**3GPP TSG-RAN WG2 Meeting #110-e *draft\_R2-2005935***

**Online, 1st – 12th June 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.304** | **CR** | **0796** | **rev** | **1** | **Current version:** | **16.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | System support for Wake Up Signal | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh2-Core, LTE\_eMTC4-Core,  NB\_IOTenh3-Core, LTE\_eMTC5-Core | | | | |  | ***Date:*** | | | 2020-06-xx |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | SA2 sent LS (S2-2001578, S2-2003217) indicating that SA2 has discussed the impact of WUS on the MME paging strategy and concluded that with some MME paging strategies, e.g. always paging a UE in the entire TA list, this may lead to increased power consumption for UEs using WUS.  SA2 has approved a CR which restricts the usage of WUS to the last used cell (i.e. the cell in which the UE’s RRC connection was last released/ suspended). | | | | | | | | |
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| ***Summary of change:*** | | Specify that Paging with (Group) Wake up Signal is only used in the last cell on which where the UE received either *RRCConnectionRelease* or *RRCEarlyDataComplete* from the eNB. | | | | | | | | |
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| ***Consequences if not approved:*** | | Depending of MME paging strategy, (G)WUS may increase rather than decrease UE power consumption | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.4, 7.5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 23.401 CR 3600  TS 36.300 CR 1264 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Functionally, this CR is a mirror CR to CR 0795. It also applies to R16 GWUS | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## 7.4 Paging with Wake Up Signal

Paging with Wake Up Signal is only used in the last cell on which the UE received either *RRCConnectionRelease* or *RRCEarlyDataComplete* from the eNB.

When the UE supports WUS and WUS configuration is provided in system information, the UE shall monitor WUS using the WUS parameters provided in System Information. When the UE supports GWUS and GWUS configuration is provided in system information, UE shall monitor WUS using the GWUS parameters provided in System Information as defined in clause 7.5. When DRX is used and the UE detects WUS the UE shall monitor the following PO. When extended DRX is used and the UE detects WUS the UE shall monitor the following *numPOs* POs or until a paging message including the UE's NAS identity is received, whichever is earlier. If the UE does not detect WUS the UE is not required to monitor the following PO(s). If the UE missed a WUS occasion (e.g. due to cell reselection), it monitors every PO until the start of next WUS or until the PTW ends, whichever is earlier.

- *numPOs* = Number of consecutive Paging Occasions (PO) mapped to one WUS provided in system information where (*numPOs*≥1).

The WUS configuration, provided in system information, includes time-offset between end of WUS and start of the first PO of the *numPOs* POs UE is required to monitor. The timeoffset in subframes, used to calculate the start of a subframe *g*0 (see TS 36.213 [6]), is defined as follows:

- for UE using DRX, it is the signalled *timeoffsetDRX*;

- for UE using eDRX, it is the signalled *timeoffset-eDRX-Short* if *timeoffset-eDRX-Long* is not broadcasted;

- for UE using eDRX, it is the value determined according to Table 7.4-1 if *timeoffset-eDRX-Long* is broadcasted

Table 7.4-1: Determination of GAP between end of WUS and associated PO

|  |  |  |  |
| --- | --- | --- | --- |
|  | | *timeoffset-eDRX-Long* | |
| *1000ms* | *2000ms* |
| *UE Reported wakeUpSignalMinGap-eDRX* | ***40ms or not reported*** | *timeoffset-eDRX-Short* | *timeoffset-eDRX-Short* |
| ***240ms*** | *timeoffset-eDRX-Short* | *timeoffset-eDRX-Short* |
| ***1000ms*** | *timeoffset-eDRX-Long* | *timeoffset-eDRX-Long* |
| ***2000ms*** | *timeoffset-eDRX-Short* | *timeoffset-eDRX-Long* |

The timeoffset is used to determine the actual subframe *g*0 as follows (taking into consideration resultant SFN and/or H-SFN wrap-around of this computation):

*g*0 = PO – timeoffset, where PO is the Paging Occasion subframe as defined in clause 7.1

For UE using eDRX, the same timeoffset applies between the end of WUS and associated first PO of the *numPOs* POs for all the WUS occurrences for a PTW.

The timeoffset, *g*0, is used to calculate the start of the WUS as defined in TS 36.213 [6].

## 7.5 Paging with Group Wake Up Signal

### 7.5.1 General

Paging with Group Wake Up Signal is only used in the last cell on which the UE received either *RRCConnectionRelease* or *RRCEarlyDataComplete* from the eNB.

When the UE supports GWUS and GWUS configuration (*gwus-Config*) is provided in system information, the UE shall monitor GWUS using the GWUS parameters provided in System Information.

A UE supporting GWUS can be configured to monitor a group WUS and a common WUS. Upon detecting either of the WUS, UE shall monitor POs as defined in clause 7.4.

For NB-IoT, E-UTRAN may configure up to 2 WUS resources (numbered 0 and 1). The time offset, *g*0, from the end of WUS resource 0 to the start of corresponding PO is determined as defined in subclasue 7.4. When both *wus-Config-r15* and g*wus-Config-r16* are present, WUS resource 0 shares radio resources with *wus-Config-r15*.The time offset from the end of WUS resource 1 to the start of corresponding PO is sum of the time offset *g*0 and the maximum WUS duration.

UE selects the WUS group set as specified in clause 7.5.2. From the selected WUS group set, UE selects one WUS group as defined in subcaluse 7.5.3.

The timeoffset, *g*0, is used to calculate the start of the WUS as defined in TS 36.213 [6].