**3GPP TSG-RAN WG4 Meeting # 111 R4-2410296**

[Fukuoka City,](https://www.3gpp.org/Specification-Groups/) Japan, 20 May – 24 May, 2024

**Agenda item:** 10.14.5

**Source:** Moderator (vivo)

**Title:** WF for RRM core requirements for LP-WUS/WUR

**Document for:** Information

# Topic #1: RRM core requirements for LP-WUS/WUR

### Sub-topic 1-1 General aspects

**Issue 1-1-2: Cases/states to be considered for RRM relaxation**

Agreement: Discuss the RAN4 requirements first for the following case #1, and FFS for case #2 to #5.

|  |  |  |  |
| --- | --- | --- | --- |
| **RRM measurement case index** | **MR serving cell measurement** | **MR neighboring cell measurement** | **LR measurement** |
| #1 Fully offloading case | Off  | Off: FFS the condition and the details | ON |

RAN4 to further discuss case #2 to #4:

|  |  |  |  |
| --- | --- | --- | --- |
| RRM measurement case index | MR serving cell measurement | MR neighboring cell measurement | LR measurement |
| #2 Relaxed case a | On with relaxation measurement | Off | ON |
| #3 Relaxed case b | On with relaxation measurement | On with relaxation measurement | ON |
| #4 Relaxed case c | Off  | On, FFS the condition and the details | ON |

FFS on other topics listed in [1] for sub-topic 1-1

### Sub-topic 1-2 LP-WUR requirements at RRC\_IDLE/INACTIVE state

FFS on topics listed in [1] for sub-topic 1-2

### Sub-topic 1-3 MR RRM relaxation

FFS on topics listed in [1] for sub-topic 1-3

### Sub-topic 1-4 Simulation work and assumptions

**Issue 1-4-2: LP-SS periodicity for evaluation**

Agreement:

* As starting point for RAN4 simulation purpose, uses 320 ms as the LP-SS periodicity in IDLE/Inactive mode, and other values based on RAN1/2 discussion are not precluded.
	+ Not consider the MR DRX configuration in the simulation.

**Issue 1-4-5: Simulation assumptions**

Agreement:

First start the simulation for FR1, and FFS for FR2 pending on the RF progress.

Recommendations:

Companies are encouraged to provide simulation assumptions based on framework in the appendix.

FFS on topics listed in [1] for sub-topic 1-4

### Sub-topic 1-5 LP-WUR CONNECTED mode

FFS on topics listed in [1] for sub-topic 1-5

### Sub-topic 1-6 Others

FFS on topics listed in [1] for sub-topic 1-6

# Reference

[1] R4-2408026, Topic summary for [111][229] NR\_LPWUS, RAN4 111, vivo

# Appendix: Simulation assumptions (for information purpose only)

Table 1: General parameters

|  |  |
| --- | --- |
| **Simulation parameters** | **Comments/values** |
| Carrier frequency for Cell 1 and Cell 2 | FR1: 2.6 GHz/700MHz |
| System bandwidth | 20/100 MHz; |
| Prior knowledge of Cell 1 / Cell 2 by the UE | No / Yes |
| DRX | No |
| BS transmit antennas for LP-SS blocks | 1 tx or single layer transmissions |
| UE receive antennas | 1 rx  |
| Data and control channel subcarrier spacing | OFDB based: The same as SS block subcarrier spacingOOK based: the same as one of the SCS(s) used for other NR transmissions in the same CP-OFDM symbol  |
| Measurement period (in number of measurement samples) |  OOK based: [5, other number of samples may also be studied upon a need]OFDM based: [5] |
| Subcarrier spacing | 2.6GHz: 15 kHz and 30 kHz; 700MHz: 15kHz |
| Number of LP-SS blocks per SS burst set, K | [1] |
| LP-SS/SSB burst periodicity | [320 ms]OFDB based: [320 ms] |
| Number of transmit antenna ports | 1 (the same port for NR-SSS, NR-PSS, NR-PBCH) |
| LP-SS block BW | [144 subcarriers for SCS=30kHz;][288 subcarriers for SCS=15kHz ]Note: May need be updated based on RAN1 conclusion |
| Actual LP-SS block transmissions | always transmitted |

Table 2: Cell-specific parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 1 | Cell 2 |
| RF Channel number | - | Channel 1 | Channel 1 |
| NR-PSS,NR-SSS and LP-SS sequences | - | To be indicated by companies | To be indicated by companies |
| PBCH and DMRS power offset with respect to NR-PSS, NR-SSS and LP-SS | dB | 0 | 0 |
| Data and control PSD relative to NR-PSS,NR-SSS and LP-SS | dB | 0 | 0 |
| RB Utilization | % | 100 | 100 |
| LP-SS |  | OOK-1;OOK-4 with M = 2,4; |  [when Cell 1 uses OOK-1; OOK-1 or NR signal is used for Cell 2][when Cell 1 uses OOK-4,OOK-4 or NR signal is used for Cell 2] |
| LP-SS pattern |  | Company report | Company report |
| Data Modulation | - | [OOK based: OOK][OFDM based: QPSK] | [OOK based: QPSK/OOK][OFDM based: QPSK] |
| Slot length | - | 14 symbols | 14 symbols |
| CP Length | - | Normal | Normal |
| Frequency Offset relative to UE frequency reference | Hz | [TBD] | [TBD] |
| 1)Relative Delay of 1st Path (synchronous) | µs | 0 | [CP/2] |
| 2) Relative Delay of 1st Path (asynchronous): Fixed delay | Ms | 0 | [3 ms] |
| SNR  | dB | OFDM based: [TBD]OOK based: [TBD] | OFDM based: [TBD]OOK based: [TBD]  |
| Es/IoT (calculated from SNR) | dB | N/A | OFDM based: [TBD]OOK based: [TBD] |
| Propagation conditions | - | FR1:AWGNTDL-A 30nsTDL-B 100nsTDL-C 300ns |
| UE speed |  | FR1: 30 km/h |
| NOTE: the companies are encouraged to state channel model parameters together with the results, the parameters are to be further discussed and aligned |

Table 3: UE-specific parameters

|  |  |
| --- | --- |
| [Receiver Filter] | [5th Order Butterworth with 4.32MHz bandwidth] |
| [Receiver ADC bit width] | [4/8-bitADC] |
| [Receiver Sampling Rate for LP-SS only] | [3.84/7.68MHz] |