**3GPP T****SG-RAN WG3 Meeting #119bis-e** **R3-231870**

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

**Agenda item: 10.2.3**

**Source: Intel Corporation (moderator)**

**Title: Summary of offline discussion for CB: # SONMDT3\_RACH**

**Document for: Discussion**

# Introduction

This document contains the summary of offline discussion for the following CB:

**CB: # SONMDT3\_RACH**

**- Check RAN2 progress in** [**R3-231112**](Inbox%5CR3-231112.zip)**, check group understanding and reply LS to RAN2**

**- Discuss RACH report optimization (e.g, feature priority, RACH partition configuration, time stamp, NW controls UE)**

**- Details on RACH report retrieval, e.g, the presence of gNB-DU UE F1AP ID and Random access Indication?**

**- Capture agreements and open issues**

**- Provide TPs if agreeable**

(moderator - Intel)

Summary of offline disc [R3-231870](Inbox%5CR3-231870.zip)

For the first round, the deadline is Thursday, April 20th, 08:00 am UTC.

# For the Chairman’s Notes

Propose to capture the following:

Issue 1: LS from RAN2 on SN RA report entries

**Conclusion: Companies’ views are diverged, but majority companies prefer Alt1 (Alt 1: 7 vs Alt 2: 2).**

**Proposal 1: Reply LS to RAN2 with following contents:**

* **Majority companies prefer Alt1**
* **List the issues identified for both Alt 1 and Alt 2**

Issue 2: RACH report optimization

**Regarding the parameters included in RA report, companies’ view splits into two groups:**

* **Network configuration information a) and b): Huawei, CATT, Ericsson**
* **A time indicator c) to help gNB identify network configuration information: Intel, Qualcomm, Samsung, Nokia**

**d) NW controls UE to report needs more justification how it works.**

**Conclusion: No consensus. To be continue. (note: RAN2 is also working on this issue)**

Issue 3: RACH INDICATION message

**Proposal 2: Only *gNB-CU UE F1AP ID* is included in the RACH INDICATION message.**

**Proposal 3: The *Random Access Indication IE* in the RACH INDICATION message is not needed.**

**Proposal 4: The criticality of the *RACH indication list IE* in the RACH INDICATION message is “reject”.**

Issue 4: Name of RA report

**Conclusion: All companies agree to resolve this misalignment issue, and two companies shared their preference on “RA report”.**

**Proposal 5: The corresponding TP to the BLCR of TS 38.300, TS 38.401, TS 38.423 and TS 38.473 to align the naming of RA report with RAN2 spec.**

**Proposal 6: To use “RA report” in TS 38.300, TS 38.401, TS 38.423 and TS 38.473.**

Issue 5: Withdraw RAN2 agreement on NR SN RA report in E-UTRA SA mode

Moderator suggests the interested companies to directly propose this in RAN2.

**Conclusion: No consensus.**

**2nd round discussion:**

* Reply LS to RAN2 on SN RA report entries
* TP to TS 38.473 on RACH INDICATION message

# Discussion (1st round )

## LS from RAN2 on SN RA report entries [1]

RAN2 made the following agreements:

1: To have “a list of SN RA report entries as a single NR container (i.e. NR RA-ReportList)”.

And then, RAN2 discusses the following alternatives regarding how the UE includes the PSCell identities:

* **Alt 1: Includes unique PSCell identities, i.e. if a PSCell occurs more than once in NR *RA-ReportList*, it is recorded only once in the list of PSCell identities**
* **Alt 2: Includes the last PSCell identity (in NR *RA-ReportList*)**

All alternatives are feasible from RAN2 perspective.

RAN2 respectfully asks RAN3 to check alternatives above (Alt 1 and Alt 2) and provide feedbacks.

**Q1-A: Please provide your comments on the two alternatives above.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Alt 1 or Alt 2** | **Comments** |
| Intel | Alt 1 | If Xn interface between the gNB of the last PSCell and the gNB of other PSCells is not available, Alt2 is not workable or needs more enhancements. |
| Huawei | Alt 1 | As we discussed in our paper in R3-231740, alt 2 has many drawbacks. And also agree with Intel’s comments above. |
| Qualcomm | Alt 2 | If there is inter-MN handover, there is no guarantee that the “new” MN has Xn interface with all the PSCells in the RA Report. **So, the logic that there might not be a direct Xn interface applies to both Alt 1 and Alt 2** **(and is not just the drawback for Alt 2).** So companies can’t use this just against Alt 2.Also as provided by an example in our paper R3-231341, Alt 1 has more drawbacks:* Uu overhead to add the list of PSCell identities
* Adds further complexity at the UE as it needs UE to determine the duplicate PSCell identities
* Unnecessary/duplicate forwarding of RA reports from MN to every PSCell in the list (need to discard if it is not relevant at receiving node)
* Unclear which node should forward the RA Report associated to PCell? In Alt1, does every PSCell receiving the RA Report would route it to the PCell? If so, it is extremely duplicate and creates confusion on how to handle these duplicate RA Reports?

Alt 2 is simple enough. If there is no Xn interface, we can see whether we can define signaling to forward this over NG. |
| Lenovo |  | For Alt1, LTE MN can transfer the received NR RA-ReportList to each corresponding PSCell separately based on the PSCell identity. The drawback of Alt1 is that some unnecessary information may be transferred.For Alt2, implementation of the last PSCell is complex, since it has to decode the NR RA-ReportList and then distribute the corresponding RA report to right PSCell. If the last PSCell has no Xn interface with the other right PSCells, Alt2 needs optimization to forward the SN RACH report.Both Alt1 and Alt2 have drawbacks, and Alt1 is slightly preferred. |
| CATT  | Alt 2 | Compared with Alt2, Alt2 introduce heavy Uu and Xn/NG interface load.Uu load: one PScell ID vs. a list of PScell IDXn/NG load: MN has to send whole NR container to each PScell vs. only send the relevant entries contained in NR container to each PScell. Note that the RA-ReportList-r16 contained in access and mobility indication does not means NG-RAN should forward all entries to each target node It is up to NG-RAN implementation whether to only forward relevant entries.Even for the Alt1, the MN2 received SN RACH report may have to forward it to relevant MN1 in case there is no interface between MN1 and SN contained in SN RACH report. The current spec support that NR node decodes the RACH report and further forward to other node.If there is no Xn/NG interface between last serving PScell1 (SN1) and other PScell2 (SN2) for Alt2, the SN1 can indicate the PScell2 and/or relevant entries to MN, and then MN can forward NR container or relevant entries to SN2. It still more efficient than Alt1 in both Xn/NG interface and Uu interface. |
| Samsung | Alt 1 | Same view as Intel. As discussed in our paper R3-231203, there may not exist the Xn interface between the gNB of last PSCell and gNBs of other PSCells. In such case, alt2 is not workable. More works are needed to transfer all reports to the corresponding gNBs.For the inter MN HO, the “new” MN forwards the reports to “old” MN first. And then the “old” MN can distribute the reports to SNs of all corresponding PSCells. Whether the “new” MN has Xn interface with all the PSCells in the RA Report does not affect the alt1-based solution.For alt 1, although it is up to the MN implementation which node to forward, the sufficient information is provided for MN and MN can decide which node to forward. Alt 2 restricts the MN only can forward to the gNB of last PSCell. The spec impact should be identified, for example, the solution proposed by CATT. Hence, the alt 1 is more efficient. |
| Ericsson | Alt1 | The main issue that we see with Alt 2 is for EN-DC. In E-UTRAN there are no X2 interfaces between en-gNBs.If a UE signals the *NR RA-ReportList* as per Alt 2 to the MN-eNB, the MN-eNB would only be able to forward the *NR RA-ReportList* to the en-gNB associated to the PSCell identities included (if that en-gNB is connected to the MN-eNB). After this hop the solution does not allow forwarding of RA Reports anymore, hence all the RA Reports not associated to the first hop en-gNB are lost.In order for the RA Reports to be further forwarded, the following should occur:* The en-gNB receiving the *NR RA-ReportList* should decode the RA Reports received and derive PSCell identities for the cells corresponding to each of such RA Reports
* The en-gNB should send the derived PSCell plus the RA Reports back to the MN-eNB
* The MN-eNB should distribute the RA Reports to the en-gNBs corresponding to the PSCells received

Namely, the above steps are a mirror copy of Alt 1. Hence it is straightforward to us that Alt 1 is a better choice. |
| Nokia | Alt 1 | Following the argumentation from many companies, we believe that the EN-DC scenario may justify alt. 1. |
| ZTE | Alt 1 | Agree with intel, If Xn interface between the gNB of the last PSCell and the gNB of other PSCells is not available, Alt2 is not workable. |

**Moderator’s summary:**

Alt 1: Intel, Huawei, Lenovo, Samsung, Ericsson, Nokia, ZTE

* Not workable for the following case:
	+ If inter-MN handover happens and no Xn interface between new MN and the gNBs of other PSCells in the RA report.

Alt 2: Qualcomm, CATT

* Not workable for the following cases:
	+ No Xn interfaces between the gNB of the last PSCell and the gNBs of other PSCells in the RA report
	+ EN-DC (since no X2 interfaces between en-gNBs)

RAN2, as the owner group of Uu interface, clearly stated in their LS that “All alternatives are feasible from RAN2 perspective”, so we don’t need to analyse Uu impact but only RAN3 impact.

**Conclusion: Companies’ views are diverged, but majority companies prefer Alt1 (Alt 1: 7 vs Alt 2: 2).**

**Proposal 1: Reply LS to RAN2 with following contents:**

* **List the issues identified for both Alt 1 and Alt 2**
* **Majority companies prefer Alt1**

**Q1-B: Reply LS to RAN2**

The reply LS will be discussed in 2nd round based on the comments received for Q1.

## RACH report optimization

The following parameters are proposed to be included in the RACH report:

* 1. Feature priorities
	2. RACH partition configuration
	3. Time between RACH access that led to the generation of a RACH Report and reporting of the RACH Report to the NG-RAN
	4. The network controls the UE to report RA information

**Q2: Please provide your comments on these parameters.**

|  |  |  |
| --- | --- | --- |
| **Company** | **a)-d)** | **Comments** |
| Intel | Yes for c) | a), b) are configured by network nodes which could be the same node the UE sends the RA report to. Even if not, a Retrieve UE Context-like procedure can be used to retrieve these configuration information from the old gNB. Besides, considering these additional parameters are optional for configuration optimization, it is still acceptable even if these information are not available or retrieval failure happens. So we think it’s not worthwhile to ask UE to report them through air interface.c) can be used for gNB to identify the RACH partition configuration for a specific UE. |
| Huawei | a and b | RAN2 is discussing the same thing. Maybe RAN3 can focus on pure RAN3 issues and leave the RA report enhancement to RAN2.The drawback of c is that it impacts on both the UE and the network, i.e., network needs to remember the RACH configuration and UE has to calculate running time between RA attempt and RA report 8 times since there are 8 RA report entries.For d, the network control solution indicates UE to report RA information which is related to certain RA configuration, e.g., last RA configuration and lead to the issues undetected and unfixed timely due to the down selection of RA reports. |
| Qualcomm | Prefer c)See comments | Regarding a) and b), just because network can’t store this configuration, it is not a good practice to ask UEs to store this and report it back to the gNB. This UE context (or network configuration) retrieval would otherwise be a never-ending saga for all SON reports (we already had similar discussion on CHO candidate cell list/execution conditions in RLF Report in Rel-17 and are having similar discussions in Rel-18 on inclusion of LBTFailureRecoveryConfig in RLF Report for NR-U optimization, inclusion of C-RNTI and timer in SHR/SPR, inclusion of S-NSSAI in RA Report for slice-related RACH optimizations). To identify UE context, a general idea of sending *MobilityInformation* (32 bit OCTET STRING) to UE and reporting it back to the network in SON/MDT reports was proposed by Nokia and a similar idea is being proposed by Samsung in SHR/SPR CB. Perhaps we should discuss this and see if we can solve this problem once-in-for-all and avoid the same discussions again.**Proposal: RAN3 should discuss whether/how to define a generic framework for UE context (or network configuration) retrieval for optimizing SON/MDT reports e.g., by gNB sending *MobilityInformation* to UE and UE reporting it back to the network in SON/MDT reports**Regarding d), we are not clear how this works? Even if the network wants UE to report just the last RA configuration, how does the UE know what is the “last RA configuration”? Is the UE required to store the different RA configurations? **Can the proponent Nokia clarify?****To Huawei:** While it is true that UE has to compute the timer for potentially 8 RA entries, UE also needs to include a) and b) for every RA entry (so overhead is comparable). |
| Lenovo |  | RAN2 is discussing the same issue, we can wait for RAN2’s progress. |
| CATT | Slight prefer a) and b) | Both a/b and c are feasible. The drawback of a/b is that UE should report a/b in each RACH entry, but I am considering if it is ok for UE to only report a/b when it was changed based on UE implementation.The drawback of c is that network should remember a/b configuration at most 48h, and UE has to calculate running time between RA attempt and RA report at most 48h. It may be not efficient from both network and UE side.  |
| Samsung | Prefer c) | For a and b, the UE needs to record the related configuration. For c, the UE needs to log the time for RA occurrence. So both solutions (a+b or c) requires UE to store the information. But the signaling overhead is larger for a and b than c. Thus c is the better solution. For d, to detect the issue timely, the UE should send the RA report in best effort mode. |
| Ericsson | 1. and b)
 | 1. Impacts the UE as well as it requires the network to keep history information of the RACH configurations adopted in the past. Hence C) has a bigger impact than b)
2. We understand that d) is proposed as a less complex solution. However, it seems equally complex and it appears incomplete. In d) the UE is configured to report only RA Reports for the latest RACH configuration. Hence the UE will have anyhow to store information about the RACH configuration in place at the time the RA Report was created, which is the bulk of the UE impact of solution b). Besides, how would solution d) work if the network wants to collect RA Reports for past RACH configurations? It seems d) would not cover this case and it leads to RA Reports for old configurations to be lost.
 |
| Nokia | c) and d) | Agree with QC and SS that the UE should not be requested to report the network’s configuration information – we believe that just storing the information in order to determine whether it changed is much less impacting than storing it. But we also believe that the network will not need information concerning old configuration because the change typically took place when the network had enough observations of the old configuration. |
| ZTE | Prefer c)See comments | RAN2 is discussing the enhancement of RA report, we propose to leave it to RAN2. if needed, We can send these options to RAN2 and say that "some RAN3 companies see benefit to include some options in the RA report, but there is no consensus in RAN3. RAN3 is waiting for the decision of RAN2". |

**Moderator’s summary:**

Regarding the parameters included in RA report, companies’ view splits into two groups:

* Network configuration information a) and b): Huawei, CATT, Ericsson
* A time indicator c) to help gNB identify network configuration information: Intel, Qualcomm, Samsung, Nokia, ZTE

As for d) NW controls UE to report, four companies (Huawei, Qualcomm, Ericsson, Samsung) raise concerns on how it works. This solution needs more justification.

Lenovo, ZTE propose to wait for RAN2’s progress, and ZTE also propose to LS RAN2 our views on different options if needed.

**Conclusion: No consensus. To be continue. (note: RAN2 is also working on this issue)**

## RACH report retrieval

RAN3 agreed to support a network-based solution for RACH report retrieval over F1AP based on an indication from the gNB-DU to the gNB-CU of successful RACH procedures which are not known to the gNB-CU (e.g., when RACH is triggered due to beam failure recovery, no PUCCH resource available, UL sync issue). A new class-2 F1AP message (e.g., RACH INDICATION) is used to indicate certain RACH occurrence(s) from gNB-DU to gNB-CU.

In last meeting, the message structure for RACH INDICATION was discussed but no agreement due to the following issues:

Whether the gNB-DU UE F1AP ID and Random access Indication are needed?

The name of IEs?

The criticality of IEs in this new introduced message?

ASN.1 issue…

Here I copied the example TP from [12] as a starting point for the continuous discussion.

#### 9.2.1.x RACH INDICATION

This message is sent by the gNB-DU to inform the gNB-CU about one or more random access procedures performed at the gNB-DU.

Direction: gNB-DU ® gNB-CU.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| Message Type | M |  | 9.3.1.1 |  | YES | ignore |
| **RACH Indication List** |  | *1..<maxnoofRACHIndications>* |  |  | YES | ignore |
| >RACH Report List Item |  | *1* |  |  |  |  |
| >>gNB-CU UE F1AP ID | M |  | 9.3.1.4 |  | YES | ignore |
| >>gNB-DU UE F1AP ID | M |  | 9.3.1.5 |  |  |  |
| >>Random accessIndication | O |  | ENUMARATED (true, …) |  |  |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofRACHIndications | Maximum number of RACH Indications. Value is FFS. |

**Q3-A: Please provide your comments on whether gNB-DU UE F1AP ID is needed.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Intel | Yes | Prefer to follow legacy, i.e. two UE IDs from both sides uniquely identify one UE. |
| Huawei |  | Technically speaking, the gNB-DU UE F1AP ID is not needed. Because only the CU UE F1AP ID is used to identify the UE in the CU. |
| Qualcomm | Perhaps no | One ID should be enough |
| Lenovo | Maybe no | Only the gNB-CU UE F1AP ID seems sufficient. |
| CATT | No  |  |
| Samsung | No | gNB-CU UE F1AP ID is enough. |
| Ericsson | No | In reply to Intel, “Legacy” is to include a single F1 APID. In fact, in the F1: Access and Mobility Indication RA Reports are signalled together with one F1 APID only, i.e. the F1 APID of the receiving node. |
| Nokia | Perhaps yes | Maybe one ID should be enough. On the other side, in reply to E///, the use of the gNB-DU UE F1AP ID in the Access and Mobility Indication procedure is different, with the IE optionally present because the received RACH report is typically not required to be associated with an existing UE context in the DU. So the applicable “legacy” corresponds probably more to Intel’s view. |
| ZTE | perhaps no, see comments | only one UE Assistant Identifier is enough, either gNB-CU UE F1AP ID or gNB-DU UE F1AP ID.  |

**Moderator’s summary:**

**Conclusion: Majority companies agree that *gNB-DU UE F1AP ID* is not needed.**

**Proposal 2: Only *gNB-CU UE F1AP ID* is included in the RACH INDICATION message.**

**Q3-B: Please provide your comments on whether Random access Indication is needed.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Intel | No | This RACH INDICATION message is used to inform the gNB-CU about the occurrences of successful random access procedures in the gNB-DU, and thus no need for this duplicate IE. |
| Huawei | No | Agree with Intel’s comments. |
| Qualcomm | No |  |
| Lenovo | No | Agree with moderator |
| CATT | No  |  |
| Samsung | No |  |
| Ericsson | No |  |
| Nokia | No |  |
| ZTE | No |  |

**Moderator’s summary:**

**Conclusion: All companies agree that the *Random access Indication IE* is not needed.**

**Proposal 3: The *Random Access Indication IE* in the RACH INDICATION message is not needed.**

In [12], IEs in the message have criticality “ignore”, but some participants raised concerns on this. In case of “ignore”, even if the receiver cannot understand the IEs and just ignore them, the sender may wrongly assume that the receiver has correctly received the message and will trigger RACH report retrieval. So instead, criticality “reject” is suggested.

**Q3-C: Please provide your comments on the criticality of IEs in this new introduced message.**

|  |  |  |
| --- | --- | --- |
| **Company** | **ignore or reject** | **Comments** |
| Intel | reject | Comments as above. |
| Huawei | reject |  |
| Lenovo | reject |  |
| CATT | reject |  |
| Samsung | reject |  |
| Ericsson | reject |  |
| Nokia | ignore | Concerning “the sender may wrongly assume that the receiver has correctly received the message and will trigger RACH report retrieval”, in this case the gNB-DU will not receive the ACCESS AND MOBILITY INDICATION message that would follow the RA report retrieval and in this way detect potential issue.  |
| ZTE | reject |  |

**Moderator’s summary:**

**Conclusion: Majority companies agree that the criticality of IEs in this new introduced message should be “reject”.**

**Proposal 4: The criticality of the *RACH indication list IE* in the RACH INDICATION message is “reject”.**

**Q3-D: TP to TS 38.473**

The corresponding TP will be discussed in 2nd round based on the comments received for Q3-A, B, C.

## Other issues

Some other issues are also raised for RACH Enhancements, e.g. naming of RACH report, RA-SDT…

**Q4: Please list any other issues you deem to be discussed under this topic and also provide your comments.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Other issues** | **Comments** |
| **Huawei** | The following proposals in R3-231740 seems missing: see right side. | There is an FFS in stage 2 on the naming to be used between “RA Report” and “RACH information report”**Proposal 1: The corresponding TP to the BLCR of TS 38.300, TS 38.401, TS 38.423 and TS 38.473 to align the naming of RA report with RAN2 spec are provided in the Annex.****Proposal 2: RAN3 replies RAN2 to withdrawn the agreement of not supporting UE to report NR SN RA report in E-UTRA SA mode.**As the impact on LTE specification for support of SN NR reporting is the same as other cases regardless the UE is in (NG)EN-DC or E-UTRA SA.Therefore, We do not see the necessity of restricting the UE not to report SN RA report when UE is in E-UTRA SA mode. Furthermore, the discard of SN RA report would affect the collect of RACH statistics and consequently has negative impact on the RACH algorithm performance. |
| **Qualcomm** | **See comments** | We should consider the stage-2 and stage-3 TPs as mentioned by Huawei, perhaps in Phase-2Also, we disagree with Huawei’s proposal to request RAN2 to withdraw the RAN2 agreement on reporting NR SN RA Report in LTE SA mode. The use case mentioned is what if UE doesn’t return to DC in 48 hours? We think this is a very corner case and need not be considered. |
| **CATT** |  | Yes, we should discuss the RA report alignment. Actually, in RAN2’s specification, the name is different. In TS38.331, the name is “RA-report/RA information” while the “RACH information report” is used in TS38.300. We slight prefer to use “RA report”. |
| **Samsung** |  | Fine to discuss the proposal 1 mentioned by HW. |
| **Ericsson** |  | We support both Proposal 1 and Proposal 2 from Huawei. We too do not understand the logic according to which the *NR RA-ReportList* can be reported to an e-UTRA eNB in DC, but not to one in SA. The only effect we see from this agreement is that RA Reports might be lost and never recovered. |
| **Nokia** |  | Huawei’s P1: okP2: disagree – we believe that RAN2 already analyzed cost/benefit of this functionality |
| **ZTE** |  | we are fine to discuss how to align the naming of RA report. |

**Moderator’s summary:**

Two other issues are proposed:

* + - 1. FFS on the name of RA report in TS 38.300, TS 38.401, TS 38.423 and TS 38.473
* TS38.331: RA-report/RA information
* TS38.300: RACH information report

Huawei, Qualcomm, CATT, Samsung, Ericsson, Nokia, ZTE support to resolve this misalignment issue, and Huawei, CATT shared their preference on “RA report”.

**Conclusion: All companies agree to resolve this misalignment issue, and two companies shared their preference on “RA report”.**

**Proposal 5: The corresponding TP to the BLCR of TS 38.300, TS 38.401, TS 38.423 and TS 38.473 to align the naming of RA report with RAN2 spec.**

**Proposal 6: To use “RA report” in TS 38.300, TS 38.401, TS 38.423 and TS 38.473.**

* + - 1. RAN2 agreement on NR SN RA report in E-UTRA SA mode

Huawei propose to ask RAN2 to withdraw the agreement of not supporting UE to report NR SN RA report in E-UTRA SA mode since they think that the impact on LTE specification for support of SN NR reporting is the same as other cases regardless the UE is in (NG)EN-DC or E-UTRA SA [10]. Ericsson supports.

But Qualcomm cannot agree because they think that the use case mentioned in [10] is a very corner case and need not be considered, and Nokia cannot agree since they think RAN2 already analyzed cost/benefit of this functionality.

Moderator suggests the interested companies to directly propose this in RAN2.

**Conclusion: No consensus.**

# Conclusion

# Reference

1. R3-231112/R2-2302066, Reply LS on RACH enhancement for R18 SONMDT, TSG RAN WG2
2. R3-231203, Discussion on SON for RACH, Samsung
3. R3-231300, (TP for SON BL CR for TS 38.473) RACH enhancements, Intel Corporation
4. R3-231341, RACH optimization enhancements, Qualcomm Incorporated
5. R3-231555, Discussion on RACH enhancement, CATT
6. R3-231586, RACH Optimization enhancement, Ericsson
7. R3-231587, Reply LS on RACH enhancement for R18 SONMDT, Ericsson
8. R3-231628, (TP for SON BL CR to TS 38.473) Further discussion on RACH optimisation, Nokia, Nokia Shanghai Bell
9. R3-231709, (TPs for SON BLCRs for TS 38.473 and TS 38.423) RACH enhancements, ZTE
10. R3-231740, (TPs for SON BLCRs for TS 38.300, TS 38.401, TS 38.423, TS 36.423, TS 38.473): Remaining issues for RACH optimisation, Huawei
11. R3-231741, [draft] Rely LS on RACH enhancement for R18 SONMDT, Huawei
12. R3-230930, (TP for SON BL CR to TS 38.473) TP for RACH optimisation, Nokia, Nokia Shanghai Bell, Ericsson, ZTE