**3GPP TSG RAN Meeting #101 RP-231812**

**Bangalore, India, September 11-15, 2023**

## Status Report to TSG

**Agenda item:** 9.2.6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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-222644 | | | | |
| **Target Completion Date**  **(indicate if changed)** | Study Item:  12/2023 |  |  |  | |
| **Overall Completion level** | Study Item:  85 % | RAN1 study completed |  |  | |

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** | Xiaodong Shen |
| **Company** | vivo Communication Technology |
| **Email** | shenxiaodong@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

**RAN1 #114**

**Agreement**

The text proposal in 8386 is endorsed in principle for the TR on LP-WUS

**Agreement**

The text proposal in 8388 is endorsed in principle for the TR on LP-WUS with the following changes to be made

* Replace company names with ‘[ref]’
* Instead of capturing the number of sources, capture the list of references contributing to each observation
  + Eg. Results in [1], [2], [3] show that …
* Discuss further where to capture Apple’s results

**Agreement**

The text proposal in 8390 is endorsed in principle for the TR on LP-WUS

**Agreement**

The TP in [R1-2308389](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308389.zip) is endorsed in principle with the following changes/points:

* Instead of capturing the number of sources, capture the list of references contributing to each observation
  + Eg. Results in [1], [2], [3] show that …
* Observations/Results to be reviewed and revised if needed
* Keep the big table in 8.2.1
* Make the following change:
  + 8.2.1.1 Summary of the performance gap between LP-WUS and NR reference channel
    - MIL margin of LP-WUS is defined as Y= (MIL of LP-WUS – MIL of NR channel), and ~~only~~ when Y>= *-1dB*, the LP-WUS sample is considered to have similar to or better than reference NR channels.
* Make the following change:
  + 8.2.2 Results for Urban
    - In the evaluation, FAR of <=0.1% and <=1% ~~can~~was be used by companies.
* Make the following change:
  + 8.2.1.2 NR Coverage for comparison
    - It can be observed that for a given NR channel, there is a MIL difference among companies. One of the reasons contributes to this difference could be the different assumptions for antenna gain corrections for gNB Tx and Rx. Another reason could be different HARQ assumption for MSG3. Another reason could be different link performance between different companies. The assumed antenna gain correction values used by companies for link budget evaluation is summarized as in Table 8.2.1-6.

**Agreement**

The TP in [R1-2308437](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308437.zip) is endorsed in principle

**Agreement**

The TP in [R1-2308387](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308387.zip) is endorsed in principle with the following changes/points:

* Instead of capturing the number of sources, capture the list of references contributing to each observation
  + Eg. Results in [1], [2], [3] show that …
* Delete “Note 5: Nokia results assume MR enters deep sleep while other companies assume ultra-deep sleep” in 8.1.1.5.1
* Separate the following bullet in 8.1.1.5.2 into two (one bullet for deep sleep and another for ultra deep sleep)
  + No MR RRM relaxed
    - Compared with i-DRX with or without PEI, LP-WUS provide mean power saving gain (average: -208%, range: -624%~21%)
* Add the following note under figure Figure 8.1.1.1–2
  + Note: Results with duty cycle ratio 5~30% are provided by [ref] and included in the TR spreadsheet
* Remove the last row in Table 8.1.1.3 - 1 simulated combinations for LP-WUR (ON, OFF) power values
* Replace FAR<=1% to list of actual FAR values used
* Remove the following bullets from observations in 8.1.1.7.2
  + MR sync/re-sync energy consumption <= 1000unit ….
* Further check 8.1.1.2.2 observation 1

**Agreement**

The TP in [R1-2308603](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308603.zip) is endorsed in principle with the following changes/points:

* Delete “,[ e.g. no larger than 4], [at least for UEs not at the cell-edge]”
* Change as follows
  + From RAN1 point of view, ~~[~~potential techniques to decrease the latency e.g. using shorter I-DRX cycles, dynamic paging occasion determination, UE MR transmit PRACH directly after wake-up by LP-WUS, UE MR entering deep sleep during LP LP-WUS monitoring, were proposed and evaluated~~were also studied~~.~~]~~”
* Further check during post RAN1#114 email discussions if the numbers are correctly reflected.
* Change as follows
  + “If the MR enters ultra deep sleep while monitoring LP-WUS, compared with legacy I-DRX operation with same I-DRX cycle, moderate paging latency increase ….”
  + “ramp up and re-sync procedure”
* Provide reference to relevant section
* Add the following:
  + For Urban scenario and PUSCH MSG3 transmission with two retransmissions
    - For OOK-based LP-WUS, the required resource reported is [Ericsson to provide] MHz\*Symbol/bit
    - For OFDM-based LP-WUS, the required resource reported is [Ericsson to provide] MHz\*Symbol/bit
* Add a paragraph for LP-SS overhead with 3 slot duration and 1.28 sec to the conclusion section
* Make the following change
  + The additional increased network power consumption due to LP-SS is also studied assuming LP-SS is an additional signal transmission than the existing NR signal/channels. When 320ms LP-SS periodicity, 4 or 8 beams and ~~no more than~~ 14/42 symbols LP-SS duration is assumed, the additional increased network power consumption rate is marginal [(0.06%~3.9%), (0.07%~2.716%), (0.388%~1.076%)] for zero load, low load and medium load respectively. Lower impact to the network power consumption is expected when LP-SS is transmitted FDM with NR SSB/SIB-1.

**Agreement**

The TP in [R1-2307302](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307302.zip) is endorsed in principle with the following changes/points:

* Instead of capturing the number of sources, capture the list of references contributing to each observation
  + Eg. Results in [1], [2], [3] show that …
* Observations/Results to be reviewed and revised if needed
* Remove the following:
  + The relative power consumption for OFF state depends on e.g., the assumption on the oscillators during OFF state and memory size maintained during OFF state.

**Agreement**

The TP for link level simulation in 7303 endorsed in principle with the following changes/points to be made:

* Remove “Note that the relative power consumption of SSB processing for a NR RedCap UE with 20MHz and 1Rx is 35 according to the UE power model in [3].”

**Agreement**

The TP in 8596 is endorsed in principle

**Agreement**

The TP in 8604 is endorsed in principle with the following changes/points

* Change “estimated” to “reported”
* Change the note as follows
  + Note that:
    - Some of the inconsistent ranges for the architectures for OOK and FSK waveforms (e.g., power consumption for the homodyne/zero-IF architecture for OOK and the parallel homodyne/zero-IF architecture for FSK) is due to the fact that not all sources provided analysis for all the architectures.
      * For each individual source, the power consumption for FSK is similar as or slightly higher than the power consumption for OOK with the same architecture type.
    - Note that some of the wide ranges for the different architectures is due to the fact that different sources made different assumptions and there is a tradeoff between power consumption and noise figure.
* Change as follows
  + For time-domain correlation, the estimated relative power consumption for ON state is in the range of 0.15~10/30, and the estimated noise figure is in the range of 7~25.

**Agreement**

Capture in TR

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *For the following Waveforms:*   * *OOK-1 30kHz SCS* * *OOK-1 60kHz SCS* * *OOK-1 120kHz SCS* * *OOK-2 M=2* * *OOK-2 M=4* * *OOK-3* * *OOK-4 M=2* * *OOK-4 M=4* * *OOK-4 M>4* * *FSK M=1* * *FSK-1 M=2* * *FSK-2 M=2* * *OFDMA*  |  |  |  | | --- | --- | --- | | **Te [us]** | **Waveform** | | | **SNR deg [dB]** | **<2dB**  **#sources** | **>=2dB**  **#sources** | | **1** | [TBA] | [TBA] | | **2** | [TBA] | [TBA] | | **3** | [TBA] | [TBA] | | **4** | [TBA] | [TBA] | | **10** | [TBA] | [TBA] | | **Sampling rate range** | |  |  | | --- | --- | | X - | Y | | | | **Inner GB BW range, if applicable** | |  |  | | --- | --- | | X - | Y | | | | **# of sources with/wo sliding window** | x/y | |   *With the following assumption*   * *ADC bit-width is 4 or more bits.* * *Frequency error is 0 ppm.* * *Other parameters are not restricted.*   *There are the following observations for timing error:*   * *[TBA]* |

Above is agreed with the following change: The results with/wo adjustments are to be captured in separate tables.

**Agreement**

Capture in TR

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *For the following Waveforms:*   * *OOK-1 30kHz SCS* * *OOK-1 60kHz SCS* * *OOK-1 120kHz SCS* * *OOK-2 M=2* * *OOK-2 M=4* * *OOK-3* * *OOK-4 M=2* * *OOK-4 M=4* * *OOK-4 M>4* * *FSK M=1* * *FSK-1 M=2* * *FSK-2 M=2* * *OFDMA*  |  |  |  | | --- | --- | --- | | **Fe [kHz]** | **Waveform** | | |  | **<2dB**  **#sources** | **>=2dB**  **#sources** | | 2 | [TBA] | [TBA] | | 2,6 | [TBA] | [TBA] | | 4 | [TBA] | [TBA] | | … | … | … | | 400 | [TBA] | [TBA] | | 600 | [TBA] | [TBA] | | 800 | [TBA] | [TBA] | | **Sampling rate range** | |  |  | | --- | --- | | X - | Y | | | | **Inner GB BW range, if applicable** | |  |  | | --- | --- | | X - | Y | | | | **# of sources with/wo time domain sliding window** | x/y | | | **# of sources with/wo frequency adjustment** | x/y | |   *With the following assumptions:*   * *ADC bit-width is 4 or more bits.* * *Timing error is 0 micro sec.* * *Other parameters are not restricted.*   *There are the following observations for frequency error:*   * *[TBA]* |

Above is agreed with the following change: The results with/wo adjustments are to be captured in separate tables.

**Agreement**

Capture in TR

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *For the following Waveforms:*   * *OOK-1 30kHz SCS* * *OOK-1 60kHz SCS* * *OOK-1 120kHz SCS* * *OOK-2 M=2* * *OOK-2 M=4* * *OOK-3* * *OOK-4 M=2* * *OOK-4 M=4* * *OOK-4 M>4* * *FSK M=1* * *FSK-1 M=2* * *FSK-2 M=2* * *OFDMA*   *With the following assumptions:*   * *Timing error = 0us.* * *Frequency error = 0ppm.* * *Only TDL-C results.* * *Other parameters are not restricted.*   + *table includes results across different receiver types, different power pooling assumption, different sampling rates, different tx antenna configurations, FAR target for the same waveform*   + *best result within a company/source is considered for the table.*  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **Waveform** | | | | | | **SNR Range [dB]** | **median [b/s/Hz]** | **average [b/s/Hz]** | **SE Min [b/s/Hz]** | **SE Max [b/s/Hz]** | **#Sources** | | [-50, -9] | [TBA] | [TBA] | [TBA] | [TBA] | [TBA] | | [-9, -3] | [TBA] | [TBA] | [TBA] | [TBA] | [TBA] | | [-3, 3] | [TBA] | [TBA] | [TBA] | [TBA] | [TBA] | | [3, 9] | [TBA] | [TBA] | [TBA] | [TBA] | [TBA] | | [9, 50] | [TBA] | [TBA] | [TBA] | [TBA] | [TBA] |  * Note: Spectral efficiency: SE = LP-WUS information size [bits]/ LP-WUS length [s] / LP-WUS BW [Hz] |

**Agreement**

TP for TR38.869:

* From RAN1 perspective, for multiplexing with other NR signals and channels, it is beneficial if LP-WUS can be flexibly configured within a carrier.

**Agreement**

The TP for link level simulation in 8473 endorsed in principle with the following changes/points to be made:

* Remove green highlight
* Add unit in Table 2
* Text under ‘FFS: More detail observations to further consider:’ is not part of this agreement. To be revisited later
* Remove Table 7, 8, 9, 10
* For observation in 1.2.1
  + *Single frequency segment OOK (except OOK3) waveform is more robust to frequency error (of X ppm) than OOK/FSK waveforms with multiple frequency segments (depending on guard-band size between segments) and both are more robust than OFDMA waveform assuming no frequency compensation/synchronization.*
  + *One source showed that single frequency segment FSK-envelop-IF waveform is more robust to frequency error (of X ppm) than OOK/FSK waveforms with multiple frequency segments (depending on guard-band size between segments) and both are more robust than OFDMA waveform assuming no frequency compensation/ synchronization.*
* For observation in 1.4.1
  + Further check numbers
* Instead of capturing the number of sources, capture the list of references contributing to each observation
  + Eg. Results in [1], [2], [3] show that …
* For observation 1.1.1, add the following observation
  + *OFDMA waveform is robust to timing error up to 4us depending on receiver implementation*
* For observation 1.1.2, add the following observation
  + *OFDM waveform is robust to timing error up to 4us*

**Agreement**

The TP in 8601 is endorsed in principle with the following changes

* Make the following change:
  + In this section and sub-sections it is assumed that “tolerate” means that SNR degradation <= 2dB compared to error free case.
* Add the following note the section 1.3
  + The spectral efficiency of OFDMA waveform is dependent on the selection of sequences
* Make the following change for Table 2
  + ~~more~~2 sources showed tolerance up to 3us
  + for OOK-4 M=4, add a note “the 300ns delay spread was baseline”
* For all tables (when necessary)
  + Add units for inner guard bands and sampling rate

**Agreement**

The TP for conclusion is endorsed in principle: [R1-2308639](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308639.zip).

Agreement

In section signal “7.2.1.1 waveform” in TR38.869 capture:

In FSK2-envelope-IF waveform generation, the N SCs of LP-WUS can be used to generate 2^M segments at the envelope of the LP-WUR’s received signal in baseband where each segment comprises one or more tones.

#### 2.1.2 Remaining Open issues

None, RAN1 study completed.

## 2.2 RAN2

#### 2.2.1 Agreements

**RAN2#123**

* Entry/exit condition(s) of using LP-WUS is configured in SIB.
* FFS via RRC dedicated signaling, e.g. by RRC release.
* Entry condition(s) of using LP-WUS include at least good serving cell quality, e.g. the serving cell quality measurement on LR and/or serving cell quality measurement on MR is better than configured threshold(s) in SIB. Other condition(s) is not precluded/FFS.
* UE stops using LP-WUS when exit condition(s) configured in SIB is fulfilled. The exit condition(s) includes at least out of coverage of LP signaling, e.g. the serving cell quality measured by LR is less than the configured threshold in SIB, FFS on measurement on MR.
* FFS the serving cell quality measurement on LR is based on LP-SS and/or SSB (pending RAN1 decision).
* After waking up by a LP-WUS, capture the below solutions in the TR:

Alt 1.1: UE could monitor paging DCI/paging;

Alt 1.2: UE could monitor PEI, if configured and supported; FFS details on using LP-WUS and PEI together, e.g. subgrouping

FFS Alt 2: UE could perform random access directly, FFS on whether and what condition/requirement is needed. R2 assumes that this require that LP-WUS includes UE\_ID or equivalent. (Depends on LP-WUS capacity to carry information)

* For Alt.1 above, after waking up by a LP-WUS, RAN2 assumes the baseline is the UE monitors the legacy PO.
* RAN2 consider the subgrouping methods for LP-WUS (if supported) includes the CN assigned and/or UE\_ID based subgrouping, which are similar to the PEI subgrouping methods. Details determined during WI phase.
* The number of subgroups depends on the decision on payload of LP-WUS in RAN1.
* Capture the below pros/cons in the TR on whether there is necessarity for the network to be aware of whether an idle/inactive UE is monitoring LP-WUS or not. Details to be updated during TR drafting.

Baseline (for further update):

|  |  |  |
| --- | --- | --- |
|  | Network knows whether UE monitors LR or MR | Network does not know whether UE monitors LR or MR |
| Pros | Reduce Uu resource consumption:  NW only **sends LP-WUS** when the target UE is monitors LP-WUS;  Lower false wake-up rate:  When LP-WUS is not sent, the other UE monitoring LP-WUS, which is in the same group with the target paging UE, will not be waken up as a result of false wake up. | Since the UE needs not to inform the NW whether its MR is monitoring or not, the  signalling overhead, Uu resource consumption, UE power consumption caused by MR state report does not exist. |
| Cons | More signalling overhead:  UE needs to inform the NW when it starts/stops monitoring with MR.  Uu resource consumption caused by more signalling overhead.  More UE power consumption caused by more signalling overhead. | More Uu resource consumption：NW always send LP-WUS signal given it always assume the target UE is monitoring the LP-WUS.  More alarm rate of LP-WUS: in case the target UE is not monitoring LP-WUS, the other UE(monitoring the same LP-WUS as the target UE) will be waken up. |

* For UE in RRC\_IDLE/RRC\_INACTIVE state, FFS on whether there is need for the network to be aware of whether the UE is monitoring LP-WUS or not.
* R2 assumes In ultra-deep-sleep, RRM measurement on serving cell via MR is relaxed (may include no measurement) if RRM measurement on LR is feasible/supported. FFS on the details, e.g. how to relax, in which condition,.
* R2 assumes In ultra-deep-sleep, RRM measurement on neighboring cell via MR is relaxed (may include no measurement) if RRM measurement on LR is feasible/supported. FFS on the details, e.g. how to relax, in which condition,.
* FFS: RRM measurement for neighboring cell by LR as well as corresponding cell (re-) selection.
* FFS to what extent UE maintains valid SI in case UE’s MR is in ultra-deep sleep state.
* R2 assumes that the Network may have the need to wake up UE by LP-WUS from ultra-deep sleep whenever there is ETWS/CMAS information etc, applicability to SI change notification FFS
* Expect that R2 could determine how/if to integrate LPWUS with DRX, determine impact to DRX, and identify MAC issues if any, with using LPWUS in CONNECTED. Additional scope FFS
* Long post meeting email discussion, on technical proposals that are in R2 scope (can also discuss proposals in said scope that is FFS).

#### 2.2.2 Remaining Open issues

The following open issues need to be addressed:

* Study and evaluate higher layer protocol changes needed to support the wake-up signals [RAN2, RAN1]

## 2.3 RAN3

#### 2.3.1 Agreements

#### 2.3.2 Remaining Open issues

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4 #108**

* General
* Topic summary on LP-WUS in [14]
* Ad-hoc meeting minutes was approved in [21]
* WF on LP-WUS was approved in [20]
* Reply LS to RAN1 was approved in [16]
* TP to RAN1 TR 38.869 was approved in [18]

**Issue 1-1-1: Refinement of ACS evaluation framework for LP-WUR in RAN4**

**Agreement:**

* Focus on the issues in the RAN1 LS.

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

**Agreement:**

* Inform RAN1 the guard RB numbers for LP-WUS ACS proposed by companies in this RAN4 meeting.
  + For 5th order filter, the guard RB number is in the range of 1RB ~ 3RBs for 30KHz SCS, or 2RBs ~6RBs for 15KHz SCS.
  + Include the assumption information in the LS to RAN1.

**Issue 1-1-3: Link-level simulation based guard RB analysis**

**Agreement:**

* For link-level simulation based guard RB analysis, use 1% BLER as metric for guard RB evaluation.
  + BER and missing detection rate can also be used
    - FFS on the percentage values for BER and missing detection rate

**Issue 1-2-1: required Guard RBs for LP-WUS ASCS**

**Agreement:**

* Inform RAN1 the guard RB numbers for LP-WUS ASCS proposed by companies in this RAN4 meeting.
  + For 5th order filter, the guard RB number is in the range of 0.5RB ~ 2RBs for 30KHz SCS, or 1RBs ~4RBs for 15KHz SCS.
  + Include the assumption information in the LS to RAN1.
    - Including how to handle ACS and ASCS simultaneous

**Issue 1-2-2: WUS location within the carrier**

**Agreements:**

* + LP-WUS can be flexible located within NR carrier as long as the required guard RBs are configured.

**Issue 1-2-3: Order of filter for consideration**

**Agreements**

* The filter assumption for guard band size evaluation shall be reasonable for low power WUR.

**Issue 1-3-1: Required Noise Figure**

**Agreements**

* RAN4 further discuss the Noise figure in Q4 based on the outcome of SNR and coverage in RAN1.

**Issue 1-4-1: LP-WUS power boosting without NR impacted**

**Agreements**

* For OFDM-based WUS waveform, reuse existing NR RE power control dynamic range of BS in TS 38.104 for LP-WUS as starting point. WUS power boosting should minimize any impacts on legacy UEs.
* RAN4 further check the feasibility of 6dB power boosting for LP-WUS assumed by RAN1

**Issue 1-5-1: Separated band for LP-WUS operation**

* **Agreements**
  + FFS in next meeting

#### 2.4.2 Remaining Open issues

The following open issues need to be addressed:

* From RAN4 perspective, study and evaluate low-power wake-up receiver architectures [RAN1, RAN4]
* From RAN4 perspective, study and evaluate wake-up signal designs to support wake-up receivers [RAN1, RAN4]
* Final LS feedback to RAN1 on LP-WUR architecture
* RAN4 further TPs on LP-WUR RF aspects to TR (if needed)

## 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.

RAN1#114

1. [R1-2307829](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307829.zip) Draft TR38.869v0.3.0 for including RAN1#113 agreements Rapporteur (CMCC), vivo
2. [R1-2307830](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307830.zip) Draft TP for TR38.869 for clean up Rapporteur (CMCC), vivo
3. [R1-2308389](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308389.zip) Draft TP for LP-WUS coverage results for TR38.869 Moderator (vivo)
4. [R1-2308391](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308391.zip) Draft TP for LP-WUS overhead evaluation results for TR38.869 Moderator (vivo)
5. [R1-2308437](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308437.zip) Draft TP for LP-WUS overhead evaluation results for TR38.869 Moderator (vivo)
6. [R1-2308387](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308387.zip) Draft TP for LP-WUS power evaluation results for TR38.869 – IDLE/INACTIVE Moderator (vivo)
7. [R1-2308603](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308603.zip) Draft TP for TR conclusion - evaluations Rapporteur (vivo)
8. [R1-2306428](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306428.zip) Evaluation of LP-WUS and Performance Results FUTUREWEI
9. [R1-2306548](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306548.zip) Evaluations for LP-WUS Huawei, HiSilicon
10. [R1-2306665](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306665.zip) Discussion on evaluation on low power WUS Spreadtrum Communications
11. [R1-2306691](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306691.zip) Discussion on evaluation on LP-WUS InterDigital, Inc.
12. [R1-2306769](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306769.zip) Evaluation results for R18 LP-WUS/WUR vivo
13. [R1-2306921](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306921.zip) Evaluation of low-power WUS Sony
14. [R1-2307062](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307062.zip) Remaining issues of Deployment scenarios and evaluation methodologies and preliminary performance results of LP-WUR CATT
15. [R1-2307142](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307142.zip) Evaluation on LP-WUS ZTE, Sanechips
16. [R1-2307215](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307215.zip) Remaining issues for evaluation methodology for LP-WUS/WUR CMCC
17. [R1-2307299](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307299.zip) On performance evaluation for low power wake-up signal Apple
18. [R1-2307356](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307356.zip) Evaluation on low power WUS xiaomi
19. [R1-2307418](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307418.zip) Low power WUS Evaluation Methodology Nokia, Nokia Shanghai Bell
20. [R1-2308234](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308234.zip) Low power WUS Evaluation Methodology Nokia, Nokia Shanghai Bell
21. Revision of [R1-2307418](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307418.zip)
22. [R1-2307490](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307490.zip) Evaluation methodology for low power WUS NTT DOCOMO, INC.
23. [R1-2307555](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307555.zip) Evaluation for lower power wake-up signal OPPO
24. [R1-2307699](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307699.zip) Evaluation on LP-WUS/WUR Samsung
25. [R1-2307831](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307831.zip) Draft TP for LP-WUS power evaluation results for TR38.869 – IDLE/INACTIVE Moderator (CMCC), vivo
26. [R1-2307832](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307832.zip) Draft TP for LP-WUS power evaluation results for TR38.869 – CONNECTED Moderator (CMCC), vivo
27. [R1-2307833](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307833.zip) Draft TP for LP-WUS coverage results for TR38.869 Moderator (CMCC), vivo
28. [R1-2307834](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307834.zip) Draft TP for LP-WUS network power consumption evaluation results for TR38.869 Moderator (CMCC), vivo
29. [R1-2307835](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307835.zip) Draft TP for LP-WUS overhead evaluation results for TR38.869 Moderator (CMCC), vivo
30. R1-2307836 FL summary #1 of evaluation on LP-WUS/WUR Moderator (CMCC)
31. [R1-2307948](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307948.zip) Evaluation methodology for LP-WUS Qualcomm Incorporated
32. [R1-2307989](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307989.zip) Low power WUS evaluations Ericsson
33. [R1-2308067](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308067.zip) Evaluation on low power WUS MediaTek Inc.
34. [R1-2307301](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307301.zip) Summary #1 on LP WUR architectures Moderator (Apple)
35. [R1-2307302](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307302.zip) Summary #2 on LP WUR architectures Moderator (Apple)
36. [R1-2307303](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307303.zip) Summary #3 on LP WUR architectures Moderator (Apple)
37. [R1-2308596](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308596.zip) draft TP for LP-WUR architecture analysis for TR38.869 Moderator (Apple)
38. [R1-2308604](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308604.zip) draft TP for the conclusion of TR38.869 on LP-WUR architecture Moderator (Apple)
39. [R1-2306549](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306549.zip) Discussion on architecture of LP-WUS receiver Huawei, HiSilicon
40. [R1-2306692](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306692.zip) Discussion on LP-WUS receiver architectures InterDigital, Inc.
41. [R1-2306770](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306770.zip) Remaining issues on low power wake-up receiver architecture vivo
42. [R1-2306804](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306804.zip) Discussion on low power wake up receiver architectures Panasonic
43. [R1-2307063](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307063.zip) Low-Power WUS receiver Architectures and its performance CATT
44. [R1-2307143](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307143.zip) LP-WUS receiver architectures ZTE, Sanechips
45. [R1-2307300](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307300.zip) On low power wake-up receiver architectures Apple
46. [R1-2307301](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307301.zip) Summary #1 on LP WUR architectures Moderator (Apple)
47. [R1-2307302](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307302.zip) Summary #2 on LP WUR architectures Moderator (Apple)
48. [R1-2307303](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307303.zip) Summary #3 on LP WUR architectures Moderator (Apple)
49. [R1-2307419](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307419.zip) Low Power WUS receiver architectures Nokia, Nokia Shanghai Bell
50. [R1-2307556](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307556.zip) Discussion on low power WUS receiver OPPO
51. [R1-2307700](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307700.zip) Receiver architecture for LP-WUS Samsung
52. [R1-2307949](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307949.zip) Receiver architecture for LP-WUS Qualcomm Incorporated
53. [R1-2307990](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307990.zip) Low power WUS receiver architectures Ericsson
54. [R1-2308068](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308068.zip) Low power WUS receiver architectures MediaTek Inc.
55. [R1-2308404](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308404.zip) Summary#1 of discussions on L1 signal design and procedure for low power WUS Moderator (Nordic Semiconductor ASA)
56. [R1-2308414](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308414.zip) Summary#2 of discussions on L1 signal design and procedure for low power WUS Moderator (Nordic Semiconductor ASA)
57. [R1-2308601](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308601.zip) TP for LP-WUS LLS observations Moderator (Nordic Semiconductor ASA)
58. [R1-2308602](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308602.zip) TP for Conclusions in 9.11.3 AI Moderator (Nordic Semiconductor ASA)
59. [R1-2306429](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306429.zip) LP-WUS Physical Signal Design and Performance FUTUREWEI
60. [R1-2306550](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306550.zip) Further details on signal design and procedure for LP-WUS Huawei, HiSilicon
61. [R1-2306626](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306626.zip) Discussion on L1 signal design and procedure for low power WUS EURECOM
62. [R1-2306666](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306666.zip) Discussion on L1 signal design and procedure for low power WUS Spreadtrum Communications
63. [R1-2306682](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306682.zip) L1 signal design and procedure for low power WUS TCL
64. [R1-2306693](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306693.zip) Discussion on L1 signal design and procedure for LP-WUS InterDigital, Inc.
65. [R1-2306771](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306771.zip) Discussion on physical signal and procedure for low power WUS vivo
66. [R1-2306805](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306805.zip) Discussion on low power wake up signal design Panasonic
67. [R1-2306922](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306922.zip) On L1 signal design and procedures for LP-WUS Sony
68. [R1-2306927](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2306927.zip) WUS Design Considerations and Impact on WUR Power Everactive
69. [R1-2307064](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307064.zip) Physical layer signals/procedures and higher layer protocol for Low-Power WUR CATT
70. [R1-2308204](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308204.zip) Physical layer signals/procedures and higher layer protocol for Low-Power WUR CATT
71. Revision of [R1-2307064](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307064.zip)
72. [R1-2307116](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307116.zip) Discussion on L1 signal design and procedure for LP-WUS NEC
73. [R1-2307144](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307144.zip) LP-WUS design and related procedure ZTE, Sanechips
74. [R1-2307216](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307216.zip) Discussion on L1 signal design for low power WUS CMCC
75. [R1-2307304](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307304.zip) On the L1 signal design and procedures for low power wake-up signal Apple
76. [R1-2307357](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307357.zip) Discussions on L1 signal design and procedure for low power WUS xiaomi
77. [R1-2307420](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307420.zip) L1 signal design and procedures for low power WUS Nokia, Nokia Shanghai Bell
78. [R1-2307491](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307491.zip) L1 signal design and procedure for low power WUS NTT DOCOMO, INC.
79. [R1-2307557](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307557.zip) Design consideration on lower power wake-up signal and procedure OPPO
80. [R1-2307625](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307625.zip) Discussion on signal design and procedure for LP-WUS China Telecom
81. [R1-2307701](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307701.zip) Signal design and procedure for LP-WUS Samsung
82. [R1-2307795](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307795.zip) Discussion on L1 signal design and procedure for LP-WUS LG Electronics
83. [R1-2307856](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307856.zip) Discussion on L1 signal design and procedure for low power WUS Sharp
84. [R1-2307950](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307950.zip) L1 signal design and procedures for LP-WUR Qualcomm Incorporated
85. [R1-2307991](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2307991.zip) L1 signal design and procedure for low power WUS Ericsson
86. [R1-2308022](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308022.zip) On LP-WUS signal design Nordic Semiconductor ASA
87. [R1-2308069](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308069.zip) L1 signal design and procedure for low power WUS MediaTek Inc.
88. [R1-2308102](file:///C:\Users\younsun\Documents\3GPP%20documents\RAN1%20tdocs\TSGR1_114\Docs\R1-2308102.zip) Discussion on the L1 signal design and procedure for low power WUS Lenovo

RAN2#123

1. [R2-2307305](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307305.zip) Work Plan for Rel-18 SI on LP-WUS/WUR vivo (Rapporteur) discussion Rel-18 FS\_NR\_LPWUS
2. [R2-2307306](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307306.zip) Update of TR 38.869 for LP-WUS WUR vivo (Rapporteur) discussion Rel-18 FS\_NR\_LPWUS
3. [R2-2309267](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2309267.zip) Report of [Offline-026][LP-WUS] Idle/inactive aspects vivo
4. [R2-2308809](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308809.zip) LP-WUS/WUR for RRC Idle and Inactive Ericsson discussion Rel-18
5. [R2-2307082](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307082.zip) Use of low-power receiver in RRC Idle/Inactive Qualcomm Incorporated discussion Rel-18 FS\_NR\_LPWUS
6. [R2-2307261](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307261.zip) Discussion on coverage impact for LP-WUR OPPO discussion Rel-18 FS\_NR\_LPWUS
7. [R2-2307274](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307274.zip) Discussion on LP-WUS in RRC IDLE and INACTIVE Continental Automotive discussion
8. [R2-2307307](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307307.zip) Discussion on LP-WUS WUR in RRC\_IDLE/INACTIVE vivo discussion Rel-18 FS\_NR\_LPWUS
9. [R2-2307344](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307344.zip) General considerations on the procedure for RRC\_IDLE\_INACTIVE Xiaomi Communications discussion
10. [R2-2307423](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307423.zip) Discussion on LP-WUS in RRC\_IDLE&INACTIVE state CATT discussion Rel-18 FS\_NR\_LPWUS
11. [R2-2307453](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307453.zip) MR/LR UE behaviours for paging and mobility in RRC\_IDLE/INACTIVE state Huawei, HiSilicon discussion Rel-18 FS\_NR\_LPWUS
12. [R2-2307461](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307461.zip) Discussion on the considerations for LPWUS in RRC\_IDLE INACTIVE NEC Corporation discussion FS\_NR\_LPWUS
13. [R2-2307516](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307516.zip) LP-WUS in RRC IDLE and INACTIVE Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_NR\_LPWUS
14. [R2-2307591](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307591.zip) RAN2 impacts of LP-WUS in idle or inactive mode ZTE Corporation, Sanechips discussion Rel-18 FS\_NR\_LPWUS R2-2305960
15. [R2-2307848](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307848.zip) RAN2 impact of LP-WUS in RRC\_IDLE/INACTIVE state Apple discussion Rel-18 FS\_NR\_LPWUS
16. [R2-2308168](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308168.zip) Considerations on LP-WUR in RRC Idle/Inactive mode Sony discussion Rel-18 FS\_NR\_LPWUS
17. [R2-2308460](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308460.zip) LP-WUS in RRC Idle/ Inactive Mode Lenovo discussion Rel-18 FS\_NR\_LPWUS
18. [R2-2308748](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308748.zip) On LP-WUS in RRC\_CONNECTED Nokia, Nokia Shanghai Bell discussion FS\_NR\_LPWUS R2-2306312
19. [R2-2308828](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308828.zip) On impact to IDLE/INACTIVE procedures to support LP-WUR SAMSUNG R&D INSTITUTE INDIA discussion Rel-18
20. [R2-2307083](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307083.zip) Use of low-power receiver in RRC Connected Qualcomm Incorporated discussion Rel-18 FS\_NR\_LPWUS
21. [R2-2307308](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307308.zip) Discussion on LP-WUS/WUR in RRC\_Connected vivo discussion Rel-18 FS\_NR\_LPWUS
22. [R2-2307260](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307260.zip) Discussion on LP-WUR’s operation OPPO discussion Rel-18 FS\_NR\_LPWUS
23. [R2-2307345](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307345.zip) Discussing on LP-WUS monitoring for RRC\_Connected Xiaomi Communications discussion
24. [R2-2307424](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307424.zip) Discussion on LP-WUS in RRC\_CONNECTED state CATT discussion Rel-18 FS\_NR\_LPWUS
25. [R2-2307449](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307449.zip) High layer procedures for LP-WUS in RRC\_CONNECTED state Huawei, HiSilicon discussion Rel-18 FS\_NR\_LPWUS
26. [R2-2307462](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307462.zip) Discussion on the considerations for LPWUS in RRC\_CONNECTED NEC Corporation discussion FS\_NR\_LPWUS
27. [R2-2307592](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307592.zip) RAN2 impacts of LP-WUS in connected mode ZTE Corporation, Sanechips discussion Rel-18 FS\_NR\_LPWUS R2-2305961
28. [R2-2307849](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2307849.zip) RAN2 impact of LP-WUS in RRC\_CONNECTED state Apple discussion Rel-18 FS\_NR\_LPWUS
29. [R2-2308461](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308461.zip) LP-WUS in RRC Connected Mode Lenovo discussion FS\_NR\_LPWUS
30. [R2-2308532](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308532.zip) Discussion on LP-WUS in RRC\_CONNECTED Continental Automotive discussion
31. [R2-2308810](file:///C:\Users\mtk65284\Documents\3GPP\tsg_ran\WG2_RL2\RAN2\Docs\R2-2308810.zip) LP-WUS/WUR for RRC Connected Ericsson discussion Rel-18 FS\_NR\_LPWUS

RAN4#108:

1. R4-2311233 Rationale for LP-WUS separate band Apple
2. R4-2311234 Impact of LP-WUS design on system coexistence Apple
3. R4-2311294 LP-WUS ACS and ASCS Guard Band Murata Manufacturing Co Ltd.
4. R4-2311502 Evaluation of Low power wake-up receiver architectures Nokia, Nokia Shanghai Bell
5. R4-2311812 Discussion on low power WUS architecture CMCC
6. R4-2311902 TP to TR 38.869: Low-power wake-up receiver RF aspects Qualcomm Inc.
7. R4-2312248 Further consideration on LP-WUS/WUR Huawei, HiSilicon
8. R4-2312570 Discussions on low-power Wave-up Receiver architectures vivo
9. R4-2312571 [draft] Reply LS to RAN1 on low-power wake-up receiver architectures vivo
10. R4-2312572 [Draft] TP to TR 38.869 on LP-WUR architectures RAN4 part vivo
11. R4-2312926 Discussion on ACS and ASCS of LP-WUR OPPO, CAICT
12. R4-2313199 Views on low-power wake-up signal and receiver for NR Sony
13. R4-2313476 LS reply on low-power wake-up receiver architectures Ericsson
14. R4-2314221 Topic summary for [108][139] FS\_NR\_LPWUS Moderator (Vivo)
15. R4-2314725 Reply LS to RAN1 on low-power wake-up receiver architectures vivo
16. R4-2314931 Reply LS to RAN1 on low-power wake-up receiver architectures vivo
17. R4-2314665 Discussions on low-power Wave-up Receiver architectures vivo
18. R4-2314726 TP to TR 38.869 on LP-WUR architectures RAN4 part vivo
19. R4-2314727 WF on FS\_NR\_LPWUS vivo
20. R4-2314932 WF on FS\_NR\_LPWUS vivo
21. R4-2314928 Ad hoc minutes for FS\_NR\_LPWUS vivo

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