**3GPP TSG-RAN WG2 Meeting #131R2-2506247**

**Bangalore, India, 25th – 29th Aug. 2025**

**Agenda item: 8.4.3**

**Source: CATT**

**Title:  [AT131][204][LPWUS] Proposals for RRC-10/38304-6, RRC-15/38304-2, 38304-12 (CATT)**

**Document for: Discussion and Decision**

# Introduction

This document is to collect the comments and proposals for the following open issues on RRM measurement relaxation and offloading in RRC\_IDLE/INACTIVE:

* [AT131][204][LPWUS] Proposals for RRC-10/38304-6, RRC-15/38304-2, 38304-12 (CATT)

Intended outcome: Proposals in R2-2506247 for RRC-10/38304-6, RRC-15/38304-2, 38304-12.

Deadline: Before CB

# Discussion

## RRC-10/38304-6: Whether UE low mobility criterion or stationary criterion should be considered for RRM relaxation/offloading.

Some companies don’t support RAN2 to consider UE low mobility criterion or stationary criterion to evaluate whether to enter or exit from Rel-19 RRM relaxation/offloading mode, as the benefit is not clear. Furthermore, some companies think it is up to UE implementation to avoid the LP-WUS operation when UE is not in low mobility state.

Some companies support RAN2 to consider UE low mobility criterion for LP-WUS. For example: We should avoid the case that a moving UE not measuring the serving cell for a very long time.

If RAN2 consider UE low mobility criterion for Rel-19 RRM relaxation/offloading mode, there are some further issues need to be resolved:

* **i) Which scenario UE low mobility criterion is applied**

RAN2 need to discuss which scenario UE low mobility criterion is applied for Rel-19 RRM relaxation/offloading mode.

* Opt1: UE low mobility criterion is only considered in Rel-19 RRM offloading.
* Opt2: UE low mobility criterion is only considered in Rel-19 RRM relaxation.
* Opt3: UE low mobility criterion is considered in both Rel-19 RRM offloading and Rel-19 relaxation.
* **ii) What is the criterion for low mobility criterion**

The criterion for Rel-16 UE low mobility in TS 38.304 is:

|  |
| --- |
| 5.2.4.9.1 Relaxed measurement criterion for UE with low mobility The relaxed measurement criterion for UE with low mobility is fulfilled when:  - (SrxlevRef – Srxlev) < SSearchDeltaP,  Where:  - Srxlev = current Srxlev value of the serving cell (dB).  - SrxlevRef = reference Srxlev value of the serving cell (dB), set as follows:  - After selecting or reselecting a new cell, or  - If (Srxlev - SrxlevRef) > 0, or  - If the relaxed measurement criterion has not been met for TSearchDeltaP:  - The UE shall set the value of SrxlevRef to the current Srxlev value of the serving cell. |

In addition, a period of TSearchDeltaP is introduced for Rel-16 UE low mobility to determine if UE enters low mobility. An example in TS 38.304 is shown below:

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| --- |
| 5.2.4.9.0 Relaxed measurement rules When the UE is required to perform measurements of intra-frequency cells or NR inter-frequency cells or inter-RAT frequency cells according to the measurement rules in clause 5.2.4.2:  - if *lowMobilityEvaluation* is configured and *cellEdgeEvaluation* is not configured; and  - if the UE has performed normal intra-frequency, NR inter-frequency, or inter-RAT frequency measurements for at least TSearchDeltaP after (re-)selecting a new cell; and  - if the relaxed measurement criterion in clause 5.2.4.9.1 is fulfilled for a period of TSearchDeltaP:  - the UE may choose to perform relaxed measurements for intra-frequency cells, NR inter-frequency cells or inter-RAT frequency cells according to relaxation methods in clauses 4.2.2.9, 4.2.2.10, 4.2.2.11, 4.2C.2.7 and 4.2C.2.8 in TS 38.133 [8];  //skip |

If RAN2 consider UE low mobility criterion for Rel-19 RRM relaxation/offloading mode, RAN2 discuss if Rel-16 UE low mobility criterion with a period of TSearchDeltaP is reused as a baseline.

And according to contributions, RAN2 need to further decide MR or LR measurement result is used for UE low mobility criterion for Rel-19 RRM relaxation/offloading mode.

* **iii) How to use UE low mobility criterion for Rel-19 RRM relaxation/offloading mode**

In Rel-16 RRM relaxation, low mobility and not at cell edge were introduced. And different scaling factors are applied when only one criterion is fulfilled or both criteria are fulfilled, which is captured in TS 38.133.

Similar as Rel-16 RRM relaxation, if RAN2 consider UE low mobility criterion for LP-WUS, RAN2 may need to send an LS and ask RAN4 to discuss corresponding requirements for the following cases:

* Case 1: Only UE low mobility criterion is configured by the network and UE low mobility criterion is fulfilled.
* Case 2: Both UE low mobility criterion and the already agreed measurement criterion for RRM relaxation/offloading are configured by network, but only one criterion is fulfilled.
* Case 3: Both UE low mobility criterion and the already agreed measurement criterion for RRM relaxation/offloading are configured by network, and both criteria are fulfilled.

And if there is a solution which has no impact on RAN4, please provide it.

Companies are invited to provide their preference on following questions:

**Q1: Which option is preferred for UE low mobility criterion for Rel-19 RRM relaxation/offloading mode?**

* Opt1: Not support to consider UE low mobility criterion for Rel-19 RRM relaxation/offloading mode.
* Opt2: Support to consider UE low mobility criterion for Rel-19 RRM relaxation/offloading mode.

Discussion:

LG: Option 1.

SS: Support UE low mobility criterion for Rel-19 RRM relaxation mode with MR measurement results.

Huawei: Not at cell edge is already enough.

**Proposal 1: Not support UE low mobility criterion for Rel-19 LP-WUS. One company still has concern on Rel-19 UE cannot use low mobility criterion to save power.**

**Q2: If Opt1 in Q1 is preferred, do you agree that it is up to UE implementation to avoid the LP-WUS operation when UE is not in low mobility state?**

**If Opt2 in Q1 is preferred, companies are invited to further provide their preference on the following questions:**

**Q3-1: If UE low mobility criterion is considered in Rel-19 RRM relaxation/offloading mode, which scenario is preferred?**

* **Opt1: UE low mobility criterion is only considered in Rel-19 RRM offloading mode.**
* **Opt2: UE low mobility criterion is only considered in Rel-19 RRM relaxation mode.**
* **Opt3: UE low mobility criterion is considered in both Rel-19 RRM offloading and Rel-19 relaxation.**

Discussion:

Ericsson: If the UE inside the LP-WUS, moving UEs are not allowed Rel-19 RRM relaxation/offloading. Reused Rel-16 low mobility criterion.

vivo, Xiaomi, ZTE: Option 1. Rel-19 has larger scaling factor.

QC, Huawei: Option 2. Reused Rel-16 low mobility criterion.

IDC, OPPO: Option 3. OPPO also prefer Option1.

QC: to avoid to define LR criterion for low mobility. For offloading, it’s in the central area of cell. Low mobility is not necessary.

**Q3-2:** **If UE low mobility criterion is considered for Rel-19 RRM relaxation/offloading mode, do you agree Rel-16 UE low mobility criterion with a period of TSearchDeltaP is reused as a baseline?**

**Q3-3:** **If UE low mobility criterion is considered for Rel-19 RRM relaxation/offloading mode, which option is preferred for the evaluation of UE low mobility criterion?**

* **Opt1: MR measurement result is used for UE low mobility criterion for Rel-19 RRM relaxation/offloading mode.**
* **Opt2: LR measurement result is used for UE low mobility criterion for Rel-19 RRM relaxation/offloading mode.**

Discussion:

Sony: support Option1 to entry low mobility. To exit, LR can be used.

Ericsson: prefer LR measurement. Further discuss the detail parameters for low mobility criterion. For NW vendor, need specify the behaviour of UE low mobility.

OPPO, ZTE: LR is needed for low mobility. LR measurement is always there.

vivo: MR is mandatory, LR is optional

**Q3-4: If UE low mobility criterion is considered for Rel-19 RRM relaxation/offloading mode, do you agree that RAN2 need to send an LS and ask RAN4 to discuss corresponding requirements for the following cases?**

* **Case 1: Only UE low mobility criterion is configured by the network and UE low mobility criterion is fulfilled.**
* **Case 2: Both UE low mobility criterion and the already agreed measurement criterion for RRM relaxation/offloading are configured by network, but only one criterion is fulfilled.**
* **Case 3: Both UE low mobility criterion and the already agreed measurement criterion for RRM relaxation/offloading are configured by network, and both criteria are fulfilled.**

Discussion:

Ericsson: RAN2 define the criterion and then RAN4 define the scaling factor.

QC: need LS to RAN4

## RRC-15/38304-2: FFS (if needed) on enhancements based on Rel-16 criteria (e.g., based on the LR measurements) for the case when MR serving cell measurement results are not available.

According to contributions, there are following alternative understandings for the open issue:

* **Alt1:** There is no impact on R16/R17 criterion of neighboring cell RRM relaxation regardless whether MR serving cell RRM measurement results are available or not, i.e., LR measurement won’t be used for R16/R17 RRM relaxation condition.

The reasons for Alt1 may include:

* Since it is agreed that the threshold of the criteria for serving cell RRM offloading should be higher than or equal to the maximum of {SIntraSearchP, SnonIntraSearchP}, thus the measurement on equal/lower priority frequency/RAT has already been stopped and UE won’t evaluate the R16/R17 RRM relaxation criterion in this case. Correspondingly, there is no need to work on the enhancement on Rel-16 neighboring cell RRM relaxation in this case.
* If Rel-19 RRM relaxation and Rel-16 RRM relaxation are configured together, it is reasonable for Rel-19 UEs performs Rel-19 RRM relaxation during LP-WUS operation.
* **Alt2:** No need to enhance Rel-19 RRM measurement relaxation criterion when the UE exits serving cell offloading.

After the UE exits serving cell offloading, the UE would not stop measuring MR serving cell, instead it may perform relaxed MR serving cell measurement if the entry condition of Rel-19 MR relaxed measurement is fulfilled. It is natural and simple that the UE starts to perform MR serving cell measurement when the UE exits serving cell offloading. Then the UE determines whether the entry condition of Rel-19 MR relaxed measurement or Rel-16 relaxed measurement criterion is fulfilled after the UE obtains MR serving cell measurement results.

* **Alt3:** For LP-WUS RRM measurement relaxation, the criteria can be based on LR measurement if MR serving cell measurement results are not available.

When UE is in measurement offloading area, UE only performs the serving measurement based on LR. Therefore, when UE entering the relaxation area and deciding whether to start neighboring cell measurement, it is only possible to perform the criteria evaluation based on the LR serving measurement results.

* **Alt4**: Supports using LR to evaluate the Rel-16 "not-at-cell-edge" and "low mobility" criteria, and defines the corresponding LR threshold.

Since the relaxation factor of MR is 16, it is very reasonable to use LR to assist in evaluating the Rel-16 “not-at-cell-edge” and “low mobility” criteria.

Companies are invited to provide their preference on following question:

**Q4: Which alternative(s) can be agreed related with open issue RRC-15/38304-2:**

* **Case 1:** There is no impact on R16/R17 criterion of neighboring cell RRM relaxation regardless whether MR serving cell RRM measurement results are available or not, i.e., LR measurement won’t be used for R16/R17 RRM relaxation condition.

OPPO, SS, QC: Agree Case 1.

**Proposal 2: There is no impact on R16/R17 criterion of neighboring cell RRM relaxation regardless whether MR serving cell RRM measurement results are available or not, i.e., LR measurement won’t be used for R16/R17 RRM relaxation condition.**

* **Case 2:** No need to enhance Rel-19 RRM measurement relaxation criterion when the UE exits serving cell offloading.
* **Case 3:** For RRM measurement relaxation, the criteria can be based on LR measurement if MR serving cell measurement results are not available.
* **Case 4**: Supports using LR to evaluate the Rel-16 "not-at-cell-edge" and "low mobility" criteria, and defines the corresponding LR threshold.

Ericsson, IDC: Support Case 4.

LG, vivo, ZTE, QC, Xiaomi: Rel-19 UE should follow Rel-19 criterion. Not support Case 4.

QC: Rel-19 is higher than Rel-16 scaling factor.

No need to further discuss on Case 2,3 and 4.

## 38304-12: FFS the impact on legacy low-mobility criteria for MR with LP-WUS.

Currently, the low mobility criteria for relaxed measurement criterion is based on signalling variations during a timer duration and the reference RSRP for relaxed measurement criterion is set below in TS 38.304:

|  |
| --- |
| 5.2.4.9.1 Relaxed measurement criterion for UE with low mobility  The relaxed measurement criterion for UE with low mobility is fulfilled when:  - (SrxlevRef – Srxlev) < SSearchDeltaP,  Where:  - Srxlev = current Srxlev value of the serving cell (dB).  - SrxlevRef = reference Srxlev value of the serving cell (dB), set as follows:  - After selecting or reselecting a new cell, or  - If (Srxlev - SrxlevRef) > 0, or  - If the relaxed measurement criterion has not been met for TSearchDeltaP:  - The UE shall set the value of SrxlevRef to the current Srxlev value of the serving cell. |

When UE exits fully offloading, the UE turns on the MR and falls back to RRM measurement for serving cell/ neighbouring cell by MR. UE can start the re-evaluation with low mobility criteria for legacy relaxed measurement criterion if configured. Thus, one company proposes the reference RSRP for relaxed measurement criterion should be reset when UE turns on the MR. The following is one possible change:

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| --- |
| 5.2.4.9.1 Relaxed measurement criterion for UE with low mobility The relaxed measurement criterion for UE with low mobility is fulfilled when:  - (SrxlevRef – Srxlev) < SSearchDeltaP,  Where:  - Srxlev = current Srxlev value of the serving cell (dB).  - SrxlevRef = reference Srxlev value of the serving cell (dB), set as follows:  - After selecting or reselecting a new cell or UE turns on MR when exit of case1, or  - If (Srxlev - SrxlevRef) > 0, or  - If the relaxed measurement criterion has not been met for TSearchDeltaP:  - The UE shall set the value of SrxlevRef to the current Srxlev value of the serving cell. |

But one company think it is not required a UE to evaluate the criterion continuously when Rel-16 low mobility criterion is broadcast in system information. Then it is similar that a UE (re)-starts the evaluation of Rel-16 low mobility criterion after camping on a cell for a period. In this case, the UE will update the value of SrxlevRef to the current Srxlev value of the serving cell when the condition “if the relaxed measurement criterion has not been met for TSearchDeltaP” is fulfilled. After the UE exits fully offloading case, the UE may (re)-start the evaluation of Rel-16 low mobility criterion. It is similar to the case that a UE (re)-starts the evaluation of Rel-16 low mobility criterion after camping on a cell for a period. Then the UE will set the value of SrxlevRef to the current Srxlev value of the serving cell when the condition “if the relaxed measurement criterion has not been met for TSearchDeltaP” is fulfilled. Thus, there is no specification impact for Rel-16 low mobility criterion when UE exits using fully offloading.

Therefore, companies are invited to provide their considerations on following questions:

**Q5: Which option is preferred for legacy low mobility criterion when UE exits fully offloading?**

* **Opt1: The reference RSRP for Rel-16 low mobility criterion should be reset when UE exists fully offloading.** (The possible TP is provided above.)
* **Opt2:**  **The case that the UE (re)-starts the evaluation of R16 low mobility criterion after the UE exits fully offloading case is similar to the case that the UE (re)-starts the evaluation of R16 low mobility criterion after camping on a cell for a period. There is no specification impact for Rel-16 low mobility criterion when UE exits fully offloading.**
* **Opt3: Other option if any.**

Discussion:

ZTE: if NW configures both Rel-16 and Rel-19, whether UE will monitor both or either criterion. vivo: can left UE implementation.

vivo, Samsung, Ericsson, IDC: Option2.

**Proposal 3: There is no spec impact that the UE (re)-starts the evaluation of R16 low mobility criterion after the UE exits fully offloading case.**

# Conclusion

Based on the above discussion, the following proposals can be discussed in the CB session.

**Proposal 1: Not support UE low mobility criterion for Rel-19 LP-WUS. One company still has concern on Rel-19 UE cannot use low mobility criterion to save power.**

**Proposal 2: There is no impact on R16/R17 criterion of neighboring cell RRM relaxation regardless whether MR serving cell RRM measurement results are available or not, i.e., LR measurement won’t be used for R16/R17 RRM relaxation condition.**

**Proposal 3: There is no spec impact that the UE (re)-starts the evaluation of R16 low mobility criterion after the UE exits fully offloading case.**