 1 (MN autonomously decides the T310/T312 related SPR triggers) should not be considered while deciding which node decides the SPR triggers in case of MN initiated PSCell change.

Further, [6] also provides the comparison b/w Option 2 and Option 3:

|  |  |
| --- | --- |
| Option 3 | Option 2 |
| MN decides the T310/T312 related SPR triggers after getting assistance from SN regarding the configured T310/T312 timer values in case of option 3 **(Xn impact for coordination)** | Source SN autonomously decides the T310/T312 related SPR triggers **(no Xn coordination needed)** |
| MN sends T310/T312 related triggers directly over MN RRC but sends the T304 related SPR trigger via SN container to UE **(RRC signaling is slightly complex)** | Source SN can send all SPR triggers (T310/T312/T304) to UE either via SN container over SRB1 or via SRB3 **(simpler RRC signaling)** |
| MN can send the SPR configuration to UE during PSCell change command or before the PSCell change command **(more flexibility in when to send SPR configuration)** | Source SN can send the T310/T312 related SPR triggers only before the PSCell change command as source SN is not involved in MN initiated PSCell change **(less flexibility in when to send SPR configuration)** |
| Only MN needs to perform root cause analysis **(root cause analysis in just one node)** | Both MN and source SN need to perform root cause analysis. MN optimizes the PSCell change configuration during mobility (as this was MN-initiated) and source SN optimizes the lower layer issues of source PSCell (as source SN decides the T310/T312 SHR triggers) **(root cause in two nodes)** |

**Q8: Which option discussed above should be adopted for deciding the T310/T312 SPR triggers in case of MN-initiated classic PSCell change/CPC?**

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| --- | --- | --- |
| Company | Option 1/2/3 | Comment |
| Samsung | Option 2 | The timer T310/T312 itself is configured by the source SN. The source SN knows the criterial to decide the value. So the source SN could give a more reasonable T310/T312 triggers.  Option1 should not be considered because the blind decision in the MN.  Option 2 has benefits in terms of no Xn coordination and simpler RRC signaling comparing with Option 3.  In the Moderator’s analysis, one drawback of Option 2 is that “**less flexibility in when to send SPR configuration**”. This drawback is not true because The source SN sends the T310/312 triggers to the MN in SgNB Release Request Ack. Message.  One thing we want to remind is that the similar issue was discussed in Rel-17 i.e. whether the source node or the target node decides T310/T312/T304 trigger for handover case. The conclusion is that the node who configure the actual value configure the triggers as well. Because that node have the best knowledge to decide the percentage. With the same logic, it should be the source SN to decide the triggers for T310/T312. |
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### Forwarding mechanism for SPR

RAN2 made the following agreement last meeting:

UE stores SPR at most 48 hours after the last successful PSCell addition/PSCell change report is stored at UE if not fetched.

The above RAN2 agreement means that the SPR can be stored at the UE and can be retrieved in a “new” MN (different from the MN that sent the SPR configuration to the UE). Mainly two different options have been proposed in [4], [6], [11], [12] regarding the forwarding mechanism of SPR when retrieved in this “new” MN and summarized below.

|  |  |
| --- | --- |
| **Option 1:** SPR is sent directly from the “new” MN to the node(s) which should perform the SPR related optimization | **Option 2:** SPR is always sent to the “old” MN which then forwards to the node(s) which should perform the SPR related optimization |
| - | New MN 🡪 old MN (always) |
| New MN 🡪 old target SN (if SPR is collected due to T304 trigger being met) | Old MN 🡪 old target SN (if SPR is collected due to T304 trigger being met) |
| New MN 🡪 old source SN (if SPR is collected due to T310/T312 trigger being met and if it’s **SN-initiated**) | Old MN 🡪 old source SN (if SPR is collected due to T310/T312 trigger being met and if it’s **SN-initiated**) |
| New MN 🡪 old MN (if SPR is collected due to T310/T312 trigger being met and if it’s **MN-initiated**)  New MN 🡪 old source SN (if old source SN also is involved in root cause analysis e.g., if option 2 is selected in section 4.2.2) | Old MN performs root cause analysis (if SPR is collected due to T310/T312 trigger being met and if it’s **MN-initiated**)  Old MN can also forward to old source SN for root cause analysis if option 2 is selected in section 4.2.2 |

**Q9a: In case the SPR is retrieved in a “new” MN (different from the MN that sent the SPR configuration to the UE i.e., “old” MN), the following options are possible for forwarding the SPR**

* Option 1: SPR is sent directly from the “new” MN to the node(s) which should perform the SPR related optimization
* Option 2: SPR is always sent from the “new” MN to the “old” MN which then forwards to the node(s) which should perform the SPR related optimization

|  |  |  |
| --- | --- | --- |
| Company | Option 1 or 2 | Comment |
| Samsung | Option 2 | If the old MN retrieves the SPR, it may forward the SPR to the source SN or the target SN depending on the scenarios. The message from MN to the source SN and the target SN should be defined anyway.  Then the only additional signaling for option 2 is the message from new MN to the old MN.  For option 1, the new MN may have no interface with the source SN or target SN, then all the signaling has to be routed via CN. |
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**Q9b: To assist in the forwarding of SPR, which of the following should the UE include in SPR?**

1. CGI of the PCell which sent the SPR configuration
2. Indication whether the PSCell change was MN-initiated or SN-initiated

* FFS how UE knows whether the PScell change as MN-initiated or SN-initiated (e.g., network indication in RRCReconfig with sync) and can be discussed in 2nd phase or later

|  |  |  |
| --- | --- | --- |
| Company | a), b) or Both | Comment |
| Samsung | a) | Open to b). |
|  |  |  |

Similar to inter-RAT SHR, it has been proposed to reuse ACCESS AND MOBILITY INDICATION to forward SPR over Xn and use Uplink/Downlink RAN Configuration Transfer for forwarding SPR over NGAP

**Moderator Proposal 7:** Reuse ACCESS AND MOBILTY INDICATION to forward SPR over Xn and use Uplink/Downlink RAN Configuration Transfer for forwarding SPR over NGAP

**Q9c: Is Moderator Proposal 7 agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Samsung | Yes |  |
|  |  |  |

### UE context retrieval while performing SPR optimizations

Several contributions have proposed solutions to identify the UE context while performing SPR optimizations. The moderator therefore wants to first agree the following:

**Moderator Proposal 8**: RAN3 should provide mechanisms to identify UE context in the node performing SPR optimizations (could be old MN, old source SN or old target SN)

If the above moderator proposal is agreeable, we can discuss further details to identify UE context in old MN, old source SN and old target SN.

|  |  |
| --- | --- |
| Q10a | To identify the UE context in the **old MN** when SPR is received, which of the following information can be included by UE in SPR   1. C-RNTI allocated by old MN 2. Time between PSCell change and SPR retrieval 3. Mobility Information in old PCell |
| Q10b | To identify the UE context in the **old source SN** when SPR is forwarded for T310/T312 related SPR optimizations,   * **Option 1:** Old MN identifies the UE context and sends the stored SN Mobility Information together with SPR to the old source SN * **Option 2:** UE includes the C-RNTI allocated by old source SN in SPR (time between PSCell change and SPR retrieval is considered in Q10a already) |
| Q10c | To identify the UE context in the **old target SN** when SPR is forwarded for T304 related SPR optimizations   * **Option 1**: Old MN identifies the UE context and sends the stored SN Mobility Information together with SPR to the old target SN * **Option 2:** UE includes the C-RNTI allocated by old target SN in SPR (time between PSCell change and SPR retrieval is considered in Q10a already) |

**Q10: If Moderator Proposal 8 is agreeable, please provide your preference for Q10a, Q10b and Q10c.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Q10a – a), b) or both**  **Q10b – Option 1 or 2**  **Q10c – Option 1 or 2** | **Comment** |
| Samsung | Q10a: c)  Q10b: Option 1  Q10c: Option 1 | For Q10a, the same reasoning as in 4.1.3.  For Q10b and Q10c, the same mechanism has been agreed for SCG Failure case. |
|  |  |  |

# Conclusion, Recommendations

If needed

# References

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| --- | --- | --- |
|  |  |  |
| [1] | [R3-231189](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231189.zip) | [TP to 38.423, SON] Configuration coordination for the successful PSCell change report (Nokia Netherlands) |
| [2] | [R3-231200](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231200.zip) | (TP for SON BLCR for 38.423) SON enhancement for SHR and SPR (Samsung) |
| [3] | [R3-231269](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231269.zip) | (TPs for SON BLCRs for TS 38.300) SHR (Huawei) |
| [4] | [R3-231270](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231270.zip) | (TPs for SON BLCRs for TS 38.300) SPR (Huawei) |
| [5] | [R3-231299](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231299.zip) | Inter-RAT SHR and SPR (Intel Corporation) |
| [6] | [R3-231339](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231339.zip) | Successful Handover Report and Successful PSCell Change Report (Qualcomm Incorporated) |
| [7] | [R3-231372](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231372.zip) | Discussion on related issue of inter-RAT SHR (NEC) |
| [8] | [R3-231423](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231423.zip) | SON enhancements for SPR (Lenovo) |
| [9] | [R3-231424](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231424.zip) | SON enhancements for SHR (Lenovo) |
| [10] | [R3-231552](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231552.zip) | Discussion on SON enhancement for SHR and SPR (CATT) |
| [11] | [R3-231584](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231584.zip) | Inter-RAT SHR and SPR discussion (Ericsson) |
| [12] | [R3-231708](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231708.zip) | (TPs for SON BLCRs for TS 38.300 TS 38.413 TS 38.473 and TS 38.423)Inter-RAT SHR and SPR (ZTE) |
| [13] | [R3-231791](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231791.zip) | SON enhancement for Inter-RAT SHR (CMCC) |
| [14] | [R3-231792](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231792.zip) | SON enhancement for SPR (CMCC) |