**3GPP TSG-RAN WG2 Meeting #131R2-250xxxx**

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

**Agenda item: 8.4.1**

**Source: CATT**

**Title: Discission of [Post130][211][LPWUS] Running CR for 38.304 (CATT)**

**Document for: Discussion and Decision**

# Introduction

This document is the report of the following discussion:

* [Post130][211][LPWUS] Running CR for 38.304 (CATT)

Intended outcome: Updated and reviewed the CR for endorsement, update the open issue list if needed, can also discuss open issues to form proposals to the next meeting

Deadline: Long

# Discussion

## Easily addressed open issues

### Open issue 38304-1: FFS on the terminology LP-WUS UE

In RAN2#130, we agreed:

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| On UE capabilities* A UE indicating support of LP-WUS reception in IDLE/INACTIVE shall support UE-ID based subgrouping.
* From R2 point of view, RRM measurement relaxation and RRM measurement fully offloading are defined as RAN2 capability without UE capability signalling.
* UE supporting LP-WUS reception shall also support RRM measurement relaxation and RRM measurement fully offloading
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Based on the agreements on UE capabilities, the possible options for the FFS on the terminology LP-WUS UE can be:

* Option A: In the running CR, UE supporting LP-WUS reception is used instead of LP-WUS UE.
* Option B: LP-WUS UE is introduced in clause 3.1 in TS 38.304. E.g. LP-WUS UE: A UE with LP-WUS reception capability as specified in TS 38.306.

Companies are invited to provide their preference.

**Q1: Which option is preferred for the FFS on the terminology LP-WUS UE?**

* **Option A: In the running CR, UE supporting LP-WUS reception is used instead of LP-WUS UE.**
* **Option B: LP-WUS UE is introduced in clause 3.1 in TS 38.304. E.g. LP-WUS UE: A UE with LP-WUS reception capability as specified in TS 38.306.**

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| **Company** | **Preferred option (A or B)** | **Comments** |
| Samsung | A | The LP-WUS function could be viewed as one of the UE behaviors that a Rel-19 UE with the capability could support, rather than requiring the introduction of a new UE type. |
| NEC | B | Using LP-WUS UE is more convenient in the spec, it doesn’t mean this is a new type of UE as long as we give a clear definition on what LP-WUS UE is. |
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**Summary:**

### Open issue 38304-7: higher priority frequency

Open issue 38304-7: Whether Relaxed measurement and offloading measurement can be performed when there is NR inter-frequency and/or NR inter-RAT frequency with reselection priority higher than that of the camped frequency. (Same as the open issue in RRC, i.e., FFS on whether/how RRM relaxation is applicable for high priority frequency)

RAN2 discussed the open issue online without conclusion in RAN2#130.

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| R2-2504623 Remaining issues for LP-WUS RRM ZTE Corporation, Sanechips discussion Rel-19 NR\_LPWUS-Core* Noted

*# existence of higher priority frequency**Proposal 8 RAN2 to discuss which threshold to be applied to RRM relaxation for high priority frequencies**1. Reuse the threshold for lower or equal priority frequency.**2. Reuse Offloading condition.*Discussion- OPPO think we can reuse offloading condition. - vivo point out that in this meeting R4 agree for both case 1 and case 3. - Ericsson fine to follow R4 conclusion and think these only applies when NW configure R19 RRM rlx/offloading. - CATT suggest to take the new agreements from R4 into account in the post meeting email discussions.  |

And in RAN4#115, the agreements on high priority frequency were:

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| * For case 1:
	+ MR is expected to perform relaxed higher priority frequency layer measurement with K2\*Thigher\_priority\_search and K2 = 60
		- Note: RAN4 assumes Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ is always met for case 1.
* For case 3:
	+ When Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, MR is expected to perform relaxed higher priority frequency layer measurement with K2\*Thigher\_priority\_search and K2 = 60
	+ When the condition of Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ is NOT met, the same requirement for higher priority, equal priority and lower priority carriers:
		- 16 times of Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter are applied
 |

According to RAN4 agreement, UE is expected to perform relaxed higher priority frequency layer measurements in both serving cell measurement offloading (i.e., Case 1) and relaxed serving cell/neighbouring cell measurements (i.e., Case 3).

General descriptions of serving cell measurement offloading (i.e., Case 1) and relaxed serving cell/neighbouring cell measurements (i.e., Case 3) have already been captured in 38.304 running CR for LP-WUS, as shown below:

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| 5.2.4.x.1 Relaxed measurement rules for LP-WUS UELP-WUS UE may choose to perform relaxed serving cell and neighbouring cell measurements on MR according to requirements specified in TS 38.133 [8] if the entry condition for measurement relaxation in clause 5.2.4.x.2 is fulfilled.//skip5.2.4.x.3 Serving cell measurement offloading rules for LP-WUS UELP-WUS UE may choose to perform serving cell measurement offloading (i.e., serving cell measurement fully offloaded to LR and no serving cell measurement via MR is required) according to requirements specified in TS 38.133 [8] if the entry condition for serving cell measurement offloading in clause 5.2.4.x.4 is fulfilled. LP-WUS UE is not required to perform serving cell measurement offloading according to requirements specified in TS 38.133 [8] if the exit condition for serving cell measurement offloading in clause 5.2.4.x.4 is fulfilled. |

Rapporteur understands general descriptions covers all cases of neighbouring cell measurements on MR. Considering the relaxed requirements are referred to TS 38.133 directly, we don’t need to specify anything on high priority frequency for serving cell measurement offloading or measurement relaxation with LP-WUS in 38.304 running CR.

**Q2: Do companies agree that nothing is needed on high priority frequency for serving cell measurement offloading or measurement relaxation with LP-WUS in 38.304 running CR? And if it is needed to specify something for high priority frequency in 38.304 running CR, please provide your suggestion.**

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| **Company** | **Yes/No** | **Comments** |
| Samsung | Yes | Nothing is needed. |
| NEC | Yes | We can leave higher priority frequency measurements to RAN4. |
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### Open issue 38304-11: FFS on the determination of RRM measurement relaxation/offloading conditions if UE supports both measurement types

In RAN2#130, it was agreed:

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| * It is up to UE implementation to choose whether SSB measurement based or OOK LP-SS measurement based conditions are used for LP-WUS monitoring entry/exit condition, if UE support both measurement types.
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In RAN2#129bis, it was agreed:

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| * RAN2 assumes for the entry/ exit conditions of serving cell measurement offloading and serving cell RRM measurement relaxation: separate MR thresholds (according to RAN1 agreement)/LR thresholds can be configured for different types of LP WUR if a cell supports both types of LRs (can revisit based on RAN1 and RAN 4 progress, if any).
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Rapporteur wonders if the above agreement in RAN2#130 can be applied to conditions of serving cell measurement offloading and serving cell & neighbouring cell measurement relaxation, i.e. it is up to UE implementation to choose whether SSB measurement based or OOK LP-SS measurement based are used for RRM relaxation/offloading conditions, if UE supports both measurement types. Or do RAN2 need to clarify that the same measurement type is used for conditions of LP-WUS monitoring and RRM relaxation/offloading?

Companies are invited to provide their preference.

**Q3: Which option is preferred if UE support both measurement types?**

* **Option A: Same as LP-WUS monitoring, it is up to UE implementation to choose whether SSB measurement based or OOK LP-SS measurement based are used for RRM relaxation/offloading conditions if UE supports both measurement types.**
* **Option B: It is clarified that the same measurement type is used for conditions of LP-WUS monitoring and RRM relaxation/offloading if UE supports both measurement types.**

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| **Company** | **Preferred option (A or B)** | **Comments** |
| Samsung | A | We prefer A, but don’t have a strong opinion. We are open to aligning with the majority view if it leans toward option B. |
| NEC | No strong view | Both options can work… |
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**Summary:**

## Comments on TS 38.304 running CR

Companies can provide comments and suggestions to the uploaded running CR in this table. Please do not add changes, suggestions, or comments directly to the draft CR document.

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| Company + Issue Number (e.g., C001) | Detailed comments | Rapporteur response |
| SS001 | We suggest discussing the alignment of terminologies in 38.304 with those in RAN1 CRs (38.212 ~ 215). For further discussion, please refer to Section 2.3.4 below. |  |
| SS002 | **- Running CR****7.x.0 General**The UE monitors one LP-WUS occasion per DRX cycle. A LO is a set of LP-WUS monitoring occasions (LP-WUS MOs). In multi-beam operations, the UE assumes that the same LP-WUS is repeated in all transmitted beams and thus the selection of the beam(s) for the reception of the LP-WUS is up to UE implementation.The time location of an LO for UE’s PO is determined by a reference PF and the configured frame-level offset:* The reference PF is the start of the PF, or the first PF of the PF(s) (if mapping of POs from multiple PFs to one LO is supported), associated with the LO. The reference PF for the LO of a PO is provided by (SFN for PF) – floor(*iPO*/*NS*) \* *T*/*N*, where SFN for PF is determined in clause 7.1, *iPO* is defined in clause 10.4C in TS 38.213[4], *T*, *Ns*, and *N* are determined in clause 7.1.
* The frame-level offset between the LO and the reference PF is provided by *lo-Offset* in SIB1.

If single value is configured for *lo-Offset*, and if the gap between the LO and the corresponding PO is no less than the wake-up delay that a UE supports, the UE monitors the LO associated with the offset, otherwise the UE follows the paging monitoring procedure as described in clause 7.1 or 7.2.If more than one values are configured for *lo-Offset*, and if the gap between the LO associated with the largest offset and the corresponding PO is no less than the wake-up delay that a UE supports, the UE monitors the LO associated with the smallest offset value that has a gap between the LO and the PO associated with the offset no less than the wake-up delay, otherwise the UE follows the paging monitoring procedure as described in clause 7.1or 7.2.**- Comment**The details regarding the locations, offsets, and UE behaviors related to LO (LP-WUS Occasion) monitoring are already defined in TS 38.213[4], as follows.

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| **[TS 38.213 CR]**A UE assumes that WUS occasions occur with a periodicity equal to the I-DRX cycle in the RRC\_IDLE/RRC\_INACTIVE state [17, TS 38.304]. The UE determines WUS occasions associated with a paging occasion based on *PO-to-LO association*. A reference frame of a WUS occasion starts a number of frames prior to the first of a number of paging frames associated with the WUS occasion. Each number of frames is provided by *LO-FrameOffsets*. The first WUS monitoring occasion of a WUS occasion starts at an offset provided by *offset\_firstMO\_withinLO* relative to the start of the reference frame. If multiple values for the number of frames provided by *LO-FrameOffsets* are larger than or equal to the value of *XYZ*, the UE monitors WUS starting at a WUS occasion corresponding to the smallest of the multiple values. If all values for the number of frames provided by *LO-FrameOffsets* are smaller than the value of *XYZ*, the UE monitors PDCCH according to Type2-PDCCH CSS sets associated with the paging occasion and does not monitor WUS.A paging occasion associated with a WUS occasion has index $i\_{PO}=\left(\left(UE\\_ID mod N\right)⋅N\_{S}+i\\_s\right) mod N\_{PO}^{WO}$ where $N\_{PO}^{WO}$ is a number of paging occasions associated with a WUS occasion, $N$, $N\_{S}$, $i\_{SG}$, and $i\\_s$ are defined in [17, TS 38.304], and $UE\\_ID$ is defined in clause 7.1 of [17, TS 38.304]. If a number of $N\_{SG}^{PO}$ subgroups per paging occasion, provided by *subgroupNumber-PO-WUS*, is $N\_{SG}^{PO}>1$, the codepoint for the subgroup index $i\_{SG}$ in a PO $i\_{PO}$ is$ i\_{PO}\*\left(N\_{SG}^{PO}+1\right)+i\_{SG}$, and the codepoint for all subgroups in the PO is$ (i\_{PO}+1)\*\left(N\_{SG}^{PO}+1\right)-1$; otherwise, the codepoint for the PO $i\_{PO}$ is$ i\_{PO}.$ |

Therefore, we could consider avoiding redundancy by not redefining these aspects here in 38.304.**- Suggestion**What if we simplify the text as follows:“The UE monitors one LP-WUS occasion per DRX cycle. A LO is a set of LP-WUS monitoring occasions (LP-WUS MOs) and is defined in clause 10.4C in TS 38.213[4]. In multi-beam operations, the UE assumes that the same LP-WUS is repeated in all transmitted beams and thus the selection of the beam(s) for the reception of the LP-WUS is up to UE implementation.” |  |
|  NEC (W001) |  7.x LP-WUS monitoring7.x.0 GeneralIf the UE detects LP-WUS and the LP-WUS is associated with the UE as specified in clause 10.xx in TS 38.213 [4], the UE monitors the associated PO as specified in clause 7.1 or monitors PEI as specified in clause 7.2, which is up to UE implementation if PEI is supported and related configuration is provided in system information. If UE does not detect a LP-WUS on the monitored LP-WUS occasion (LO) or the LP-WUS is not associated with the UE as specified in clause 10.xx in TS 38.213 [4], the UE is not required to monitor the associated PO as specified in clause 7.1. **Comment: when we look at RAN1 spec, the similar wording is used:**10.4C PDCCH monitoring activation by WUS in RRC\_IDLE/RRC\_INACTIVEA paging occasion associated with a WUS occasion has index $i\_{PO}=\left(\left(UE\\_ID mod N\right)⋅N\_{S}+i\\_s\right) mod N\_{PO}^{WO}$ where $N\_{PO}^{WO}$ is a number of paging occasions associated with a WUS occasion, $N$, $N\_{S}$, $i\_{SG}$, and $i\\_s$ are defined in [17, TS 38.304], and $UE\\_ID$ is defined in clause 7.1 of [17, TS 38.304]. If a number of $N\_{SG}^{PO}$ subgroups per paging occasion, provided by *subgroupNumber-PO-WUS*, is $N\_{SG}^{PO}>1$, the codepoint for the subgroup index $i\_{SG}$ in a PO $i\_{PO}$ is$ i\_{PO}\*\left(N\_{SG}^{PO}+1\right)+i\_{SG}$, and the codepoint for all subgroups in the PO is$ (i\_{PO}+1)\*\left(N\_{SG}^{PO}+1\right)-1$; otherwise, the codepoint for the PO $i\_{PO}$ is$ i\_{PO}.$If, in a WUS monitoring occasion, a UE determines a codepoint associated with the UE [17, TS 38.304], the UE performs PDCCH monitoring according to Type2-PDCCH CSS sets for the paging occasion associated with the WUS monitoring occasion when a time from the end of the WUS reception to the start of the PDCCH monitoring occasion is not smaller than the value of *XYZ*; otherwise, the UE is not required to perform the PDCCH monitoring. The UE may also perform PDCCH monitoring for Type2A-PDCCH CSS sets for DCI format 2\_7, if provided. **Comment: both RAN1 and RAN2 use the wording “associated” but not mention how to map to subgroup, it is a little** **ambiguous. Therefore, we suggest RAN2 to modify the spec as below:**If the UE detects LP-WUS and the LP-WUS is associated with the subgroup the UE belongs to or is associated with all subgroups as specified in clause 10.4C in TS 38.213 [4], the UE monitors the associated PO as specified in clause 7.1 or monitors PEI as specified in clause 7.2, which is up to UE implementation if PEI is supported and related configuration is provided in system information. If UE does not detect a LP-WUS on the monitored LP-WUS occasion (LO) or the LP-WUS is not associated with the subgroup the UE belongs to and is not associated with all subgroups as specified in clause 10.4C in TS 38.213 [4], the UE is not required to monitor the associated PO as specified in clause 7.1.  |  |
| NEC (W002) | 7.y.2 UE\_ID based subgrouping for LP-WUSSubgroupID = (floor(UE\_ID/(N\*Ns\*Np)) mod lp-SubgroupsNumForUEID) + (lp-SubgroupsNumPerPO – lp-SubgroupsNumForUEID),where:Np is the number of *subgroupsNumForUEID* for PEI, if configured and UE supports PEI; otherwise, Np is 1lp-SubgroupsNumForUEID and lp-SubgroupsNumPerPO are the subgroup number for UE\_ID based subgrouping for LP-WUS and the total subgroup number for LP-WUS, respectively**Comment: no strong view, but think this is broadcast signalling. It would be better to modify as below (similar to the PEI description):**Np is the number of *subgroupsNumForUEID* for PEI, if broadcasted in system information and UE supports PEI; otherwise, Np is 1 |  |
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## Open issue list

### Closed open issue

**RRM relaxation/offloading**

Open issue 38304-4: FFS relaxed measurement criteria/RRM offloading criteria is different from LP-WUS monitoring criteria. (Same as the open issue in RRC, i.e., FFS on whether/how to reduce the threshold number for LP-WUS/WUR)

**LP-WUS in idle/inactive mode**

Open issue 38304-5: FFS the UEs expecting MBS group notification should monitor its PO to receive the MBS group notification regardless of LP-WUS.

### Remaining open issues on LP-WUS in idle/inactive mode

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| **Index** | **Issue description** | **Rapporteur suggestion** |
| 38304-8 | Whether LP-WUS is only used in the last used cell or in any cell | **Issue Type:** not essential not important**How to address it:** can be discussed based on companies’ contribution |
| 38304-9 | FFS the SubgroupID for LP-WUS used outside CN PTW in RRC\_INACTIVE state with CN configured PTWNote: the open issue was discussed online in RAN2#130 (R2-2504677) without conclusion. | **Issue Type:** not essential not important**How to address it:** can be discussed based on companies’ contribution |
| 38304-10 | FFS whether/how LP-WUS with SDT is supportedNote: the open issue was discussed online in RAN2#130 (R2-2504264) without conclusion. | **Issue Type:** not essential not important**How to address it:** can be discussed based on companies’ contribution |

### Remaining open issues on RRM relaxation/offloading

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| **Index** | **Issue description** | **Rapporteur suggestion** |
| 38304-1 | FFS on the terminology LP-WUS UE | **Issue Type:** not essential not important**How to address it:** can be discussed in clause 2.1 as an easily addressed open issue. |
| 38304-2 | FFS (if needed) on enhancements based on R16 criteria (e.g., based on the LR measurements) for the case when MR serving cell measurement results are not available. | **Issue Type:** not essential not important**How to address it:** can be discussed based on companies’ contribution |
| 38304-3 | FFS on exit condition for serving cell RRM relaxation, e.g., whether a separate exit condition other than ‘not fulfilling the entry condition’ is needed, or whether exit condition include MR and/or LR-based measurements. (Same as the open issue in RRC, i.e., FFS on exit condition for serving cell RRM relaxation) | **Issue Type:** not essential but important**How to address it:** can be discussed based on companies’ contribution |
| 38304-6 | Whether UE low mobility criterion or stationary criterion should be considered for RRM relaxation/offloading. (Same as the open issue in RRC, i.e., FFS on low mobility criteria) | **Issue Type:** not essential not important**How to address it:** can be discussed based on companies’ contribution |
| 38304-7 | Whether Relaxed measurement and offloading measurement can be performed when there is NR inter-frequency and/or NR inter-RAT frequency with reselection priority higher than that of the camped frequency. (Same as the open issue in RRC, i.e., FFS on whether/how RRM relaxation is applicable for high priority frequency) | **Issue Type:** not essential but important**How to address it:** can be discussed in clause 2.1 as an easily addressed open issue. |
| 38304-11 | FFS on the determination of RRM measurement relaxation/offloading conditions if UE supports both measurement types | **Issue Type:** not essential not important**How to address it:** can be discussed in clause 2.1 as an easily addressed open issue |

### Other open issues

In addition to the above open issues, please provide your comments on any other RAN2 open issues of 38.304 running CR for LP-WUS, and Rapporteur will response.

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| **Company** | **Open issue** | **Rapporteur response** |
| Samsung | **Whether/ How to align terminologies among WGs.**Now RAN1 has finalized the LP-WUS CRs in 38.212, 213, 214, and 215 with using the following terminologies:* LPSS Low power synchronization signal
* WUS Wake-Up Signal
* WUR Wake-Up Receiver

Additionally, the LS R1-2504888 from RAN1 explicitly states that RAN1 does not intend to specify LR or MR in Release 19. As far as we understand, RAN1 views the LP-WUS function as a sub-functional UE behavior that a Rel-19 UE with the capability could support, rather than introducing a significant burden, such as defining a new LP-RAT. Therefore, they are reluctant to explicitly distinguish LR and MR.Based on this context, we suggest discussing the following proposals: **P1. Whether to align the terminologies among TSs/WGs.**If the answer of P1 is yes, we propose:**P2. Modify the following terminologies (Straightforward changes)*** **LP-WUS → WUS**
* **LP-SS → LPSS**
* **LO (LP-WUS Occasion) → WUS Occasion.**

**P3. Discuss how to modify/remove the LR and MR.** As an example, we could consider the following changes: * **LR → WUR**
* **MR → removed**

**P4. Modify parameter names such as:** * **Q\_rxlevmeas\_lr →  Q\_rxlevmeas\_wur**
* **based on LR → based on WUR**
* **lpxxx → wurxx**
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**Summary:**

# Conclusion

According to feedback on clause 2.1, we propose:

And the following stage 3 open issues of 38.304 running CR for LP-WUS are identified: