**3GPP TSG-RAN2 Meeting #116-e R2-21xxxxx**

**Online, November 1st – 12th, 2021**

**Agenda Item: 9.1.2**

**Source: Huawei**

**Title: Summary of [301] RLF measurements (Huawei)**

**Document for: Discussion and decision**

# Introduction

This document is the report of the offline discussion “[Post115-e][301][NBIOT/eMTC R17] RLF measurements (Huawei)” as below:

* [Post115-e][301][NBIOT/eMTC R17] RLF measurements (Huawei)

Scope: Progress the FFSs

Intended outcome: Report to next meeting

Deadline for comments: October 14th, 0900 UTC

Deadline for summary: October 21st, 0900 UTC

The agreements of RAN2#115-e [1] are summarised below and the remaining FFSs highlighted.

|  |
| --- |
| RAN2#115-e agreements:   * The configuration of the criteria for starting the measurements include a serving cell NRSRP threshold. FSS how to address variance (as agreed last meeting) * It is useful to have a shorter T310 timer for UEs supporting this enhancement, but FFS whether this is best achieved with the existing dedicated signalling or based on a new condition. * Prioritisation of carriers/cells to measure is left to the UE implementation. * FFS: whether to provide a separate criteria for inter-frequency measurements (i.e. needing re-tuning) considering that they will take longer and should start earlier. * Legacy relaxed monitoring criteria is reused to address the variance part of the criteria to start the measurements.   + - FFS: Whether it is enabled by the provision of separate SSearchDeltaP and TSearchDeltaP parameters from RRC\_IDLE. * The conditions where the UE is required to perform measurements are specified. No requirement on when to stop measurements is needed. * The configuration of the criteria for starting the measurements is provided via broadcast signalling. * Provision of information regarding which cells/carriers to be considered is not supported. It is up to UE implementation to choose and prioritize carrier/cell list for measurement. * Report of the cells measured in RRC\_IDLE to assist measurement configuration is not supported. * Report of information about connected measurements during the RRC Connection re-establishment procedure for network optimisation is not supported. * There is no need to specify which subframes can be used for measurements beyond them not being needed for PDCCH monitoring or data transmission / reception. * Support for connected mode measurement is optional with capability signalling. * FFS: Whether to support an indication from the UE that it starts/ stops performing measurement |

This is the continuation of [AT115-e][301][NBIOT/eMTC R17] RLF measurements (Huawei) [2].

# Discussion

## Separate criteria for inter-frequency measurements

At RAN2#115-e, it has been agreed that prioritisation of carriers/cells to measure is left to the UE implementation and a FFS was raised whether to provide a separate criteria for inter-frequency measurements (i.e. needing re-tuning) considering that they will take longer and should start earlier.

**Discussion point 1:** Do you support having a separate criteria for inter-frequency measurements (i.e. needing re-tuning) considering that they will they will take longer and should start earlier. Please justify.

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **yes/no** | **Detailed comments** |
| ZTE | Yes | Similar as that in RRC\_IDLE, we assume UE can prioritize intra-frequency measurements based on a set of “easy-to-satisfy” threshold while deprioritize inter-frequency (i.e. needing re-tuning) measurements with another a bit strict set of threshold.  We are not sure about the thinking that inter-frequency measurements should start earlier just because of the consideration that it may take longer. As the length of required time for measurement is related to some aspects, e.g., the amount of free sub-frames and the coverage status of the UE, it may be not easy to assume the length of required time for measurement, and also not easy to associate the configured criteria with an assumed time length.  Anyway, from specification perspective, we can just allow two sets of thresholds configuration. Which configuration is strict and which is loose can be left to network implementation. |
|  |  |  |

## Enabling of relaxed monitoring enabled in RRC\_CONNECTED

At RAN2#115-e, it has been agreed that legacy relaxed monitoring criteria is reused to address the variance part of the criteria to start the measurements and a FFS was raised whether it is enabled by the provision of separate SSearchDeltaP and TSearchDeltaP parameters from RRC\_IDLE.

In RRC\_IDLE, relaxed monitoring is enabled by the provision of *s-SearchDeltaP* in SIB3-NB:

CellReselectionInfoCommon-NB-v1450 ::= SEQUENCE {

s-SearchDeltaP-r14 ENUMERATED {dB6, dB9, dB12, dB15}

}

And 36.304 specifies that TSearchDeltaP = 5 minutes or the eDRX cycle length if eDRX is configured and the eDRX cycle length is longer than 5 minutes.

During the email discussion at RAN2#115 [2], most companies indicated that the parameters could be different from RRC\_IDLE.

**Discussion point 2-1:** Is relaxed monitoring in RRC\_CONNECTED enabled/disabled by the network ?

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **yes/no** | **Detailed comments** |
| ZTE | **Yes** for measurement enabled/disabled by the network, but it’s not suitable to say for relaxed monitoring | We are not sure whether it’s suitable to say relaxed monitoring in RRC\_CONNECTED. There is no such concept. We just re-use (part of) the criteria in relaxed monitoring in RRC\_IDLE for checking the variance of serving cell quality in RRC\_CONNECTED.  Furthermore, as RAN2 has agreed the configuration of the criteria for starting the measurements (including absolute threshold for serving cell quality and the threshold for the variance of serving cell quality) is provided via broadcast signalling, we understand the values of *s-SearchDeltaP* and *TSearchDeltaP* for RRC\_CONNECTED would be common for all the UEs.  But we think introducing indication(s) in dedicated signalling to enable/disable connected mode measurement would be beneficial, at least for IoT test. Moreover, with such indication, the network can enable only a part of the UEs to perform measurement. |
|  |  |  |

**Discussion point 2-2:** Can the values of *s-SearchDeltaP* and *TSearchDeltaP* be different in RRC\_CONNECTED and RRC\_IDLE? if yes, how are they provided?

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **yes/no** | **Detailed comments** |
| ZTE | Yes | RAN2 has agreed to provide the criteria, e.g., *s-SearchDeltaP* and *TSearchDeltaP* via broadcast signalling. Therefore, the criteria would be common to all the UEs. But we think it should be different for RRC\_CONNECTED and RRC\_IDLE.  For example, *TSearchDeltaP* can be shorter for RRC\_CONNECTED. For *s-SearchDeltaP*, it may be larger for RRC\_IDLE as the purpose is try to reduce the measurement. But for RRC\_CONNECTED, it may have two purposes of triggering measurement and avoiding unnecessary measurement, so it can be a bit small. |
|  |  |  |

## UE indication that it starts/stops measurements

At RAN2#115-e, it has been discussed and left FFS whether to support an indication from the UE that it starts/ stops performing measurements.

**Discussion point 3:** Do you support having an indication that the UE starts measurement, please justify? If yes, how is it reported?

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| ZTE | No | Based on our analysis, we see it’s already possible for network to provide suitable configuration to facilitate UE to perform connected mode measurement without interrupting the service transmission.  For UE side, when the criteria for starting connected mode measurement is fulfilled, UE can just perform the measurement in the scheduling gap (e.g., making use of the free sub-frames). Moreover, as long as the measurement is started, UE can try to complete the measurement at least once and stop the measurement after getting the results. In short, we see no any issue without notifying the measurement start/stop to the network.  On the other hand, if introducing such start/stop indication(s), the time duration between the start and stop indications can be seen as kind of “measurement gap” detemined by the UE. In such “measurement gap”, the network would completely stop scheduling for the UE. We see it’s not good for service performance and user experience. Moreover, to introduce such measurement start/stop indications may have considerable specification impacts and cause signalling overhead. It may be not only to define only two indications, but also need to further consider the acknowledgement of the start/stop indications in order try to avoid any possible inconsistence between UE and network. |
|  |  |  |
|  |  |  |
|  |  |  |

## Shorter T310 timer

At RAN2#115-e, it was agreed ‘It is useful to have a shorter T310 timer for UEs supporting this enhancement, but FFS whether this is best achieved with the existing dedicated signalling or based on a new condition”. This was further discussed in offline [310] without conclusion [2].

Based on the previous discussions, the two options are clarified as below:

1. Existing signalling: eNB configures a shorter value of *t310-r13* in *rlf-TimersAndConstants-r13.* T310 timer is handled as per legacy, no impact on the specification.
2. New condition: New timer, e.g. *t310bis-r16*, configured by the eNB, which value the UE uses when starting T310 if the condition is fulfilled. Further handling of T310 timer is as per legacy. Signalling of the timer to be discussed.

**Discussion point 4-1:** Is the support of connected mode measurement a sufficient condition for a shorter T310? If no, clarify what additional condition is needed.

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **yes/no** | **Detailed comments** |
| ZTE | No  (here “No” means we prefer option a) and see no any additional condition is needed for applying dedicated T310. “No” doesn’t means the condition of supporting of connected mode measurement is needed while other conditions are not needed) | We prefer the option a) and think whether and when to configure a shorter T310 can be left to network implementation. No need to further discuss the condition for configuring a shorter T310. For UE side, we think UE should follow the dedicated configuration if it’s provided. Therefore, it’s also no need to further discuss the condition for the UE to apply a shorter T310. In short, configuring/applying the dedicated T310 timer don’t need to depend on whether the UE supports connected mode measurement or any other condition.  With the following reasons, we prefer to use existing dedicated T310 timer provision and no need to define any aditional condition(s) or any other new timer.   1. The current dedicated signalling can already allow shorter T310 timer configuration for a certain UE, e.g., according to UE’s coverage. If a UE is in very good coverage, it’s much likely to be configured with shorter T310, e.g., 2s. But if the UE’s coverage is already not so good, it may be configred with a bit longer value (still can be shorter than 8s). This is already with consideration for trade-off between quick reselection to new cell and enough time for recovery (in a not so good coverage, DL/UL repetitions are anyway needed for in-sync indications reception). 2. Even we can have a kind of common understanding that R17 UEs may be with continuous movement, there may have no common assumption on the long connection. It’s still possible for UE to only have a few data for transmission, the each time connection may be not long. For such UE, it’s likely to use CP solution and we can assume the dedicated T310 configured at each RRC establishment procedure would be always suitable during the whole connection. If UE has more data for transmission, it’s likely to use UP solution and maintain long connection. For such UE, the situation may change a lot. When such case occurs, it’s possible for network to reconfigure the UE with another suitable T310 value. Moreover, we don’t think network need to rely on UE’s report, the evaluation on DL/UL service quality can provide enough information to network. 3. In previous contribution, companies also mentioned using a shorter T310 will reduce the chance of recovery for UEs not at the cell edge and experiencing temporary bad radio conditions. They think shorter T310 should be avoided in this case. We disagree. We cannot see big difference between using 2s and 8s. Taking the whole RLF procedure into consideration, for a **temporary** radio condition deterioration, the “recovery” may happen at any stage. The only case with benefit of long T310 may be that the "in-sync" indications are received after the T310 runs for 2s but before 8s. We think it would be very rare case. With following thoughts, it’s hard to say benefit of long T310 (or hard to say the drawbacks of short T310):    * The UE may not receive enough N310 consecutive "out-of-sync" indications to trigger T310. Then it doesn't matter to use T310 of 2s or T310 of 8s.    * "in-sync" indications occurs late, e.g., just after start of T310. Since the UE is originally in good coverage (not at the cell edge), 2s may be still enough for UE to receive them.   In a summary, without crystal clear benefit, such complexity of handling additonal condition or additional (third) timer is unnecessary. |
|  |  |  |
|  |  |  |
|  |  |  |

**Discussion point 4-2:** If the answer to discussion 4-1 is no, does the NW need to know the additional condition is fulfilled for option a)? Please clarify.

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **yes/no** | **Detailed comments** |
| ZTE | No | This is purely network implementation. Nothing needs to be specified. |
|  |  |  |
|  |  |  |
|  |  |  |

**Discussion point 4-3:** If the answer to discussion 4-1 is no, does the NW need to know the additional condition is fulfilled for option b)? Please clarify.

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **yes/no** | **Detailed comments** |
| ZTE | No | No need of option b).  Even with option b), the condition can be purely network implementation. Nothing needs to be specified. |
|  |  |  |
|  |  |  |
|  |  |  |

**Discussion point 4-4:** If option b) is selected, how is the new timer provided, via dedicated signalling only, via broadcast signalling only, via one and/or the other (same as existing t310-r13)? Please justify.

Companies’ inputs

|  |  |  |
| --- | --- | --- |
| **Company** | **Dedicated/broadcast / both** | **Detailed comments** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Other

Please indicate here any other issue that you would like to raise in the email discussion.

Companies’ inputs

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

# Conclusion

TBC

# Participants

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **e-mail address** |
| Huawei (rapporteur) | Odile Rollinger | odile.rollinger@huawei.com |
| ZTE | Ting Lu | lu.ting@zte.com.cn |

# References

1. R2-2108974 RAN2 agreements for Rel-17 NB-IoT and LTE-MTC Ericsson RAN2#115-e August 2021
2. R2-21089 Summary of [301] RLF measurements (Huawei) Huawei RAN2#115-e August 2021