**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:

|  |
| --- |
| 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
 |

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.**

|  |  |  |
| --- | --- | --- |
| **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. |
| Vivo | A | Totally agree with Samsung. LP-WUS/WUR is a Rel-19 feature. Usually, we only specify the UE supporting xx feature, but not xx UE, which looks like a new UE type. We should avoid such potential mis-understanding. Besides, RAN1 has sent an LS to RAN2 in last meeting. One intention is 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. |
| Huawei/HiSilicon | Please see comment | We favour Option A but think the wording needs modification. May be “UE can use LP-WUS”? (Our intention is to say that UE supports LP-WUS and the camped cell configures LP-WUS).  |
| Lenovo | B | Once a clear definition is included in clause 3.1 for the terminology of LP-WUS UE, it can be used in the spec for simplicity. |
| OPPO | A | Option A is clearer as LP-WUS is a new optional feature with UE capability rather than a new UE type. |
| Ericsson | A, see comments | No strong view, i.e. both can work. For option A prefer to shorten to “**UE supporting LP-WUS**”.  |
| DOCOMO | A | Share similar views with Samsung and vivo. It is better to avoid misunderstanding as a new UE type by Option B. For Option A, we think alignment of terminology is necessary depending on the outcome from the on-going post email discussion titled “[Post130][210][LPWUS] Running CR for 38.331”. It is discussed whether to algin the terminologies related to LP-WUS among specs. |
| Xiaomi | A | Similar as PEI, we can use “UE supporting LP-WUS” |
| Qualcomm | A | Agree with Samsung. |
| Apple | A | Agree with Samsung that LP-WUS is a new UE feature but not a new device type. |
| ZTE | A |  |
|  |  |  |

**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.

|  |
| --- |
| 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:

|  |
| --- |
| * 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:

|  |
| --- |
| 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.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Samsung | Yes | Nothing is needed. |
| NEC | Yes | We can leave higher priority frequency measurements to RAN4. |
| vivo | See comment | Yes by now. We agree with Rapporteur the corresponding relaxation requirements need to be captured in TS 38.133. It seems nothing is needed in TS 38.304 **if the corresponding higher priority frequency relaxation has been captured in RAN4 specifications**. With this, we think there is no need to have any proposal/conclusion on this part for safety. Let’s review the RAN2/RAN4 specification to check whether anything is missing.  |
| Huawei/HiSilicon |  | Agree with Vivo |
| Lenovo | Yes | Refer to follow spec TS28.133 is enough. |
| OPPO | Yes | The measurement for higher priority frequency can rely on RAN4 spec. In current spec, it is specified that the measurement for higher priority frequency is according to TS38.133:- For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency, the UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8]. |
| Ericsson | Yes, see comment | We agree with the principle, but we need to check how/what RAN4 has captured in 38.133.  |
| DOCOMO |  | Agree with vivo and Huawei. |
| Xiaomi | See comments | Agree with Ericsson that the principle can be agreed. However, we still need to pay attention to the details to make sure that RAN2 and RAN4 are not having conflictions with each other on UE’s behaviors.An example is in current TS 38.304:5.2.4.2 Measurement rules for cell re-selectionFollowing rules are used by the UE to limit needed measurements:- If the serving cell fulfils Srxlev> SIntraSearchP and Squal > SIntraSearchQ:…UE may not perform intra-frequency measurements.- For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency, the UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8].- For a NR inter-frequency with an equal or lower reselection priority than the reselection priority of the current NR frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current NR frequency:- If the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ:…the UE may choose not to perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority;As agreed in RAN4, for case3, if if When Srxlev > SIntraSearchP and Squal > SIntraSearchQ in case3, UE should perform relaxed higher priority frequency layer measurement with K2\*Thigher\_priority\_search and K2 = 60 which is different from what captured above. Then, for serving cell, and low and equal priority frequency layer, we can still wait for RAN4’s output and make sure the behaviors in RAN2 and RAN4 are aligned. |
| Qualcomm | Yes | Agree with Vivo |
| Apple | Yes | Agree with companies that RAN2 can assume there is no need to capture the HP priority relaxation and leave it to RAN4.  |
| ZTE | Yes | Refer to RAN4 description(e.g. according to requirements specified in TS 38.133 [8]) is enough. |

### 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:

|  |
| --- |
| * 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.
 |

In RAN2#129bis, it was agreed:

|  |
| --- |
| * 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).
 |

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.**

|  |  |  |
| --- | --- | --- |
| **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… |
| vivo | A | LP-WUS monitoring and RRM relaxation are two separate features for UE supporting LP-WUS/WUR. Reasonable UE behaviour should choose the same RS type measurement for LP-WUS monitoring and RRM relaxation. Considering it is up to UE implementation to choose which RS type measurement is used for RRM relaxation, we should apply the same principle for LP-WUS monitoring.  |
| Huawei/HiSilicon | A |  |
| Lenovo | A | Prefer to follow the principle as agreed for LP-WUS monitoring, can be left to UE implementation. |
| OPPO | A | We can use the same principle for LP-WUS monitoring. Leave it up to UE implementation to determine. |
| Ericsson | A |  |
| DOCOMO | A |  |
| Xiaomi | A |  |
| Qualcomm | A |  |
| Apple | A |  |
| ZTE | A |  |
|  |  |  |

**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.

|  |  |  |
| --- | --- | --- |
| 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.

|  |
| --- |
| **[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. **[Xiaomi]We think RAN2 can keep the spec as it is and RAN1 will define the code pionts that UE is required to monitor.** |  |
| 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 |  |
| Vivo (v001) | Proposed change:- LP-WUS UE may perform further relaxed serving cell and neighbouring cell measurement on MR as specified in clause 5.2.4.x.1 or serving cell measurement offloading from MR to LR as specified in clause 5.2.4.x.3.**Reason**: “further perform” may be mis-interpreted as LP-WUS UE should first perform legacy relaxation and further perform Rel-19 relaxation. The trueth is LP-WUS could perform either legacy relaxation (as in legacy) or Rel-19 further relaxation defined in RAN4.  |  |
| Vivo (v002) | 5.2.4.x Relaxed measurement and measurement offloading for LP-WUS UE**Reason**: to keep the consistent with below description. |  |
| Vivo (v003) | 5.2.4.x.1 Relaxed measurement rules 5.2.4.x.2 Relaxed measurement criterion 5.2.4.x.3 Serving cell measurement offloading rules 5.2.4.x.4 Serving cell measurement offloading criterion **Reason:** as it is already mentioned “the LP-WUS UE” in title of 5.2.4.x |  |
|  |  |  |
| Vivo (V004) | **7.x.0 General**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 configured), 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 *lpwus-LoOffset* in SIB1.

**Comment:** The “reference PF” is not aligned with current RRC CR (from RAN1 RRC parameters), it should be “reference PF/PO” or “reference point”.**Reason:** to align with RRC. |  |
| Vivo (v005) | 7.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 if PEI is supported and related configuration is provided in system information, which is up to UE implementation. 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.  |  |
| Vivo (v006) | 7.x.1These thresholds can be configured separately for LR measurments based on LP-SS and LR measurements based on SSB if a cell supports both measurement types as specified in TS 38.331 [3]. If UE supports both measurement types, it is up to UE implementation to choose whether LR measurments are based on LP-SS or based on SSB for the determination of the LP-WUS monitoring entry/exit conditions.Comments: this sentence should be moved after exit condition, as it is also applied to exit condition.  |  |
| Vivo (v007) | 7.x.1 Condition for LP-WUS monitoringThe entry condition for LP-WUS monitoring is fulfilled when:- Srxlev > SLP\_WUS\_EntryThresholdP\_MR, and, - Qrxlevmeas\_lr > QLP\_WUS\_EntryThresholdP\_LR, if QLP\_WUS\_EntryThresholdP\_LR is configured, and,- Squal > SLP\_WUS\_EntryThresholdQ\_MR, if SLP\_WUS\_EntryThresholdQ\_MR is configured, and- Qqualmeas\_lr > QLP\_WUS\_EntryThresholdQ\_LR, if QLP\_WUS\_EntryThresholdQ\_LR is configured.The exit condition for LP-WUS monitoring is fulfilled when:- Qrxlevmeas\_lr < QLP\_WUS\_ExitThresholdP\_LR or,- Qqualmeas\_lr < QLP\_WUS\_ExitThresholdQ\_LR, if QLP\_WUS\_ExitThresholdQ\_LR is configured.Where:**Reason:** to keep the consistent with other places.  |  |
| Vivo (v008) | 7.y.1 CN assigned subgrouping 7.y.2 UE\_ID based subgrouping**Reason**: as it is already mentioned “for LP-WUS” in title of 7.y. similar to what captured in 7.3 |  |
| HW (001) | “- LP-WUS UE may further perform relaxed serving cell and neighbouring cell measurement on MR as specified in clause 5.2.4.x.1 or serving cell measurement offloading from MR to LR as specified in clause 5.2.4.x.3.”**Editorial:** “measurement” to “measurements” |  |
| HW (002) | 5.2.4.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.**Proposed change (editorial):** ((i.e., serving cell measurement is fully offloaded to LR and no serving cell measurement via MR is required)) |  |
| HW (003) | 5.2.4.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.**Proposed change:** “LP-WUS UE ~~is not required to perform~~ should exit serving cell measurement offloading .....” |  |
| HW (004) | 7.x.0 GeneralThe UE may monitor LP-WUS in RRC\_IDLE and RRC\_INACTIVE states in order to reduce power consumption. If LP-WUS configuration is provided in system information, the UE in RRC\_IDLE or RRC\_INACTIVE state supporting LP-WUS (except for the UEs expecting MBS group notification) may start LP-WUS monitoring using LP-WUS parameters in system information according to the procedure described below if the entry condition in clause 7.x.1 is fulfilled. The UE may stop LP-WUS monitoring if the exit condition in clause 7.x.1 is fulfilled.If 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. 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.Proposed changes (editorial): 1. “If the UE does not detect a LP-WUS on the monitored LP-WUS occasion (LO)”
2. “The UE monitors one ~~LP-WUS occasion~~ LO per DRX cycle” (motivation: as LO is already mentioned in the above paragraph)
 |  |
| HW (005) | 7.x.0 General“If more than one values are configured for *lo-Offset*, and if the gap between the LO associated with the largest offset”Editorial: “one value is” |  |
| Len001 | 5.2.4.9.x Relaxed measurement criterion for LP-WUS UE……..Editor’s NOTE: The detailed parameters for RRM measurement relaxation for LP-WUS will be aligned with RRC specification.~~Editor’s NOTE: FFS for the metrics of serving cell RRM relaxation (i.e. RSRP and/or RSRQ).~~~~Editor’s NOTE: FFS serving cell quality by MR is existing Srxlev/ Squal or Q~~~~rxlevmeas~~~~/ Q~~~~qualmeas~~ ~~(i.e. measured value).~~~~Editor’s NOTE: FFS serving cell quality by LR is measured value.~~Editor’s NOTE: 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.~~Editor’s NOTE: FFS if the entry condition for serving cell RRM measurement relaxation is the same as neighbour cell RRM measurement relaxation.~~Editor’s NOTE: FFS whether/how to capture separate thresholds for different UE types (to be aligned with RRC specification).~~Editor’s NOTE: FFS relaxed measurement criteria is different from LP-WUS monitoring entry criteria.~~5.2.4.9.z Serving cell measurement oOffloading measurement criterion for LP-WUS UE……Editor’s NOTE: The detailed parameters for RRMserving cell measurement offloading will be aligned with RRC specification.~~Editor’s NOTE: FFS for the metrics of serving cellRRM measurement offloading.~~~~Editor’s NOTE: FFS serving cell quality by MR is existing Srxlev or Q~~~~rxlevmeas~~ ~~(i.e. measured value).~~~~Editor’s NOTE: FFS serving cell quality by LR is measured value.~~Editor’s NOTE: FFS whether/how to capture separate thresholds for different UE types (to be aligned with RRC specification).Comments: Above FFS note with strikethrough can be removed and replaced by corresponding RAN2 agreements. |  |
| Len 002 | 5.2.4.9.y Serving cell ~~o~~Offloading measurement rulesLP-WUS UE may choose to perform RRM 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 RRM ~~measurement~~serving cell measurement offloading in clause 5.2.4.9.z is fulfilled. LP-WUS UE is not allowed required to perform serving cell~~RRM~~ measurement offloading according to requirements specified in TS 38.133 [8] if the exit condition for serving cell~~RRM~~ measurement offloading in clause 5.2.4.9.z is fulfilled.5.2.4.9.z Serving cell measurement ~~o~~Offloading measurement criterion for LP-WUS UEThe entry condition for MR ~~RRM~~ serving cell RRM measure~~re~~ment offloading is fulfilled when:……Comments: Fixed wording issues. For 5,2,4,9.z added MR to align with 5.2.4.9. x |  |
| OPPO001 | - Qrxlevmeas\_lr = current measured cell RX level value of the serving cell based on LR (RSRP).- Qqualmeas\_lr = current measured cell quality value of the serving cell based on LR (RSRQ).Comment: Since these two parameters are measured by LR, maybe we need to use LR-RSRP and LR-RSRQ to avoid the confusion.  |  |
| ERI001 | The UE shall stop LP-WUS monitoring if the exit condition in clause 7.x.1 is fulfilled. |  |
| ERI002 | PEI is always monitored **after** LP-WUS?… If 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,The PEI occasion can be configured before the LP-WUS occasion?: pei-FrameOffset-r17 INTEGER (0..16), lpwus-LoFrameOffsetList-r19 SEQUENCE { offsetForLongerWakeUpDelay-r19 SEQUENCE (SIZE (1..8)) OF INTEGER (8..200) OPTIONAL, -- Need R offsetForShorterWakeUpDelay-r19 SEQUENCE (SIZE (1..8)) OF INTEGER (8..200) OPTIONAL -- Need R |  |
| ERI003 | It is good to capture in 38.304 that in case the UE is not able to monitor the LO then the UE monitors the PO (e.g. during cell reselection) which is not captured in 38.213:If the UE is unable to monitor the LP-WUS occasion corresponding to its PO, e.g. during cell re-selection, the UE monitors the associated PO according to clause 7.1. |  |
| ERI004 | When the UE uses the same i\_s in RRC\_IDLE and RRC\_INACTIVE, then the UE shall use the ipo for RRC\_IDLE: $$i\_{PO}=\left(\left(UE\\_ID mod N\right)⋅N\_{S}+i\\_s\right) mod N\_{PO}^{WO}$$*N* is different in RRC\_IDLE and RRC\_INACTIVE when the used DRX cycle in RRC\_IDLE and RRC\_INACTIVE is different. The UE has to use the same ipo otherwise there can be problems with RRC state mismatch ([R2-2213049](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_120/Docs//R2-2213049.zip)), i.e. the UE should use the same subgroup ID in RRC\_IDLE and RRC\_INACTIVE: In RRC\_INACTIVE state, when the UE uses the same i­\_sas for RRC\_IDLE state as specified in clause 7.1, the UE shall use the same *iPO* as for RRC\_IDLE state. Otherwise, the UE determines the *iPO* based on the formula defined in clause 10.4c in TS 38.213 [4]. |  |
| ERI005 | Editorials and wording:“if PEI is supported and PEI configuration is provided in system information”“an LP-WUS”“An LO”“PF or PFs if mapping of POs from multiple PFs to one LO is supported”“If LP-WUS and subgrouping are configured, UEs monitoring the same PO can be divided into one or more subgroups” |  |
| A001 | Section 5.2.4.2 Measurement rules for cell re-selectionThe following bullet is proposed to be updated:Current version- LP-WUS UE may further perform relaxed serving cell and neighbouring cell measurement on MR as specified in clause 5.2.4.x.1 or serving cell measurement offloading from MR to LR as specified in clause 5.2.4.x.3.Suggested TP:- If the UE supports LP-WUS reception and *relaxedMeasurementForServingAndNeighboringCell* is present in *SIB2*, the UE may further relax the needed serving cell and neighbouring cell measurement on MR as specified in clause 5.2.4.x.1.- If the UE supports LP-WUS reception and *offloadMeasurementForServingCell* is present in *SIB2*, the UE may further offload the serving cell measurement from MR to LR as specified in clause 5.2.4.x.3. |  |
| ZTE01 | Section 7.y.1 CN assigned subgrouping for LP-WUS“a subgroup ID (between 1 to 31)” should be “a subgroup ID (between 0 to 30)”, because the subgroup ID should start from 0, otherwise, the formula for UEID based subgroup ID should be updated. And the maximal value(e.g. 31) is reserved in RAN1 for other use.Suggest to change to:7.y.1 CN assigned subgrouping for LP-WUSLP-WUS with CN assigned subgrouping is used in the cell which supports CN assigned subgrouping for LP-WUS, as described in clause 7.y.0. A UE supporting CN assigned subgrouping for LP-WUS in RRC\_IDLE or RRC\_INACTIVE state can be assigned a subgroup ID (between 0 to 30) by AMF through NAS signalling. The UE belonging to the assigned subgroup ID monitors its associated LP-WUS as specified in clause 7.x. |  |
| ZTE02 | Section 7.x.0 GeneralIf the LP-WUS monitoring condition is met, LP-WUS UE shall monitor LP-WUS. “may start LP-WUS monitoring” is not accurate.Suggest to change to:7.x.0 GeneralThe UE may monitor LP-WUS in RRC\_IDLE and RRC\_INACTIVE states in order to reduce power consumption. If LP-WUS configuration is provided in system information, the UE in RRC\_IDLE or RRC\_INACTIVE state supporting LP-WUS (except for the UEs expecting MBS group notification) monitors LP-WUS using LP-WUS parameters in system information according to the procedure described below if the entry condition in clause 7.x.1 is fulfilled. The UE may stop LP-WUS monitoring if the exit condition in clause 7.x.1 is fulfilled. |  |
| ZTE03 | Section 7.x.0 GeneralThe gap between the LO and the corresponding PO should be clarified.Suggest to change to:7.x.0 General...If single value is configured for *lo-Offset*, and if the gap between the LO and the corresponding PO(i.e. the gap between the end of the last LP-WUS MO the UE monitors in the LO and the start of the 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.... |  |
| ZTE04 | Section 7.x.0 GeneralIf more than one values are configured for lo-Offset, multiple lo-Offset should be used to determine whether the gap between the LO and the corresponding PO is less than the wake-up delay that a UE supports. And the gap(not the offset ) should be used to compare with the wake-up delay.Suggest to change to:7.x.0 General...If more than one values are configured for *lo-Offset*, and if the gap between the LO associated with at least one *lo-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 *lo-Offset* value with which the gap between the LO and the corresponding PO is no less than the wake-up delay, otherwise the UE follows the paging monitoring procedure as described in clause 7.1 or 7.2.... |  |
| ZTE05 | Section 7.x.0 GeneralIf UE monitors LP-WU but does not detect a LP-WUS or the LP-WUS is not associated with the UE, the UE is not required to monitor the associated PO as specified in clause 7.1 and PEI as specified in clause 7.2. Suggest to change to:7.x.0 General...If 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 the 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 7.1and PEI as specified in clause 7.2. ... |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## 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

|  |  |  |
| --- | --- | --- |
| **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

|  |  |  |
| --- | --- | --- |
| **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.

|  |  |  |
| --- | --- | --- |
| **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**
* …
 |  |
| Xiaomi-001 | The impact on legacy low-mobility criteria for MR need to be considered.An example is:For case1, when UE exits using fully offload, the UE turn on the MR. UE can start the re-evaluation for low mobility criteria for legacy relaxed measurement criterion if configured. For such case, we need to add such case for setting the reference Srxlev value as shown below.5.2.4.9.1 Relaxed measurement criterion for UE with low mobilityThe 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. |  |
| Xiaomi 002 | Impact on EMR is not discussed.Similar as PEI, UE does not transit to fully offload/ partial offload relaxing measurements when EMR is configured. |  |
| Xiaomi-003 | As agreed, if the gap between an LO and the PO associated with the offset is no less than the wake -up delay a UE supports, the UE monitors the PO associated with the offset after receiving a wake-up indication in a LP-WUS. There are 3 cases:For case1, MR wake up before PEI, and UE can monitor LP-WUS and PEI.For case2, MR wake up after PEI, and UE can monitor LP-WUS but will miss PEI.In current spec, we have captured that “If the UE is unable to monitor the PEI occasion (i.e. all valid PDCCH MO for PEI) corresponding to its PO, e.g. during cell re-selection, the UE monitors the associated PO according to clause 7.1.”We think such case should be considered as invalid PDCCH MO for PEI. |  |
| ERI-001 | When the configured time offset is shorter than the minimum gap needed by the UE, then the UE cannot monitor LP-WUS. Configuring two time offsets per PO increases the number of LP-WUS transmissions. But when the configured offset is not suitable for the UE than the UE should be allowed to use the LP-WUS occasion associated with the PO to the “left” of the UE’s PO. There is no need to configure a second time offset. But it can be discussed further if the second offset can match the LP-WUS occasion associated with the PO to the “left” of the UE’s PO. We think it is not a good design when different wake-up times are supported, but this may imply that the UE cannot monitor LP-WUS.  |  |
|  |  |  |
|  |  |  |

**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: