**3GPP TSG-RAN WG2 Meeting #113-eR2-21xxxxx**

**Online, 25th Jan – 5th Feb 2021**

**Agenda item:** 8.13.2

**Source:** ZTE Corporation, Sanechips

**Title:** Report of[Offline-888][NRR17 SONMDT] Indication for 2-step RACH (ZTE)

**Document for:** Discussion and Agreement

# 1 Introduction

This is to report the result of the following email discussion at the RAN2#113-e meeting [1].

 [AT113-e][888][NR/R17 SON/MDT]  Indication for 2-step RACH (ZTE)

* Working on the FFS part that “The RA report includes as indication of whether the DL beam quality, associated to the used 2 step RA resource, is above or below the msgA-RSRP-Threshold.”

    Intended outcome: Agreeable WF

Deadline: Thursday 04/02/2021

Based on email confirmation received from Chair, this email discussion also considers following proposals from paper R2-2102269 [2]:

* “Include the measured DL RSRP obtained just before performing RACH procedure in RA report, which can be used to optimize the RSRP threshold for RACH type selection.”

According to the chair’s guidance, this report is used to collect companies’ views on the need of inclusion of DL beam quality indication associated to the used 2 step RA resource [1], and to find an agreeable way forward. Companies are requested to provide their opinions before the deadline Thursday 04/02/2021, UTC 11:00.

# 2 Contact Information

To make it easier to find the correct contact delegate in each company for potential follow-up questions, the rapporteur encourages the delegates who provide input to provide their contact information in this table:

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| --- | --- |
| Company | Contact: Name (E-mail) |
| ZTE | Zhihong Qiu (qiu.zhihong@zte.com.cn) |
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| vivo | WenMing (ming.wen@vivo.com) |
| Lenovo | Wulh5@lenovo.com |
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| Nokia, Nokia Shanghai Bell | malgorzata.tomala@nokia.com |
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# 3 Discussion

During the RAN2#113-emeeting following agreements have been achieved for RA report[1]:

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| 2-step RA related SON:1 The reporting granularity of whether the DL beam quality, associated to the used 2 step RA resource, is above or below the msgA-RSRP-ThresholdSSB is per-RA-attempt.2 The RA report includes an indication that enables the network to know that the fallback from 2 step RA to 4 step RA was performed by the UE. FFS: Implicit vs explicit indication.Choose ‘per RA procedure’ for the granularity of RA type (2 step RA vs 4 step RA) indication. FFS: Implicit vs explicit indication. |

The controversial issues are whether to include DL beam quality information associated to RA type selection in RA report. If does, how to address this information in RA report.

In order for companies to make informative decisions, some background knowledge regarding to *msgA-RSRP-Threshold* are given as follows:

*msgA-RSRP-Threshold* is an RSRP threshold for selection between 2-step RA type and 4-step RA type, which will only be used once during RA initialization procedure. According to the field description as specified in 38.331[3], this parameter is **mandatory present if both 2-step random access type and 4-step random access type are configured in the BWP, otherwise the field is not present.**

According to TS 38.321[4], in case both 2stepRA and 4step resource is configured for selected BWP, UE will first compare the **RSRP of downlink pathloss reference** with configured *msgA-RSRP-Threshold* to determine RA type. UE sets RA type to 2stepRA when the downlink pathloss reference is above *msgA-RSRP-Threshold*, otherwise UE sets RA type to 4stepRA. After determination of RA type, UE will for each RA attempt compares the **RSRP of beams** (SSBs/CSI-RSs) with *rsrp-ThresholdSSB*/*rsrp-ThresholdCSI-RS* (if RA type is 4stepRA) or *msgA-RSRP-ThresholdSSB* (if RA type is 2stepRA) to select suitable beam for RA attempt.

According to the summary in [5], companies in favor of the include the beam quality indication associated to *msgA-RSRP-Threshold* consider such information is helpful for NW to know whether the configured threshold for RA type selection is appropriate or not. While for opponent companies, they think UE will only use this threshold once during the whole RA procedure , and this information shall be able to deduce based on the RA type selected, there is no need to duplicate this information in RA report.

**Q1: Do companies agree to include the DL beam quality indication used to indicate whether used 2 step RA resource is above or below the *msgA-RSRP-Threshold* in RA report? If does, please also provide the preferred granularity (e.g., per RA procedure or per RA attempt) in the detailed comments.**

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| Company | Agree/Disagree | Detailed Comments |
| ZTE | Disagree | As discussed in our contribution R2-2101587, whether DL path loss reference is above MsgA-RSRP-Threshold or not can be derived based on RA type selected. Also, in our understanding the MsgA-RSRP-Threshold is also used for load balancing, therefore it is possible for NW to configure a higher threshold to narrow down the UEs selected for 2step RA, in such case the beam quality indication cannot provide much useful information. |
| OPPO |  Disagree | As specified in 38.321, UE compares the RSRP of DL pathloss reference with the **msgA-RSRP-Threshold** when determining whether to perform 2-step RA or 4-step RA. After RA type is selected, beam quality is used in SSB selection. There is no comparison between DL beam quality and msgA-RSRP-Threshold in the whole 2-step RA procedure. Therefore, we do not think it is necessary to log any information that is not originally in the procedure.For the issue on whether to include an indication on whether -the **RSRP of DL pathloss reference** is above/below the **msgA-RSRP-Threshold**, we share the same view with ZTE. |
| CMCC | Disagree | Share the view with ZTE and OPPO to some degree, the indication only could not provide much helpful information to the network, and the reporting of the RSRP measurements is much more beneficial. |
| Qualcomm | Disagree | In our understanding, inclusion of the DL beam quality indication used to indicate whether used 2 step RA resource is above or below the *msgA-RSRP-Threshold* in RA report. At the same time, we believe that RSRP measurement is not needed, using the implicit indication, network can optimize the msA-RSRP-threshold. Note that the network configures the parameter msgA-RSRP-Threshold and thus adopt any optimization scheme based on implicit indication of the parameter and its information of configured msgA-RSRP-Threshold.  |
| vivo | Disagree | We share the similar view with above comments. The RA type was already determined based on the comparision between RSRP of DL pathloss reference and *msgA-RSRP-Threshold*, upon receiving the 2-step RA related report, the NW could be aware of the RA type that UE chose.We don’t see the need to include such an indicator. |
| Lenovo&MM | Disagree | Agree with ZTE. it can be deduced based on the selected RA type. |
| Ericsson | Agree (if Q2 is not agreed) | The above comments do not consider that the network may desire to configure only 2-step RACH in certain cells. In this case, it might be important for the network to know whether the UE selects 2-step RACH because the DL quality was good enough or just because the 4-step resources were not configured.In case Q2 is agreed, we may not need this functionality.[ZTE2]: Thanks for the comments. But in our understanding, UE will includes in RA report the the cell id, the frequency information of RA resource configured and of the associated BWP and , NW shall be able to know detailed RA resource configuration, e.g., if both 2step/4step is configured for the selected RA resource or not. Therefore no explicit indication is needed also.[Ericsson2]: Related to ZTE comment above, we note that the RA configuration can be a per UE-configuration. Hence, in order for the network to know whether both 2step/4step were configured for this UE or only one of them, it is not enough to just read the cellID/freq/BWP included in the RA-report. The network needs to also remember whether those information were associated to a 2-step or 4-step configuration, which is hard to assume considering that the RA-report may be reported hours after the UE performed RA. [ZTE3]: When dedicated RA resource is configured for UE, UE will select the RA type to the type of dedicated resource configured without comparing the MsgA-RSRP-Threshold. In this case NW can based on the RA information (e.g., perRA-InfoList) included to know if the RA attempt is contention free or contention based if the same principle for storing 4step RA information is adopted for 2step . Then together with the RA type information, NW can know for this case UE selects RA type due to presence of dedicated RA resource.  While for contention based resource, the resource is configured in a cell specific method, the issue you mentioned won't be a big problem then. |
| Huawei, HiSilicon | Agree (if Q2 is not agreed) | We share the same view as Ericsson, there are cases where 2/4-step RA is selected for another reason than the DL measurement, e.g. explicit fallack. To cover this case we may need more than one report, for example the indication of measurement vs. threshold when 2 step RACH starts and the when 4 step RACH starts. |
| Samsung | Disagree |  |
| CATT | Agree | We think “per attempt” report of information reflecting RSRP measurment is meaningful for network to optimize the threshold and resources for 2s rach. We understand companies concern on feedback overhead. So we propose a balanced WF, see our comments to Q2. In short the solution in Q1 is actually a good way to reduce the overhead but still able to give some information on a finer (per attempt) level.  |
| Nokia, Nokia Shanghai Bell | Disagree, but should be compared to msgA-RSRP-ThresholdSSB for each attempt, instead of msgA-RSRP-Threshold which is used for RA type selection  | Whether the beam quality is above msgA-RSRP-Threshold threshold (note it's a different threshold from msgA-RSRP-ThresholdSSB for beam selection after 2-step RA type is selected) is only checked at RA initiation for RA type selection but not for further attempts. Then for beam selection, any beam can be selected if no beam is above threshold after the RA type is selected. It could be also beneficial to log per RACH attempt for all following attempts whether the selected beam is above msgA-RSRP-ThresholdSSB threshold to let the network know the reason why an attempt fails or fallback happens. [ZTE3]: beam quality is above msgA-RSRP-ThresholdSSB or not per RA attempt has already been agreed based on following agreements made on second online session:

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| Agreements2-step RA related SON:1 The reporting granularity of whether the DL beam quality, associated to the used 2 step RA resource, is above or below the msgA-RSRP-ThresholdSSB is per-RA-attempt. |

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| Sharp | Agree | Firstly, we agree with CATT’s comments.Secondly, though UE only selects RA type once at the beginning of a RA procedure, the radio condition changes. For each RA attempt, even if the RA type is 2 step, the radio measurement can be below the threshold. It is beneficial to let the network know about this.  |

It is proposed in [2] that comparing to the beam quality indication, the actual measured DL RSRP obtained just before performing RACH procedure is more useful for NW to optimize the 2step RACH configuration. Based on the detailed discussion, here the DL RSRP refers to the RSRP of DL pathloss reference, to avoid misunderstanding, the complete terminology“RSRP of DL pathloss reference” is used in the proposal instead of “DL RSRP”.

**Q2: Do companies agree to include the measured RSRP of DL pathloss reference** **obtained just before performing RACH procedure in RA report? If does, please also provide the preferred granularity (e.g., per RA procedure or per RA attempt) in the detailed comments.**

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| Company | Agree/Disagree | Detailed Comments |
| ZTE | Maybe not  | Even without this information, NW can still adjust the RSRP roughly based on the RA attempts received for each RA type to balance the RA load between different RA type. Although we see some benefits, but this information will increase the overhead in RA report. |
| OPPO | Agree | When both 2-step RA and 4-step RA are configured, RA type is selected depending on the configured RSRP threshold. UE compares the measure RSRP of DL pathloss reference with the threshold. For case that the RSRP threshold is set improperly, it would lead to one group of UE, either performing 2-step or 4-step RACH are encountered with much more RACH collisions and access latency than the other group. To make an optimization, we think it is beneficial to include the measure RSRP result per RA procedure, with which the network can determine whether adjustment of RSRP threshold should be made. |
| CMCC | Agree | The appropriate selection between 2-step RA and 4-step RA is important for both UE and network, and the reporting of the UE’s RSRP measurement is beneficial for the network to optimize the configured *msgA-RSRP-Threshold.* Furthermore, the reporting is per RA preocedure rather than per attempt, since UE will not change the RA type during one RA procedure. Therefore, the reporting overhead is acceptable. |
| Qualcomm | No | We believe that RSRP measurement is not needed, using the implicit indication, network can optimize the msA-RSRP-threshold. Note that the network configures the parameter msgA-RSRP-Threshold and thus adopt any optimization scheme based on implicit indication of the parameter and its information of configured msgA-RSRP-Threshold.  |
| vivo | Maybe not | The threshold is configured by NW, and if the NW receives feedback from UEs that RACH collisions happened frequently, the NW could perform optimization based on the previous configured threshold and the parameters UE reported. |
| Lenovo&MM | Agree | If the threshold is not suitable, the RA failure probability will increase. Therefore, the reported RSRP of DL pathloss reference could be helpful for network to optimize the threshold.  |
| Ericsson | Agree | We agree with previous comments that this can be used to optimize the msgA-RSRP-Threshold, and also to determine whether to configure only 2-step RACH or both 4-step and 2-step. |
| Huawei, HiSilicon | Agree | We need to clarify what “per procedure” means. We think it would be useful to have at least the measurement when 2-step RA starts and the measurement when 4 step RA starts, to cover fallback cases other than MsgA threshold. |
| Samsung | No | It can be implicitly derived with DL quality indication and # of preamble retransmission.We can consider 4SRA related information made in Rel-16. |
| CATT | Agree | We think the report of RSRP per RA attempt would be helpeful for network to optimize its configuration of related threshold. Our 1st preference would be to report this RSRP value per attempt as that gives finer information. But if this is considered as high overhead, we think it is useful to have **a RSRP value report per procedure, plus a flag to indicating “above or below threshold” per attempt.** That way it gives a good banlance of performance and overhead.  |
| Nokia, Nokia Shanghai Bell | Agree | If the network knows the actual RSRP value at which the network selected 2-step versus 4-step RACH it can optimize the threshold parameter configuration and therefore the PUSCH resource efficiency (PUSCH occasions).  |
| Sharp | Agree | We prefer the report of RSRP per RA attempt. Only the RSRP just at the beginning of the RA procedure per RA procedure is not enough, see our comment for Q1.However, if the high overhead is a concern, we can consider “indication about whether used 2 step RA resource is above or below the msgA-RSRP-Threshold” as mentioned in Q1. |

**Conclusion:**

# 4 Conclusion

**TBD**

# 5 References

1. R2-113-e SONMDT HuNan 2021-01-29-0630 UTC
2. R2-2102269 Discussion on 2-step RACH reporting for SON OPPO discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core
3. 38.331 NR; Radio Resource Control (RRC) protocol specification (Release 16)
4. 38.321 NR; Medium Access Control (MAC) protocol specification (Release 16)
5. R2-2102265 Summary of AI 8.13.2 Ericsson discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core