**3GPP RAN WG2 Meeting #127 R2-2407801**

**Maastricht, Netherlands, Aug 19th – 23rd, 2024**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** | **1921** | **rev** | **1** | **Current version:** | 18.2.0 |  |
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| *For* [***HELP***](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 |  |

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| ***Title:***  | Miscellaneous MAC corrections for network energy savings |
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| ***Source to WG:*** | InterDigital |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | Netw\_Energy\_NR-Core |  | ***Date:*** | 2024-08-20 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *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 canbe 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | * RAN2 agreed to clarify UE behavior for determining the SFN to use when calculating the cell DTX Active period with asynchronous CA configured. The following was agreed “for cell DTX/DRX will use the SFN of SpCell for Cell DTX/DRX. Will add a note to specify.”
* The change for parameter name (*cellDTX-DRX-ActivationStatus*) from CR 1855 was not merged into TS 38.321 v 18.2.0 properly, i.e. at some but not all instances.
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| ***Summary of change:*** | * The note “In case of unaligned SFN across carriers in a cell group, the SFN of the SpCell is used to calculate the cell DRX duration.” is added for the UE to calculate when to start the *cellDTX-DRX-onDurationTimer* when asynchronous CA is configured.
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| ***Consequences if not approved:*** | UE calculating the start of the cell DTX Active period is not clear when asynchronous CA is configured. **Impact analysis**Impacted functionality:NESInter-operability:If the UE is implemented according to this CR but the network is not, some UL/DL transmissions/receptions in CA may be time miss-aligned with the network at the beginning of the Active Period.If the network is implemented according to this CR but the UE is not, some UL/DL transmissions/receptions in CA may be time miss-aligned with the network at the beginning of the Active Period. |
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| ***Clauses affected:*** | 5.34.1, 5.34.2, 5.34.3 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<<<<<<<<<<<<<<<<<<<< First change begins >>>>>>>>>>>>>>>>>>>>

## 5.34 Cell-Level Energy Saving

### 5.34.1 General

Each Serving Cell may be configured by RRC with a periodic cell DTX pattern (i.e., Active and Non-Active Periods). The cell DTX operation controls UE's monitoring activity of PDCCH and configured downlink assignments in RRC\_CONNECTED. For all activated Serving Cells with cell DTX configured and activated, the MAC entity may monitor PDCCH and configured downlink assignments using the cell DTX operation specified in clause 5.34.2.

Each Serving Cell may be configured by RRC with a periodic cell DRX pattern (i.e., Active and Non-Active Periods). The cell DRX operation controls Scheduling Request and configured uplink grant transmission activity in RRC\_CONNECTED. For all activated Serving Cells with cell DRX configured and activated, the MAC entity may transmit configured uplink grant transmissions and Scheduling Request using the cell DRX operation specified in clause 5.34.3.

RRC controls cell DTX and cell DRX operation by configuring the following parameters in *cellDTX-DRX-Config* per Serving Cell:

- *cellDTX-DRX-ConfigType*: defines whether only cell DTX is configured, only cell DRX is configured, or both are configured;

- *cellDTX-DRX-onDurationTimer*: the active duration at the beginning of a cell DTX/DRX cycle;

- *cellDTX-DRX-StartOffset*: defines the subframe where the cell DTX/DRX cycle starts;

- *cellDTX-DRX-SlotOffset*: the delay before starting the *cellDTX-DRX-onDurationTimer*;

- *cellDTX-DRX-Cycle*: the cell DTX/DRX cycle period.

- *cellDTX-DRX-ActivationStatus*: the initial activation status of cell DTX and cell DRX operation.

### 5.34.2 Cell Discontinuous Transmission

Cell DTX is configured if *cellDTX-DRX-ConfigType* is set to *dtx* or *dtxdrx*. Cell DTX operation is activated and deactivated for each Serving Cell by:

- receiving a cell DTX indication from lower layers indicating *activation* or *deactivation* of cell DTX operation, as specified in TS 38.213 [6];

- configuring *cellDTX-DRX-Config* by upper layers: if cell DTX is configured and *cellDTX-DRX-ActivationStatus* is set to *activated*, cell DTX operation is activated upon cell DTX configuration; if cell DTX is configured and *cellDTX-DRX-ActivationStatus* is set to *deactivated*, cell DTX operation is deactivated upon cell DTX configuration; if *cellDTX-DRX-Config* is released, cell DTX operation is deactivated and all the corresponding configurations are released.

When cell DTX is configured and activated for a Serving Cell, the cell DTX Active Period includes the time while:

- *cellDTX-DRX-onDurationTimer* is running for the associated Serving Cell.

For each Serving Cell configured with cell DTX, the MAC entity shall:

1> if cell DTX is activated for this Serving Cell:

2> if [(SFN × 10) + subframe number] modulo (*cellDTX-DRX-Cycle*) = (*cellDTX-DRX-StartOffset*):

3> start *cellDTX-DRX-onDurationTimer* for this serving cell after *cellDTX-DRX-SlotOffset* from the beginning of the subframe.

NOTE: In case of unaligned SFN across carriers in a cell group, the SFN of the SpCell is used to calculate the cell DTX duration.

1> if cell DTX operation is deactivated for this Serving Cell; or

1> if the Serving Cell is in the cell DTX Active Period:

2> monitor PDCCH on this Serving Cell, as specified in TS 38.213 [6] and other clauses of this specification.

1> if any *drx-RetransmissionTimerDL*, *drx-RetransmissionTimerUL* or *drx-RetransmissionTimerSL* (as described in clause 5.7) is running on any Serving Cell in the DRX group of this Serving Cell; or

1> if *ra-ContentionResolutionTimer* (as described in clause 5.1.5) or *msgB-ResponseWindow* (as described in clause 5.1.4a) is running; or

1> if a Scheduling Request is sent on PUCCH and is pending (as described in clause 5.4.4 or 5.22.1.5); or

1> if a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the Random Access Preamble not selected by the MAC entity among the contention-based Random Access Preamble (as described in clauses 5.1.4 and 5.1.4a):

2> monitor PDCCH on the Serving Cells in the DRX group of this Serving Cell, as specified in TS 38.213 [6] and other clauses of this specification.

1> if *ra-ResponseWindow* (as described in clause 5.1.4) is running and this Serving Cell is the SpCell:

2> monitor PDCCH on this Serving Cell (as described in clause 5.1.4).

For each Serving Cell configured with cell DTX, the MAC entity need not:

1> if cell DTX operation is activated and the Serving Cell is not in the cell DTX Active Period:

2> monitor PDCCH for the MAC entity's RNTIs listed in clauses 5.7 and 5.7b, irrespective of the requirements of clauses 5.7 and 5.7b, unless stated otherwise in this clause;

2> instruct the physical layer to receive transport block on the DL-SCH of this Serving Cell according to a configured downlink assignment for SPS;

2> indicate the presence of a configured downlink assignment and deliver the stored HARQ information to the HARQ entity;

2> set the HARQ Process ID to the HARQ Process ID associated with the PDSCH duration of a configured downlink assignment;

2> consider the NDI bit for the HARQ process corresponding to the PDSCH duration of a configured downlink assignment to have been toggled for the configured downlink assignment.

### 5.34.3 Cell Discontinuous Reception

Cell DRX is configured if *cellDTX-DRX-ConfigType* is set to *drx* or *dtxdrx*. Cell DRX operation is activated and deactivated for each Serving Cell by:

- receiving a cell DRX indication from lower layers indicating *activation* or *deactivation* of cell DRX operation, as specified in TS 38.213 [6];

- configuring *cellDTX-DRX-Config* by upper layers: if cell DRX is configured and *cellDTX-DRX-ActivationStatus* is set to *activated*, cell DRX operation is activated upon cell DRX configuration; if cell DRX is configured and *cellDTX-DRX-ActivationStatus* is set to *deactivated*, cell DRX operation is deactivated upon cell DRX configuration; if *cellDTX-DRX-Config* isreleased, cell DRX operation is deactivated and all the corresponding configurations are released.

When cell DRXis configured and activated for a Serving Cell, the cell DRX Active Period includes the time while:

- *cellDTX-DRX-onDurationTimer* is running for the associated Serving Cell.

For each Serving Cell configured with cell DRX, the MAC entity shall:

1> if cell DRX is activated for this Serving Cell:

2> if [(SFN × 10) + subframe number] modulo (*cellDTX-DRX-Cycle*) = (*cellDTX-DRX-StartOffset*):

3> start *cellDTX-DRX-onDurationTimer* for this serving cell after *cellDTX-DRX-SlotOffset* from the beginning of the subframe.

NOTE 1: In case of unaligned SFN across carriers in a cell group, the SFN of the SpCell is used to calculate the cell DRX duration.

1> if cell DRX is activated and the Serving Cell is not in the cell DRX Active Period:

2> not instruct the physical layer to signal a SR on a PUCCH resource for SR;

2> not increment the *SR\_COUNTER* for a SR;

2> not start the *sr-ProhibitTimer* for a SR;

2> not deliver any configured uplink grant and the associated HARQ information to the HARQ entity;

2> not instruct a HARQ process associated with a configured uplink grant to trigger a new transmission or a retransmission;

2> not report CSI on PUCCH and semi-persistent CSI configured on PUSCH;

2> if an emergency service is initiated by upper layers and this Serving Cell is the SpCell:

3> initiate a Random Access procedure (as specified in clause 5.1.1).

NOTE 2: How the MAC layer in the UE is aware of an ongoing emergency service is up to UE implementation.

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