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3GPP TSG RAN Meeting #101

Bangalore, India, September 11 - 15, 2023

Agenda item: 8A.2.12.1

RP-231877

Low-power Wake-up Signal and Receiver for NR

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Motivation for LP-WUS/WUR

- In Rel-18, a Study Item on LP-WUS/WUR is ongoing, in which the evaluation methodology & KPIs, receiver architectures of LP-WUR, L1 signal design, PHY and higher layer procedures are studied.
- The primary target is supporting LP-WUS/WUR for power-sensitive, small form-factor devices including IoT use cases (such as industrial sensors, controllers and wearables). Other use cases are not precluded, e.g. XR/smart glasses, smart phones.
- In Rel-19, it is proposed to start a WI on LP-WUS/WUR based on the outcomes of the SI.

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Overview of new WI

- Following Rel-18 SI, start WI for the fundamental parts of LP-WUS/WUR
  - Introduce LP-WUS for both RRC_IDLE/INACTIVE and RRC_CONNECTED, to better exploit the power saving benefits brought by LP-WUS
    - In draft TR 38.869, considerable power saving gains can be observed for both RRC idle/inactive and RRC connected
  - Introduce LP-SS for synchronization and measurement
    - Compared to OFDM based SS, an LP-WUS-waveform based LP-SS is beneficial for the LR architectures which utilize envelop detector
  - Offload RRM measurement to LR to further reduce the active time of MR
  - Address potential coverage difference between LR signal and MR signal for a specific UE
    - Strive for same/similar coverage, however to handle the issue of potential higher misdetection probability of LP-WUS

MR power state transition triggered by LP-WUS/WUR

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Objectives for LP-WUS

- Specify signal generation for LP-WUS and LP-SS, including:
  - Signal generation for LP-WUS and LP-SS, including baseband signal generation, encoding, multiplexing with other signal/channels, etc.
- Specify L1 procedures to support LP-WUS/WUR, including:
  - UE monitoring configuration and monitoring procedure for LP-WUS
  - Synchronization and measurement procedure based on LP-SS
- Specify higher layer enhancement to support LP-WUS/WUR in RRC_IDLE/INACTIVE and RRC_CONNECTED, including:
  - Enhancement on paging/PEl monitoring behavior to support LP-WUS/WUR in RRC IDLE/INACTIVE
  - Enhancement on C-DRX and PDCCH monitoring behavior to support LP-WUS/WUR in RRC_CONNECTED
  - Support of entry/exist condition and network awareness of LP-WUS monitoring
  - LP-WUS content and LP-WUS grouping mechanism
  - Support of RRM measurement by LR (at least for serving cell and intra-frequency measurement), and relaxed RRM measurement by MR

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Summary

- As the continuation from the Rel-18 SI, the work on LP-WUS/WUR should be done based on the outcome of the SI.
- All new functions including new receiver architecture shall be operated in a cell supporting legacy UEs, as confirmed in the SI.

- **Proposal:** New WI of LP-WUS/WUR is approved for Rel-19 with the following objectives (details as in slide#4):
  - Specify signal generation for LP-WUS and LP-SS
  - Specify L1 procedures to support LP-WUS/WUR
  - Specify higher layer enhancement to support LP-WUS/WUR in RRC_IDLE/INACTIVE and RRC_CONNECTED

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