**3GPP TSG RAN WG1 #102-e R1-200xxxx**

**e-Meeting, Aug 17th – 28nd, 2020**

**Title: [draft]** LS on evaluation methodology for UE power saving enhancements

**Response to:**

**Release:** Release 17

**Work Item:** NR\_UE\_pow\_sav\_enh

**Source:** MediaTek, RAN1

**To:** RAN2

**Cc:** RAN4

**Contact Person:**

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**Attachments:** None

**1. Overall Description:**

In RAN1#102-e, RAN1 updates the evaluation methodology related to paging enhancement(s) for Rel-17 UE power saving enhancements. RAN1 would like to inform RAN2 the following related agreements:

Agreements:

For study of Rel-17 paging enhancement, the following are assumed as a baseline for FR1 and FR2:

* Reference configuration for FR1/FR2 as specified in Section 8.1.1/8.1.2 of TR 38.840
	+ Note: the setting for some PDSCH parameters may not be applicable for RedCap UEs
* Baseline paging cycle length: [1.28] second
* SS burst related assumptions:
	+ 20 ms periodicity
	+ 2 ms duration for serving cell RRM measurement, which can overlap with the one for synchronization before PO
	+ FFS time/frequency tracking
* Measurement related assumptions:
	+ 20 ms SMTC periodicity
	+ 2 ms SMTC window for intra-frequency RRM measurement, assuming synchronized deployment
	+ [5 ms SMTC window and 6 ms measurement gap for inter-frequency RRM measurement]
		- Note: RAN4 requirement assumes one frequency layer per measurement gap, and 0.5 ms is assumed for switch in/out a frequency layer
* Note: the inclusion of potential TRS/CSI-RS occasions can be considered

Agreements:

The following power consumption model for FR1 is utilized for the evaluations of Rel-17 UE power saving enhancements in idle/inactive mode

* FFS: FR2 power consumption model for idle/inactive mode operations

|  |  |  |
| --- | --- | --- |
| Power State | Relative Power(FR1 reference from TR 84.840) | Relative Power (Idle/inactive-mode operation with reception bandwidth 20 MHz) |
| Deep Sleep (PDS) | 1 | 1 |
| Light Sleep (PLS) | 20 | 20 |
| Micro sleep (PMS) | 45 | 45 |
| PDCCH-only (PPDCCH) | 100 | 50Note |
| PDCCH + PDSCH (PPDCCH+PDSCH) | 300 | 120 |
| PDSCH-only (PPDSCH) | 280 | 112 |
| SSB/CSI-RS proc. (PSSB) | 100 (synchronization or serving cell measurement) | 50 |
| Intra-frequency RRM measurement (Pintra) | ·        150 (synchronous case, N=8, measurement only; Pintra, meas-only)·        200 (combined search and measurement; Pintra, search+meas) | ·        [60] (synchronous case, N=8, measurement only; Pintra, meas-only)·        [80] (combined search and measurement; Pintra, search+meas) |
| Inter-frequency RRM measurement (Pinter) | ·        150 (measurement only per freq. layer; Pinter, meas-only)·        150 (neighbor cell search power per freq. layer; Pinter, search-only)·        Micro sleep power assumed for switch in/out a freq. layer | ·        [60] (measurement only per freq. layer; Pinter, meas-only)·        [150] (neighbor cell search power per freq. layer; Pinter, search-only)·        Micro sleep power assumed for switch in/out a freq. layer |
| Note: Power scaling to 20MHz reception bandwidth follows the rule in Section 8.1.3 of TR 38.840, i.e., max{reference power \* 0.4, 50}. |

Agreements:

Group paging rate of 10% is assumed for the evaluation of Rel-17 paging enhancement

* FFS: Another group paging rate > 10%
* Note: If UE sub-grouping is applied, the sub-group paging rate can be reduced w.r.t. the total sub-group number for a PO

Agreements:

For the study on paging enhancements to reduce unnecessary paging reception, the following metrics are considered:

* UE power saving gain (relative to a given feature or overall)
* Impact to UE paging detection probability
	+ FFS: Link level simulation assumptions
* System impact, including
	+ Additional resource overhead and its implications
	+ Impact to Rel-15/Rel-16 idle/inactive-mode UEs and connected-mode UEs
	+ Impact to other legacy functionalities, including SI change and ETWS indication
	+ [Note: NW energy consumption evaluation is not precluded]

Agreements:

* For the study of paging enhancement, 1, 2, or 3 SS burst processing is assumed before PO
	+ Note: in choosing one or more values (1, 2, or 3) for the evaluations, companies to provide justification

**2. Actions:**

**To RAN2:**

RAN1 respectfully asks RAN2 to take the evaluation methodology for paging enhancement(s) into account in the corresponding RAN2 study.

**3. Date of Next RAN1 Meetings:**

TSG-RAN WG1 Meeting 103-e 26 October – 13 November 2020 e-Meeting

TSG-RAN WG1 Meeting 104 01 – 05 March 2021 Athens, Greece