**3GPP TSG-RAN WG4 Meeting #111 R4-240xxxx**

**Fukuoka City, Fukuoka, Japan, 20th – 24th May, 2024**

**Agenda item:** 10.14.5

**Source:** vivo

**Title:** WF for [111][136] NR\_LPWUS\_UERF

**Document for:** Approval

# Introduction

This is WF for Rel-19 LP-WUS UE RF.

# Topic #1: General and system parameters

### Sub-topic 1-1 General and system parameters

**Issue 1-1-1: Operation bands for LP-WUS feature**

**Agreements:**

RAN4 confirm LP-WUS is a general feature not limited to specific example band(s)

**Issue 1-1-2: FR1 example bands for requirements as phase 1**

**Proposed WF:**

No need to list specific example band(s)

**Issue 1-1-5: Rx diversity gain assumption for LP-WUR**

**Agreements:**

No diversity gain as baseline for FR1. More Rx could be implementation choice

**Issue 1-1-6: CBW and RB number for LP-WUR**

*Moderator：this has been discussed and decided in LLS parameters. No agreements needed*

**Issue 1-1-7: Channel raster for LP-WUR**

**Agreements:**

RAN4 further check whether no channel raster is needed for LP-WUR.

**Issue 1-1-8: system parameters for LP-WUR**

*Moderator：based on discussion, only channel raster needs further check. No agreements needed*

**Issue 1-1-9: Side condition for LP-WUR requirements**

**Proposed WF:**

* + **FFS RAN4 should consider both idle and connected mode conditions in the side conditions for the LPWUR requirements.**

**1-1-11Metric for LP\_WUR requirements**

* + **along with FAR will be used as the metric for LP\_WUR requirements**
    - **MDR and FAR values.**

# Topic #2: REFSENS, ASCS and ACS requirements

### Sub-topic 2-1 Alignment of LLS parameters to specify ACS/ASCS requirements

**Issue 2-1-1: Center frequencies for LLS simulation**

**Agreement:**

* For ACS and ASCS simulation, select 900MHz, 2.6GHz and 3.5GHz as example frequencies for FR1.
* FFS on FR2 example band(s)

**Issue 2-1-2: Performance metric (MDR/BLER value) for LLS simulation (apply to ACS/ASCS and REFSENS)**

**Agreement:**

* For LLS simulation (apply to ACS/ASCS and REFSENS), the metric includes
  + 1% MDR/BLER as baseline and 5% MDR/BLER as optional
  + The following false alarm rate can be considered
    - 1%
    - 5%
    - Providing the information whether the false alarm rate is considered or not
* Further down-select the performance metric for the requirements and testing

**Issue 2-1-3: Waveform for LLS simulation**

**Agreement:**

* Use both OOK1 and OOK4 based on RAN1 agreements for link level simulations

**Issue 2-1-4: number of LP-WUS RBs for LLS simulation**

**Agreement:**

* Assume 11PRB for LP-WUS signal with 30kHz SCS for simulations
* FFS on RB number(s) for 15KHz SCS depending on RAN1 decision

**Issue 2-1-5: number of ADC assumption for LLS simulation**

**Agreement:**

* Number of ADC assumption for LLS simulation
  + Option 1: 8 bit
  + Option 2: 4 bit
  + Encourage companies to provide simulation results with both options for comparison

**Issue 2-1-6: Frequency error assumption for LLS simulation**

**Agreement**

* Frequency error assumption for LLS simulation
  + Up to 20ppm

**Issue 2-1-7: Phase noise model for LLS simulation**

**Agreement:**

* Not needed in LLS. Consider as RF impairment of implementation.

**Issue 2-1-8: For ASCS, the BWinterferer for ASCS evaluation**

**Agreement:**

* For ASCS evaluation, only 10MHz and 20MHz NR CBWs are assumed and the BWinterferer is
  + All RBs between WUS edge to channel edge

**Issue 2-1-10: The overall simulation parameters for LLS simulation**

**Agreement:**

* Wait for RAN1 conclusion on FR2 to decide the parameters for evaluations

|  |  |  |  |
| --- | --- | --- | --- |
| Attributes | Assumptions | | |
| Case name (waveform) | OOK-1 waveform | | OOK-4 waveform |
| Center frequency | 900MHz, 2.6GHz and 3.5GHz | | |
| Channel structure | Total 8/16 bits | | |
| Chip rate | M=1 | M=1/2/4 | |
| WUS duration | FFS | | |
| Coding | 1/2 rate Manchester coding | | |
| Time error | 0 | | |
| Residual Frequency error | 0/10/20 ppm | | |
| SCS | 30kHz | | |
| UE Channel BW | 20MHz (51 RB)-case 1  10MHz (24 RB)-case 2  5MHz (11 RB)-case 3 | | |
| WUS RB | * Fixed 11RB ~ 3.96MHz for 10MHz and 20MHz cases | | |
| Position within channel | * For 10/20MHz CBW, Center for ASCS, edge for ACS [assume no ASCS impact] * For 5MHz CBW, fixed center of channel | | |
| Guardband of NR channel, both wanted cell and interfer cell (ACS) | * For wanted signal: 505kHz for 5MHz, 665kHz for 10MH, 805kHz for 20Mhz * For interference cell2 5MHz: fixed 505kHz | | |
| Guard RB | * For ASCS: 0 or 1RB on each side of LP-WUS bandwidth * For ACS: 1/2/3/4 RB | | |
| Filter | * 3th/5th Order lowpass Butterworth matching fixed 3.96MHz RF bandwidth for 10MHz/20MHz case   + Other order lowpass filter is not precluded * The filter bandwidth is adapted with actual WUS RBs, for 5MHz case | | |
| ASCS | PDSCH mapped on RBs not used for LP-WUS and Guard RB;  EPRE of PDSCH /EPRE of LP-WUS = 0 dB  Same PSD with WUS signal | | |
| ACS | PDSCH mapped on interference RBs (11RB for 5MHz CBW), one side;  EPRE of PDSCH /EPRE of in-band LP-WUS = [20~33] dB  NOTE: decide the interference level depending on SNR | | |
| Wanted signal level | For ACS, REFSENS + 14 dB for LP-WUS | | |
| Sampling rate | 7.68MHz | | |
| ADC bit width | 4/8 bits ADC for ASCS/ACS  Encourage companies to provide simulation results with both options for comparison | | |
| Phase noise | Not modelled | | |
| Non-linearities | Not modelled | | |
| Power boosting | EPRE ratio: 0dB/3dB for OOK-1/OOK-4  NOTE: 3dB is optional for simulation | | |
| Channel Model | Option 1: TDL-C 300  Option 2: AWGN  Note: encourage companies to provide simulation results with both options | | |
| Performance metric | * + 1% MDR/BLER as baseline and 5% MDR/BLER as optional   + The following false alarm rate can be considered     - 1%     - 5%   Providing the information whether the false alarm rate is considered or not | | |

### Sub-topic 2-2 REFSENS requirements

**Issue 2-2-2: signal configuration for REFSENS requirements**

* Proposals
  + **Proposal 1: Both LP-SS and LP-WUS should be configured in REFSNES test. (Samsung)**
* Recommended WF
  + TBD

*Moderator：based on ad-hoc discussion, it is common understanding no NR signal and no need to further clarify LP-WUS currently, can be detailed in test case stage discussion*

**Issue 2-2-3: SNR value (not requirement) for REFSENS**

Proposed WF

* + Stick to last meeting agreements: Wait for RAN1 SNR progress

**Issue 2-2-4: NF Gap between LR and MR for REFSENS (assume MR as 9dB)**

* Proposals
  + **Option 1: +5dB for OFDM-based, +8dB for OOK-based**
  + **Option 2: +2dB, +5dB, +8dB for LR’s NF.**
  + **Option 3: 0dB for the OFDM signal, +3-6dB gap for OOK signal.**
  + **Option 4:** +**3 dB gap as a baseline for LP\_WUR.**
  + **Option 5: +0-7dB for OFDM-based, +3~7dB for OOK-based.**
  + **Option 6: +2 dB for OFDM-based, +8dB for OOK-based.**
  + **Option 7: +5dB for OOK-based.**
* Recommended WF
  + Discuss based on the summarized value

Proposed WF

* + RAN4 further discuss potential NF for OOK-based and OFDM-based receiver.
  + Linked to resolution of Issue 2-2-8

**Issue 2-2-5: Diversity Gain value for REFSENS**

*Moderator：covered by issue 1-1-5*

**Issue 2-2-6: IM value for REFSENS**

Proposed WF

* + RAN4 further discuss potential IM value for OOK-based and OFDM-based receiver.

**Issue 2-2-7: False alarm rate requirements for LP-WUS receiver**

* Proposals
  + **Proposal 1: False alarm rate is a demodulation requirement related to the setting of the demodulation threshold. Whether to have false alarm rate should discuss in demodulation part not in FR part. (Xiaomi)**
  + **Proposal 2: False alarm rate can be considered as a dedicated performance requirements for baseband demodulation, e.g., X% FAR at -Y dBm AWGN level. (vivo)**
  + **Proposal 3: Whether we should define requirements of false alarm rate depends on RAN1’s progress. (Spreadtrum)**
  + **Proposal 4: RAN4 to introduce a requirement for false alarm rate for LP-WUS in order to guarantee the merits of introducing LP-WUS/LP-WUR. (CATT)**
* Recommended WF
  + Consider FAR as demodulation requirements

*Moderator：covered by issue 2-2-1*

**Issue 2-2-8: Whether a baseline architecture is needed for LP-WUS receiver**

* Proposals
  + **Proposal 1: Agree to use zero-IF receiver as a baseline architecture for LP\_WUR. (Nokia)**
  + **Proposal 2: Exclude RF envelope detection architecture for LP-WUR. (ZTE, Sony)**
  + **Proposal 3: It is proposed that RAN4 start to select candidate LP-WUR reference architectures, which will be used to derive the REFSENS requirements in the future. (Sony)**
  + **Proposal 4: RAN4 to decide one or two reference architectures prior to proceeding with the detailed specification of RF requirements for LP-WUR. (CATT)**
  + **Proposal 5: It is proposed to fully consider the antenna sharing and switching architecture when deciding NF and REFSNES requirements. (Samsung)**
* Recommended WF
  + Discuss NF for each type as architecture agnostic.

We do need a reference architecture to define NF.

### Sub-topic 2-3 ASCS requirements

**Issue 2-3-1: Align the definition of ASCS requirements**

* Proposals
  + **Proposal 1: The ASCS requirement definition should consider both the ASCS value in dB scale and also applicable guard RB. (CMCC)**
  + **Proposal 2: RAN4** **can specify the definition of ASCS, as following**
    - **Adjacent SubCarrier Selectivity (ASCS) is a measure of a receiver's ability to receive an LP-WUS signal at its assigned channel frequency in the presence of an adjacent subcarrier NR signal at a given frequency offset (guard RB) between LP-WUS and NR. ASCS is the ratio of the receive filter attenuation on the assigned LP-WUR channel frequency to the receive filter attenuation on the adjacent NR subcarrier**
* Recommended WF
  + TBD

Proposed WF

* + RAN4 can use the following ASCS definition as starting point.
    - **Adjacent SubCarrier Selectivity (ASCS) is a measure of a receiver's ability to receive an LP-WUS signal at its assigned channel frequency in the presence of an adjacent subcarrier NR signal at a given frequency offset (guard RB) between LP-WUS and NR. ASCS is the ratio of the receive filter attenuation on the assigned LP-WUR channel frequency to the receive filter attenuation on the adjacent NR subcarrier**

**Issue 2-3-2: ASCS requirements value**

* Proposals
  + **Proposal 1: If guard RB is specified for ASCS scenario, there is no need to define specific requirement for ASCS. (Huawei, vivo)**
    - **test case condition (e.g., bandwidth, power level, MDR) and required guard RB should be specified**
  + **Proposal 2: further investigating if the ACSC should be set to the same value as the ACS requirement. (Sony)**
* Recommended WF
  + Check whether proposal 1 is agreeable

Proposed WF

* + RAN4 further discuss whether ASCS requirements value should be specified, or just the test parameter are specified, i.e., LP\_WUS and NR signal bandwidths and power levels, and guard RBs.

**Issue 2-3-3: Required number of guard RB for ASCS**

* Proposals
  + **Proposal 1: It is proposed to adopt 1 RB as the size of guard RB for LP-WUS ASCS regardless of the applied SCS. (Huawei)**
  + **Proposal 2: RAN4 shall derive the number of guard RB based on some practical filter assumption once the ACS/ASCS requirement is agreed. (Sony)**
* Recommended WF
  + Guard RB value needs further discussion based on LLS outcome

Proposed WF

* + RAN4 further discuss required number of guard RB for ASCS based on LLS simulation outcome next meeting.

**Issue 2-3-4: Test case for ASCS**

* Proposals
  + **Proposal 1: The ASCS requirements can not be verified directly, the test case should be designed at a fixed DL power of NR and LP-WUS (same PSD, X dB higher than REFSENS) to check whether the MDR is within Y%. (vivo)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss detailed test parameters for ASCS.

### Sub-topic 2-4 ACS requirements

**Issue 2-4-1: Whether to update the ACS definition for LP-WUS**

* Proposals
  + **Proposal 1: the ACS requirement definition for LP-WUR. (vivo)**
    - **Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an ~~NR~~ LP-WUS signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the center frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 consider the following clarified ACS requirements definition for LP-WUS as starting point.
    - **Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an ~~NR~~ LP-WUS signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the center frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).**

**Issue 2-4-2: ACS requirements value**

* Proposals
  + **Proposal 1: It is proposed to relax ACS requirement for LP-WUR from co-existence and performance perspective. The proposed ACS could be in the range of 20~25dBc. (Huawei)**
  + **Proposal 2: Wen LP-WUS is located in a NR UE channel bandwidth larger than WUS signal and packed with NR legacy DL signal on both sides: (Xiaomi)**
    - **The ACS can keep the same requirements with legacy NR UE**
    - **The parameters of unwanted interferring for the narrow band blocking and in band blocking can reuse the values of legacy NR UE, the wanted signalling can be defined based on the REFSENS of LP-WUS.**
  + **Proposal 3: Define the ACS requirement for LP-WUS as 33 dB. (Sony)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 consider the how to specify ACS requirements. FFS same as MR.
    - Decision will be made based on LLS outcome

**Issue 2-4-3: Required guard RB for ACS case**

* Proposals
  + **Proposal 1: It is proposed to define 1 RB for 30kHz SCS as guard RB size for LP-WUR ACS case. (Huawei)**
  + **Proposal 2: RAN4 shall derive the number of guard RB based on some practical filter assumption once the ACS/ASCS requirement is agreed. (Sony)**
  + **Proposal 3: Define the ACS requirement with guard RBs as the LP-WUS signal at the edge of NR channel and the interference NR signal is directly next to the first NR channel. (OPPO)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss required number of guard RB for ACS based on LLS simulation outcome next meeting.

**Issue 2-4-4: Side condition for ACS test case**

* Proposals
  + **Proposal 1: - LP-WUS occupies all assigned NR UE channel bandwidth standalone as figure 2-4. (Xiaomi)**
* Recommended WF
  + TBA

*Moderator：covered by LLS simulation assumption*

**Issue 2-4-5: Test parameters for LP-WUR ACS case**

* Proposals
  + **Proposal 1: Test parameters defined in Table 7.5-3, 7.5-4, 7.5-5, and 7.5-6 of TS 38.101-1 apply for LP\_WUR ACS test case. (Nokia)**
    - **In test case where Pinterferer depends on REFSENS, main receiver REFSENS should be used**
* Recommended WF
  + TBD

*Moderator：further discuss detailed test parameters next meeting*

# Topic #3: Other RF requirements

### Sub-topic 3-1 General for UE RF

**Issue 3-1-1: IBB and OBB assumption**

* Proposals
  + **Proposal 1: The WUR should tolerate the same level RF interferer of IBB and OBB as main receiver. (E///)**
  + **Proposal 2: FFS whether LR can work well in presence of strong interference (Huawei)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further check and discuss whether same interference level of IBB and OBB as MR is assumed for LP-WUR.

**Issue 3-1-2: IBB and OBB requirements**

* Proposals
  + **Proposal 1: In order to guarantee the coverage of LP-WUR, the interference levels for IBB and OBB could be relaxed compared to the values defined for MR. (Huawei)**
  + **Proposal 2: The IBB/OBB can reuse legacy NR UE requirements. (CMCC, OPPO, Xiaomi)**
  + **Proposal 3: The IBB/OBB/intermodulation requirements for LP-WUS is related to the allocated position of LP-WUS signal within NR channel, the definition and test cases should be modified. (vivo)**
  + **Proposals 4: The WUR requirement should be set in relation to the MR channel bandwidth. (E///)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss detailed test condition for IBB and OBB, e.g., location of LP-WUS in-band, MR channel bandwidth, whether guard RBs are allocated, power level.
    - FFS IBB and OBB requirements

**Issue 3-1-3: IBB and OBB test case**

* Proposals
  + **Proposal 1: The DL power level for IBB/OBB requirements should also be re-evaluated for LP-WUS at different bandwidth and different location. (vivo)**
    - **The Guard RBs for ACS/ASCS should be configured for the above requirements**
  + **Proposal 2: The same of the degradation of wanted power level of the WUR. The same condition set for WUR REFSESN requirements should be extended for IBB and OBB test (E///)**
* Recommended WF
  + TBA

*Moderator：covered in issue 3-1-2*

**Issue 3-1-4: Intermodulation requirements**

* Proposals
  + **Proposal 1: FFS whether intermodulation requirement needs to be relaxed for LP-WUR. (Huawei)**
  + **Proposal 2: the WUR requirement should be tested with interferer setting from MR. (E///)**
  + **Proposal 3: The DL power level for intermodulation requirements should also be re-evaluated for LP-WUS at different bandwidth and different location. (vivo)**
    - **The Guard RBs for ACS/ASCS should be configured for the above requirements**
  + **Proposal 4:** **specify two sets of requirements for OFDM signal and OOK signal. (CMCC)**
* **The requirements in TS 38.101-1 for legacy UE could be reused for OFDM signal.**
* **New intermodulation requirements need to be specified for OOK signal.**
* Recommended WF
  + TBD

Proposed WF

* + RAN4 further discuss detailed test condition for Intermodulation requirements, e.g., location of LP-WUS in-band, MR channel bandwidth, whether guard RBs are allocated, power level.
    - FFS Intermodulation requirements requirement

**Issue 3-1-5: IF LP-WUS occupies all assigned NR UE channel bandwidth**

* Proposals
  + **Proposal 1: - The parameters of unwanted interferring for the narrow band blocking and in band blocking need be re-evaluated, the wanted signalling can be defined based on the REFSENS of LP-WUS. (Xiaomi)**
* Recommended WF
  + TBD

*Moderator：covered in issue 3-1-4*

### Sub-topic 3-2 spurious emissions and response requirements

**Issue 3-2-1: Spurious emissions requirements**

* Proposals
  + **Proposal 1: The same level of receiver spurious emissions for MR shall be defined for LR as well. (Huawei, CMCC, vivo, Xiaomi, OPPO, E///)**
* Recommended WF
  + TBD

Proposed WF

* + RAN4 conclude Spurious emissions requirements can be reused for LP-WUR.

**Issue 3-2-2: spurious response requirements**

* Proposals
  + **Proposal 1: spurious response as a remedial measure for blocking tests needs to be considered for LP-WUR. (Huawei)**
  + **Proposal 2: Spurious response should be treated the same with the IBB and OBB for WUR. (E///)**
* Recommended WF
  + TBD

Proposed WF

* + RAN4 further discuss whether spurious response requirements is needed for LP-WUR.

### Sub-topic 3-3 Other Rx requirements

**Issue 3-3-1: Maximum input level requirements**

* Proposals
  + **Proposal 1: Specify maximum input level requirements and side conditions for LP-WUR. (Nokia)**
    - **A single value as of -25 dBm is sufficient**
* Recommended WF
  + TBD

Proposed WF

* + RAN4 further discuss whether maximum input level requirements can be reused for LP-WUR.
    - FFS side condition

**Issue 3-3-2: Narrow band blocking requirements**

* Proposals
  + **Proposal 1: No need to define narrow band blocking requirements. (Nokia)**
* Recommended WF
  + TBD

Proposed WF

* + RAN4 conclude no need to define narrow band blocking requirements for LP-WUR.

# Topic #4: Testability issues

### Sub-topic 4-1 Testability for UE RF requirements

**Issue 4-1-1: Test performance metric**

* Proposals
  + **Proposal 1: Test metric should be aligned with the performance metric of each requirement.**
  + **Proposal 2: If the additional test mode would be preferred from RAN5 perspective, ask also if other testing metric would be better than MDR. E.g (BER/BLER)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss whether test metric is aligned with the metric for requirements, i.e., different values of metric defined in Issue 1-1-11.

**Issue 4-1-2: Separate RF test case for idle and connection mode**

* Proposals
  + **Proposal 1: Test cases should be designed separately LP-WUS operation in IDLE/INACTIVE mode and CONNECTED mode since the procedures are different and the LP-WUS signals could be different for these modes. (Huawei)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss whether different test case should be defined for IDLE/INACTIVE mode and CONNECTED mode.
    - FFS test procedure and parameters

**Issue 4-1-3: BLER/MDR counting based on MR wake-up or not**

* Proposals
  + **Proposal 1: Counter the detection rate without waking up the MR would be enough for the LP-WUS test in terms of verifying the RF requirements. (Huawei, vivo)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss BLER/MDR counting approach.

**Issue 4-1-4: How to get feedback from LP-WUR**

* + **Proposal 1: For LP-WUR testability issue, RAN4 can consider the following two options, e.g., (vivo)**
    - **Option1: MR connection mode, but MR should not receive and detect LP-WUS signal. The MDR can be calculated based on “ACK/NACK” results of LP-WUR which is feedback to gNB by MR**
    - **Option2: MR idle mode, there is no LP-WUS feedback to gNB during testing, a new UE test mode is needed. MR should be waken-up after testing of all LP-WUS signal and connected to gNB to feedback the LP-WUS detection results**
  + **Proposal 2: Feedback from the UE regarding LP-WUR performance should be gathered in the RRC\_CONNECTED mode. (Nokia)**
  + **Proposal 3: RNA4 should determine to perform the test of LP-WUR in IDLE mode or CONNECTED mode first. (ZTE)**
    - **For IDEL mode test, TE should be designed to transmit Paging message corresponding to LP-WUS and receive PRACH from the main radio after LP-WUS is transmitted**
    - **For CONNECTED mode test, legacy test method can be reused while the test metric is MDR (or with FAR together) rather than throughput**
  + **Proposal 4: After setting up the test mode in connected mode, when the UE enters into the IDLE/INACTIVE mode, the UE can record the detection rate and false alarm rate then report the rates to TE when the UE enter back to the connected mode. The test mode as well as the details of the test mode can also be left to RAN5. (Huawei)**
* Recommended WF
  + TBA

Proposed WF

* + RAN4 further discuss how to feedback the LP-WUS detection results to gNB for counting BLER/MDR.

**Issue 4-1-5: Consider FAR for LP-WUS RF test or not?**

* + **Proposal 1: False alarm rate should be considered for the LP-WUS test. (Huawei, Nokia)**
  + **Proposal 2: FAR is considered as demodulation test metric but not RF. (E///, vivo)**
* Recommended WF
  + TBA

*Moderator：covered in issue 1-1-11*

**Issue 4-1-6: detailed Test configuration**

* + **Proposal 1: Set the SNR of the PDCCH higher than TS 38.101-4 for the corresponding antenna configuration of main receiver to decrease the PDCCH detection impact on WUR testing metric. (E///)**
  + **Proposal 3: A higher SNR for the main radio signals can be used, so that we just test the performance of the LP-WUR. RAN5 can decide the confidence level to be used for testing the LP-WUR requirements in a reasonable amount of time. (Nokia)**
* Recommended WF
  + TBA

*Moderator：FFS detailed test configuration for each requirement*

**Issue 4-1-7: detailed Test procedure**

* + **Proposal 1: RAN5 defines the detailed test procedure for the conformance tests. (Nokia)**
  + **Proposal 2: Leave the details of test cases design to RAN5. (Huawei)**
* Recommended WF
  + TBA

*Moderator：FFS detailed test procedure. However, Aligned understanding in RAN4 is needed*

**Issue 4-1-8: UE test mode for LP-WUR**

* Proposals
  + **Option 1: UE test mode is needed.**
  + **Option 2: other**
* Recommended WF
  + TBA

Proposed WF

* + A UE test mode is needed for LP-WUS requirements testing.

**Issue 4-1-9: whether a LS to RAN5 on test issue**

* Proposals
  + **Proposal 1: Discuss if a LS to RAN5 or a note in RAN4 specification is sufficient. (Nokia)**
  + **Proposal 2: Send a LS to RAN5 to see if MDR could be further optimized from testing perspective. (E///)**
    - **RAN4 are discussing the test metric for wake up receiver RF performance test. As the WUR only detect LP-WUS/LP-SS and no other signals, legacy throughout monitoring for PDSCH is not possible anymore. Therefore, RAN4 propose the test metric of Miss Detection Rate of LP-WUS (target 1%) as one option. To test MDR of LP-WUS, there are two options to do it and RAN4 agree that it will be up to RAN5 to decide which options is suitable for WUR receiver test**
    - **Two options below to test**
      * **Using the legacy paging procedure to detect successfully LP-WUS reception by WUR**
      * **New test mode for testing the successfully LP-WUS reception by WUR**
    - **RAN4 also want to ask if the new test mode would be preferred from testing time perspective, would the test metric of BER/BLER be a better performance metric than MDR (1%).**
* Recommended WF
  + TBA

Proposed WF

* + Further discuss requirements and potential test case, FFS whether LS to RAN5 is needed.