**3GPP TSG RAN Meeting #102 RP-23XXXX**

**Edinburgh, Scotland, December 11-15, 2023**

## Status Report to TSG

**Agenda item:** 9.2.5

|  |  |
| --- | --- |
| **WI / SI Name** | Study on low-power Wake-up Signal and Receiver for NR |
| included in this status report | Study Item: Yes | Core part: No | Performance part:No | Testing part:No |
| **Acronym** | FS\_NR\_LPWUS |
| **Unique ID** | 940085 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-232674 |
| **Target Completion Date****(indicate if changed)** | Study Item: 12/2023 |  |  |  |
| **Overall Completion level** | Study Item: 100% |  |  |  |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | RAN 1 |
| **Rapporteur** | **Name** | Xueming Pan |
| **Company** | vivo |
| **Email** | panxueming@vivo.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

None. RAN1 study completed.

#### 2.1.2 Remaining Open issues

None. RAN1 study completed.

## 2.2 RAN2

#### 2.2.1 Agreements

RAN2#123bis

* RAN2 assumes that the Intention with LP-WUS indication in connected is to trigger MR PDCCH monitoring.
* Option 1: to relate LP-WUS with DRX: Network can configure LP-WUS outside MR DRX active time. In that case, LP-WUS can trigger MR PDCCH monitoring to start procedures related to DRX timer(s). FFS which timer and whether/how it may co-exist with R16 DCP.
* UL transmission by MR also triggers PDCCH monitoring by MR.
* Option 2: to have LP-WUS transparent to current MAC operation (might not have impact to MAC)
* Capture the LP-WUS using option that LP-WUS has similar functionality as Rel-16 DCP in TR.
* Capture the LP-WUS using option that LP-WUS could be used at any time outside DRX active time to indicate UE to enter into active time in TR.
* FFS whether to capture the LP-WUS using option that LP-WUS could be used after the beginning of drx-onDurationTimer in TR.
* Capture the LP-WUS using option that LP-WUS could be used when C-DRX is not configured in TR and FFS the detail.
* FFS whether it is possible that LP-WUS and DCP are configured for a UE and UE use only one of them at any time e.g. depend on network configuration or link quality.
* FFS whether LP-WUS could be used in conjunction with DCP.
* Capture the pros/cons and RAN2 impacts for duty cycle and continuous mode for LP-WUS in TR.

RAN2#124

* SI is complete from R2 perspective
* RAN2 think during the SI, no blockers have been found for the continued work, the main / most obvious potential technical solution / consequences / alternatives are described in the TR, but as necessary L1 assumptions has not yet need established, and the Time allocation has been limited, the RAN2 study had little possibility to make detailed solution choices or exhaustively include all aspects. RAN2 understands that such remaining aspects are on such level that they can be handled during normal execution of a WI.

|  |
| --- |
| For RRC\_IDLE/INACTIVE mode:* RAN2 has studied the procedure where network configures LR for LP-WUS monitoring and concluded that LP-WUS to control paging/PEI monitoring with no UE reporting of WUS coverage status or change is feasible. Details are to be decided in WI phase.
	+ RAN2 has studied and concluded to support subgrouping for LP-WUS, detailed design depends on the payload of LP-WUS.
	+ RAN2 has studied the entry and exit condition of using LP-WUS, and concluded the condition(s) could be at least based on the measurement on at least serving cell quality using LR and/or MR.
	+ RAN2 has studied LP-WUS configuration, at least via system information broadcast. Further wording during TR draft.
	+ RAN2 has studied and concluded the feasibility for RRM measurement relaxation (including no measurement) for serving cell by MR and neighboring cell by MR at least if RRM measurement on LR for serving cell is feasible/supported. Details are to be decided in WI.

For RRC\_CONNECTED mode* RAN2 has studied the procedure where network control/configure/activate LR for LP-WUS monitoring, and concluded the feasibility for LP-WUS to control PDCCH monitoring by MR with / without C-DRX. Detailed design is to be decided in WI.

Note: Both duty cycled and/or continuous monitoring for LP-WUS could be further discussed in WI phase for RRC\_IDLE/INACTIVE and RRC\_CONNECTED mode.  |

* TP above is agreed.
* The network Need not to be aware of whether the UE is monitoring LP-WUS or not in IDLE/INACTIVE.
* Regarding how to receive SI change notification and/or ETWS/CMAS when UE is using LP-WUS, Alt 1 is the basline, other alternatives needs further justification and may dep on the payload capacity of LP-WUS is

Alt 1: based on legacy indication in short message/paging, i.e. waking UE up by LP-WUS, and receiving the notification of SI change or ETWS/CMAS as in legacy.

* Capture all the below solution(s) on LP-WUS in Connected mode, configured/used together with Rel-16 DCP in the TR, and continue to discuss the details in WI.

Solution 1: Both LP-WUS and DCP can be configured for a UE. However, UE may use only one of them at any time, e.g. depend on network configuration or link quality, etc.

Solution 2: LP-WUS is used in conjunction with DCP, e.g. LP-WUS first wakes up MR, which then monitors DCP.

* The impact on configured resources in connected mode with LP-WUS if any can be discussed in WI (e.g. SPS CG)

#### 2.2.2 Remaining Open issues

None. RAN2 study completed.

## 2.3 RAN3

#### 2.3.1 Agreements

#### 2.3.2 Remaining Open issues

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4 #108bis RF and RRM**

**RF part**

**Issue 1-1-1: Updated number of guard RBs for LP-WUS ACS**

***Agreements:***

* Capture simulations results contributed this meeting as company input to TR.
* Keep current agreement in reply LS as it is and add a sub-bullet to say that the required guard RBs might be updated/confirmed next meeting based on data considering additional/combined RF impairments, if needed.

**Issue 1-1-2: Updated number of guard RBs for LP-WUS ASCS**

***Agreements:***

* Update the required number of guard RBs for ASCS to 0RB~1RB for 30kHz SCS, capture in TR as RAN4 evaluation outcome.

**Issue 1-2-1: Guard RBs placement for LP-WUS ACS case**

***Agreements:***

* For ASCS, the guard RBs belongs to “WUS carrier”, the overall RBs should within “WUS carrier” bandwidth.
* For ACS,
	+ Option 1: the required RBs are RB offset between WUS carrier bandwidth edge and channel edge,
		- RBs within the offset may not be blanked.
		- Guard RBs within WUS carrier bandwidth should be taken into account in addition to required RBs
	+ Option 2: the required guard RBs are RBs within WUS carrier bandwidth.
		- FFS on how to allocate guard RBs for ASCS and ACS purpose
	+ NOTE: for evaluation purpose, WUS carrier bandwidth is the bandwidth of WUS signal plus guard RBs, e.g., 25PRBs for 15Khz SCS and 14PRBs for 30KHz SCS

**Issue 1-3-1: Noise Figure range for LP-WUR (LR)**

***Agreements:***

* Regarding the NF in RAN1 evaluation, RAN4 will derive RF requirement based on updated NF which is feasible from coverage and implementation perspective in WI phase.
* For LP-WUS evaluation, RAN4 could use ~9dB NF and X dB SNR (FFS channel) as an example assumption for MR coverage discussion.
* Encourage companies to share assumed NF of each architecture of LR next meeting.
* RAN4 will focus on sensitivity evaluation instead of specific NF value in WI phase.

**Issue 1-4-1: Possible LP-WUS power range**

***Agreements:***

Manufacture could declare power boosting for WUS signal is supported and the boosting level from 0 dB to [x]dB. Final [x] will be decided in WI phase based on further analysis.

* Encourage companies to provide analysis in RAN4#109 for upper bound of power boosting level.

**Issue 1-5-1: Band operation for LP-WUS**

***Agreements:***

RAN4 can consider the following scenarios and analyse RF impacts in WI phase:

1. The IMT band for LR and MR is the same, e.g., WUS within a NR band for LP-WUR, WUS and NR DL could be TDM/FDM mode.
2. The IMT band for LR and MR can be different, e.g., WUS located within a NR band for LP-WUR, and another NR band for MR.

**Issue 1-6-1: Performance metric for LP-WUR RF requirements**

***Agreements:***

RAN4 should discuss a new the methodology for WUR requirements in WI phase. Following can be considered:

* BLER
* Misdetection ratio, including paging failure
* others

**Issue 1-6-2: LP-WUR Sensitivity**

***Agreements:***

* FFS, sensitivity requirement depends on RAN-P decision on LP-WUS coverage, which can be discussed in WI phase.

**Issue 1-6-3: LP-WUR test cases**

***Agreements:***

* The testability issue of LP-WUR RF requirements should be discussed in WI phase.

RRM part

**Issue 1-1-1: Views on RAN1 outcome**

RAN4 confirm that the evaluation methodology by RAN1 in TR38.869 for serving cell RSRP/RSRQ measurement offloading to LP-WUR at IDLE/INACTIVE mode is reasonable for SI phase.

* The evaluation methodology refers to the consideration of side condition, number of samples and accuracy.
	+ In addition, in RAN4, RF impairment margin is considered.

**Issue 1-2-1: Noise figure impact**

*Agreement: RAN4 understands the determination of SNR target X of LP-WUR should consider at least the NF difference between LP-WUR and MR.*

**Issue 1-2-2: SNR target X for serving cell measurement offloading**

*Agreement: RAN4 understands the determination of SNR target X of LP-WUR should consider at least the applicable coverage conditions of LP-WUR.*

**RAN4 #109 RF and RRM**

* Agreements for finalization of RF and RRM study
* RAN4 concluded RF part is completed for this SI.
* RAN4 concluded RRM study of the SI can be closed.
* TP to TR 38.869 on LP-WUS RF summary was approved in [63]
* TP to TR 38.869 on LP-WUS receiver architectures was approved in [65]
* TP to TP to TR 38.869 on RRM aspects for LP-WUR [61]

#### 2.4.2 Remaining Open issues

None. RAN4 study completed.

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

RAN2#123bis

1. R2-2309737 Update of TR 38.869 for LP-WUS WUR vivo (Rapporteur) discussion Rel-18 FS\_NR\_LPWUS
2. R2-2309735 Discussion on LP-WUS WUR in RRC\_IDLE INACTIVE vivo discussion Rel-18 FS\_NR\_LPWUS
3. R2-2310313 RAN2 impact of LP-WUS in RRC\_IDLE/INACTIVE state Apple discussion Rel-18 FS\_NR\_LPWUS
4. R2-2309493 Use of low-power receiver in RRC Idle/Inactive Qualcomm Incorporated discussion Rel-18 FS\_NR\_LPWUS
5. R2-2309536 Discussion on LP-WUS in RRC\_IDLE/INACTIVE OPPO discussion Rel-18 FS\_NR\_LPWUS
6. R2-2309818 Further considerations on LP-WUS in RRC\_IDLE&INACTIVE states CATT discussion Rel-18 FS\_NR\_LPWUS
7. R2-2309858 LP-WUS in RRC\_IDLE/INACATIVE LG Electronics Inc. discussion Rel-18 FS\_NR\_LPWUS
8. R2-2310039 General considerations on the procedure for RRC\_IDLE\_INACTIVE Xiaomi Communications discussion
9. R2-2310062 Discussion on LPWUS in RRC\_IDLE INACTIVE NEC Corporation. discussion Rel-18 FS\_NR\_LPWUS
10. R2-2310483 Remaining issues on LP-WUS in RRC\_IDLE/INACTIVE state Huawei, HiSilicon discussion Rel-18 FS\_NR\_LPWUS
11. R2-2310722 LP-WUS in RRC IDLE and INACTIVE Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_LPWUS
12. R2-2310778 Considerations on LP-WUR in RRC Idle/Inactive mode Sony discussion Rel-18 FS\_NR\_LPWUS
13. R2-2310827 Remaining issues of LP-WUS in idle or inactive mode ZTE Corporation, Sanechips discussion Rel-18 FS\_NR\_LPWUS
14. R2-2311064 LP-WUS/WUR for RRC Idle and Inactive Ericsson discussion Rel-18 FS\_NR\_LPWUS
15. R2-2311171 On impact to IDLE/INACTIVE procedures to support LP-WUR Samsung R&D Institute India discussion Rel-18
16. R2-2311216 LP-WUS in RRC Idle/ Inactive Mode Lenovo discussion FS\_NR\_LPWUS
17. R2-2309492 Summary of [Post123][060][LPWUS] Low-power receiver in RRC Connected (Qualcomm) Qualcomm Incorporated discussion Rel-18 FS\_NR\_LPWUS
18. R2-2309842 Further considerations on LP-WUS in RRC\_CONNECTED Huawei, HiSilicon discussion Rel-18 FS\_NR\_LPWUS
19. R2-2311068 LP-WUS/WUR for RRC Connected Ericsson discussion Rel-18 FS\_NR\_LPWUS
20. [R2-2311336](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311336.zip) Summary of [AT123bis][510][LP-WUS] connected mode (vivo) vivo
21. R2-2309530 Discussion on LP-WUS in RRC Connected OPPO discussion Rel-18 FS\_NR\_LPWUS
22. R2-2309736 Discussion on LP-WUS WUR in RRC\_Connected vivo discussion Rel-18 FS\_NR\_LPWUS
23. R2-2309819 LP-WUS co-existence with DCP in RRC\_CONNECTED state CATT discussion Rel-18 FS\_NR\_LPWUS
24. R2-2310040 Discussing on LP-WUS monitoring for RRC\_Connected Xiaomi Communications discussion
25. R2-2310061 Discussion on LPWUS in RRC\_CONNECTED NEC Corporation. discussion Rel-18 FS\_NR\_LPWUS
26. R2-2310314 RAN2 impact of LP-WUS in RRC\_CONNECTED state Apple discussion Rel-18 FS\_NR\_LPWUS
27. R2-2310442 Discussion on LP-WUS for Connected LG Electronics Inc. discussion FS\_NR\_LPWUS
28. R2-2310828 Remaining issues of LP-WUS in connected mode ZTE Corporation, Sanechips discussion Rel-18 FS\_NR\_LPWUS
29. R2-2310877 On Low-power WUS in RRC\_CONNECTED Nokia, Nokia Shanghai Bell discussion FS\_NR\_LPWUS
30. R2-2311172 On impact to Connected mode procedures to support LP-WUR Samsung R&D Institute India discussion Rel-18
31. R2-2311217 LP-WUS in RRC Connected Mode Lenovo discussion FS\_NR\_LPWUS

RAN2#124

1. [R2-2311914](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311914.zip) Update of TR 38.869 for LP-WUS WUR vivo (Rapporteur) discussion Rel-18 FS\_NR\_LPWUS
2. R2-2313939 Report of [AT124][505][LPWUS] Update of TR 38.869 for LP-WUS WUR, vivo (Rapporteur)
3. R2-2313940 Update of TR 38.869 for LP-WUS WUR, vivo (Rapporteur)
4. [R2-2311915](file:///C%3A%5C%5CUsers%5C%5Cmtk65284%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2_RL2%5C%5CRAN2%5C%5CDocs%5C%5CR2-2311915.zip%22%20%5Co%20%22C%3AUsersmtk65284Documents3GPPtsg_ranWG2_RL2RAN2DocsR2-2311915.zip) Summary of discussions on open issues for LP-WUS vivo discussion Rel-18 FS\_NR\_LPWUS
5. [R2-2312571](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312571.zip) TP for TR conclusion on high layer aspects vivo (Rapporteur) discussion Rel-18 FS\_NR\_LPWUS
6. [R2-2311774](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311774.zip) Use of low-power receiver in RRC Idle/Inactive Qualcomm Incorporated discussion Rel-18 FS\_NR\_LPWUS
7. [R2-2311896](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311896.zip) LP-WUS in RRC Idle/ Inactive Mode Lenovo discussion FS\_NR\_LPWUS#
8. [R2-2311916](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311916.zip) Discussion on LP-WUS WUR in RRC\_IDLE INACTIVE vivo discussion Rel-18 FS\_NR\_LPWUS R2-2309735
9. [R2-2311969](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311969.zip) Discussion on LP-WUS in RRC\_IDLE/INACTIVE OPPO discussion Rel-18 FS\_NR\_LPWUS
10. [R2-2311981](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311981.zip) General considerations on the procedure for RRC\_IDLE\_INACTIVE Xiaomi Communications discussion
11. [R2-2312074](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312074.zip) Discussion on LPWUS in RRC\_IDLE INACTIVE NEC discussion FS\_NR\_LPWUS
12. [R2-2312298](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312298.zip) RAN2 impact of LP-WUS in RRC\_IDLE/INACTIVE state Apple discussion Rel-18 FS\_NR\_LPWUS
13. [R2-2312387](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312387.zip) Remaining issues of LP-WUS in idle or inactive mode ZTE Corporation, Sanechips discussion FS\_NR\_LPWUS
14. [R2-2312450](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312450.zip) Open issues in IDLE/INACTIVE Procedures to support LP-WUR Samsung R&D Institute India discussion Rel-18
15. [R2-2312640](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312640.zip) Remaining issues on LP-WUS in RRC\_IDLE/INACTIVE state Huawei, HiSilicon discussion Rel-18 FS\_NR\_LPWUS
16. [R2-2312737](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312737.zip) LP-WUS in RRC IDLE and INACTIVE Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_LPWUS
17. [R2-2312848](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312848.zip) RAN2 aspects on LP-WUS/WUR in RRC Idle/Inactive mode Sony discussion Rel-18 FS\_NR\_LPWUS
18. [R2-2313103](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2313103.zip) LP-WUS in IDLE or INACTIVE LG Electronics Inc. discussion Rel-18 FS\_NR\_LPWUS
19. [R2-2313230](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2313230.zip) LP-WUS/WUR for RRC Idle and Inactive Ericsson discussion Rel-18 FS\_NR\_LPWUS
20. [R2-2313274](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2313274.zip) Further considerations on LP-WUS in RRC\_IDLE&INACTIVE state CATT discussion Rel-18 FS\_NR\_LPWUS
21. [R2-2311917](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311917.zip) Discussion on LP-WUS WUR in RRC\_Connected vivo discussion Rel-18 FS\_NR\_LPWUS
22. [R2-2311926](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311926.zip) LP-WUS in RRC Connected Mode Lenovo discussion FS\_NR\_LPWUS
23. [R2-2311961](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311961.zip) Discussion on LP-WUS in RRC Connected OPPO discussion Rel-18 FS\_NR\_LPWUS
24. [R2-2311982](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2311982.zip) Discussing on LP-WUS monitoring for RRC\_Connected Xiaomi Communications discussion
25. [R2-2312075](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312075.zip) Discussion on LPWUS in RRC\_CONNECTED NEC discussion FS\_NR\_LPWUS
26. [R2-2312388](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312388.zip) Remaining issues of LP-WUS in connected mode ZTE Corporation, Sanechips discussion FS\_NR\_LPWUS
27. [R2-2312449](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312449.zip) Discussion on LP-WUS in connected mode Samsung R&D Institute India discussion Rel-18
28. [R2-2312641](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312641.zip) Further considerations on LP-WUS in RRC\_CONNECTED Huawei, HiSilicon discussion Rel-18 FS\_NR\_LPWUS
29. [R2-2312847](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2312847.zip) Considerations on LP-WUS/WUR in RRC connected mode Sony discussion FS\_NR\_LPWUS
30. [R2-2313127](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2313127.zip) On LP-WUS in RRC\_CONNECTED Nokia, Nokia Shanghai Bell discussion FS\_NR\_LPWUS
31. [R2-2313231](file:///C%3A%5CUsers%5Cmtk65284%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CRAN2%5CDocs%5CR2-2313231.zip) LP-WUS/WUR for RRC Connected Ericsson discussion Rel-18 FS\_NR\_LPWUS

RAN4#108bis

1. R4-2315172 Discussion on RAN1 RRM measurement accuracy studies of LP-WUR CMCC
2. R4-2315194 discussion on LP-WUS ACS and ASCS requirements CMCC
3. R4-2315206 Low-power wake-up receiver RF aspects Nokia, Nokia Shanghai Bell
4. R4-2315214 Consideration on LP-WUR RRM vivo
5. R4-2315239 Further consideration on LP-WUS/WUR Huawei, HiSilicon
6. R4-2315386 TP to TR38.869 on separate band WUS Apple, Rohde & Schwarz
7. R4-2315387 On LP-WUR architectures Apple
8. R4-2315388 Impact of LP-WUS design on system coexistence Apple
9. R4-2315427 Review of outcome of RAN1 studies related to RRM Xiaomi
10. R4-2315565 Views on low-power wake-up signal and receiver for NR Sony
11. R4-2315846 Discussions on low-power Wave-up Receiver architectures vivo
12. R4-2315847 TP to TR 38.869 on LP-WUS receiver architectures vivo
13. R4-2315933 Views on RAN1 conclusions in TR38.869 MediaTek Inc.
14. R4-2316067 Discussion on RRM related aspects for LP-WUR study Huawei, HiSilicon
15. R4-2316279 TP on for WUS signal power boosting Ericsson
16. R4-2316280 TP on for WUS guard RB Ericsson
17. R4-2316281 On Remaining issue for low-power wake-up receiver Ericsson
18. R4-2316330 Further consideration on LP-WUS ZTE Corporation
19. R4-2316359 Discussions on RAN1 studies related to RRM for WUR Ericsson
20. R4-2316549 Review of outcome of RAN1 studies related to RRM SAMSUNG R&D INSTITUTE JAPAN
21. R4-2316590 On LP-WUR based RRM Apple
22. R4-2316675 Review of outcome of RAN1 studies related to RRM Nokia, Nokia Shanghai Bell
23. R4-2316697 TP to TR 38.869: Low-power wake-up receiver RF aspects Qualcomm Inc.
24. R4-2316858 Review of outcome of RAN1 studies related to RRM Qualcomm Incorporated
25. R4-2317206 Topic summary for [108-bis][214] FS\_NR\_LPWUS Moderator (Vivo)
26. R4-2317257 Topic summary for [108-bis][134] FS\_NR\_LPWUS Moderator (Vivo)
27. R4-2317283 Ad-hoc minutes for FS\_NR\_LPWUS Vivo
28. R4-2317366 WF on RRM aspects for NR LPWUS Vivo
29. R4-2317426 WF on RRM aspects for NR LPWUS Vivo
30. R4-2317599 WF on UE RF part for LP\_WUS Vivo
31. R4-2317635 WF on UE RF part for LP\_WUS Vivo
32. R4-2317636 TP to TR 38.869 on LP-WUS receiver architectures vivo, Huawei, Qualcomm, Ericsson, Nokia, Apple
33. R4-2317637 Ad hoc minutes for LP\_WUS Vivo
34. R4-2317760 TP on for WUS guard RB Ericsson
35. R4-2317766 WF on UE RF part for LP\_WUS Vivo
36. R4-2317775 TP to TR 38.869 on LP-WUS receiver architectures vivo, Huawei, Qualcomm, Ericsson, Nokia, Apple

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1. R4-2318141 Topic summary for [109][135] FS\_NR\_LPWUS Moderator (Vivo)
2. R4-2318174 Topic summary for [109][218] FS\_NR\_LPWUS Moderator (Vivo)
3. R4-2318398 Review of outcome of RAN1 studies related to RRM Samsung
4. R4-2318658 On LP-WUR based RRM Apple
5. R4-2318973 TP to TR 38.869 on LP-WUS RF summary vivo
6. R4-2318974 Discussions on low-power Wave-up Receiver architectures vivo
7. R4-2318975 TP to TR 38.869 on LP-WUS receiver architectures vivo, CMCC
8. R4-2319246 On remaining issues for on LP-WUR RRM study vivo
9. R4-2319247 TP to TR 38.869 on RRM aspects for LP-WUR vivo
10. R4-2319734 Consideration on remaining issues on LP-WUS/WUR Huawei, HiSilicon
11. R4-2320016 Discussion on RRM related aspects for LP-WUR study Huawei, HiSilicon
12. R4-2320084 Further consideration on LP-WUS ZTE Corporation
13. R4-2320085 TP for TR 38.869\_Updates for guard band definition ZTE Corporation
14. R4-2320127 Discussions on RAN1 studies related to RRM for WUR Ericsson
15. R4-2320128 TP for TR 38.869 RRM for WUR Ericsson
16. R4-2320291 Review of outcome of RAN1 studies related to RRM Nokia, Nokia Shanghai Bell
17. R4-2320432 Discussion on LR based RRM ZTE Corporation
18. R4-2320516 Evaluation of Low power wake-up receiver architectures Nokia, Nokia Shanghai Bell
19. R4-2320546 TP on ADC impairment Ericsson
20. R4-2320547 TP on WUR Noise figure Ericsson
21. R4-2320548 On remaining issues for low-power wake-up receiver Ericsson
22. R4-2320643 TP to TR 38.869: Low-power wake-up receiver RF aspects Qualcomm Inc.
23. R4-2320662 TP to TR 38.869, Coverage aspects on WUR Sony Europe B.V.
24. R4-2320817 LP WUR ACS with phase noise Murata Manufacturing Co Ltd.
25. R4-2321341 TP to TR 38.869 on RRM aspects for LP-WUR vivo
26. R4-2321737 Ad hoc minutes for [109][135] FS\_NR\_LPWUS Vivo
27. R4-2321819 TP to TR 38.869 on LP-WUS RF summary vivo
28. R4-2321820 TP to TR 38.869 on LP-WUS receiver architectures vivo, CMCC
29. R4-2321904 TP to TR 38.869 on LP-WUS receiver architectures vivo, CMCC, Qualcomm, Ericsson, ZTE, Sony, Nokia, Murata, Huawei

 17.05.2021 minor adaptations for RAN #92e

 28.01.2021 minor adaptations for RAN #91e

 09.11.2020 minor adaptations for RAN #90e

 31.08.2020 minor adaptations for RAN #89e

 20.04.2020 minor adaptations for RAN #88e

 18.02.2020 minor adaptations for RAN #87e

 14.11.2019 minor adaptations for RAN #86

 18.08.2019 minor adaptations for RAN #85

 12.05.2019 minor adaptations for RAN #84

 27.02.2019 minor adaptations for RAN #83

 21.11.2018 completion levels with colours added (for RAN #82)

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects (for RAN #81)

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template