**3GPP TSG RAN WG1 Meeting #117 R1-240xxxx**

**Fukuoka, Japan, May 20th – 24th, 2024**

**Source: Moderator (Intel Corporation)**

**Title: Summary #1 of discussion for Rel-18 NES enhancements on cell DTX/DRX mechanism**

**Agenda item: 8.4**

**Document for: Discussion**

# Introduction

In this contribution, moderator summarizes issues identified by the submitted maintanence contributions for RAN1 #117 agenda 8.1 regarding network energy saving (NES) cell DTX/DRX operations.

# Suggested proposals for agreement/conclusion

This section will be completed by the moderator after offline discussions.

# Status summary of Proposal/TPs

|  |  |  |
| --- | --- | --- |
| Proposal/TP | Status | Moderator Notes |
| TP#1-1 | Suggest for agreement |  |
|  |  |  |

# Summary of issues

## 4.1 Handling of SRS overlapping with other channel/signals

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| **Company** | **Proposals & Observations** |
| Samsung [1][2] | Proposal 1: Adopt the following TP for TS 38.214 Clause 6.2.1 in R1-2404084 for correcting the condition for UE operation of a SRS overlapped with other channels/signals. |

### Summary of Issues

Samsung has suggested an update for text regarding handling of SRS overlapping with other channels and signals. The suggestion to align the description similar to how other channels are handled and does not change the material behaviors. As such, moderator assumes the suggested changes should be acceptable.

##### TP #1-1

**Reason for change:** Incorrect condition related to cell DRX for UE operation for the overlapped between SRS and other channels/signals (e.g., PUCCH/PUSCH/SRS).

**Summary of change:** UE handles the overlap between a SRS and other channels/signals (e.g., PUCCH/PUSCH/SRS) if the SRS is transmitted on a serving cell in cell DRX non-active period of the serving cell with cell DRX is activated.

**Consequences if not approved:** Incorrect UE behavior to operate the overlapped between SRS and other channels/signals (e.g., PUCCH/PUSCH/SRS) in case of cell DRX.

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| **TP for TS 38.214 Clause 6.2.1 UE sounding procedure**  <omitted texts>  **6.2 UE reference signal (RS) procedure**  **6.2.1 UE sounding procedure**  The UE may be configured with one or more Sounding Reference Signal (SRS) resource sets as configured by the higher layer parameter *SRS-ResourceSet* or *SRS-PosResourceSet*. For each SRS resource set configured by *SRS-ResourceSet*, a UE may be configured with SRS resources (higher layer parameter *SRS-Resource*), where the maximum value of K is indicated by UE capability[13, 38.306]. When SRS resource set is configured with the higher layer parameter *SRS-PosResourceSet,* a UE may be configured with *K* ≥1 SRS resources (higher layer parameter *SRS-PosResource*), where the maximum value of K is 16. The SRS resource set applicability is configured by the higher layer parameter *usage* in *SRS-ResourceSet.* When the higher layer parameter *usage* is set to 'beamManagement'*,* only one SRS resource in each of multiple SRS resource sets may be transmitted at a given time instant, but the SRS resources in different SRS resource sets with the same time domain behaviour in the same BWP may be transmitted simultaneously.  During non-active periods of cell DRX, the UE configured with cell DRX is not expected to transmit the periodic SRS, or semi-persistent SRS for channel acquisition. SRS for positioning is not impacted by cell DRX operation.  During non-active periods of cell DRX if cell DRX is activated for a serving cell, the UE ~~configured with cell DRX~~ applies the procedures described in this clause after it determines PUSCH, SRS, and PUCCH transmission on the serving cell due to cell DRX operations according to clause 5.34.3 of [11, TS 38.321].  For the SRS resource set(s) configured *in srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* set to '*antennaSwitching*' or '*beamManagement*', the UE expects the same SRS resource set(s) with the same *usage* being configured in *srs-ResourceSetToAddModList.*  <omitted texts> |

### 1st Round Discussion

Companies are asked to provide inputs on TP#1-1.

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| Company | Comments |
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## 4.2 Any other issues

This section will be used to capture any other open issues raised during RAN1 #117 regarding NES cell DTX/DRX operations.

### 1st Round Discussion

Companies are asked to provide inputs on other open issues (that moderator might have missed) for RAN1 #117.

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| Company | Comments |
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# Summary of Agreements/Conclusions from RAN1 #117

To be filled by moderator.

# Reference

1. R1-2404081, “Remaining issues on network energy saving,” Samsung
2. R1-2404084, “Correction on Cell DRX operation for SRS,” Samsung

# Appendix A: RAN1 Agreements

## RAN1 #112 (Feb-2023)

**Agreement**

* RAN1 continues discussion on the at least following physical layer related aspects of cell DTX/DRX aspects
  + physical layer signals/channels and procedures expected to be impacted during non-active periods of cell DTX/DRX
    - consider impact to at least KPIs from the SI when physical layers/signals/channels are impacted by cell DTX/DRX
* Further discussions on other aspects are not precluded

**Agreement**

At least the following candidate signals/channels for connected mode UEs, which the UE may be expected to not transmit or receive during non-active periods of cell DTX/DRX, are considered from RAN1 perspective for further discussion. The exact set of signals/channels that the UE may be expected to not transmit or receive is FFS.

* DL
  + Periodic/Semi-persistent CSI-RS (including TRS)
  + PRS
  + PDCCH scrambled with UE specific RNTI
  + PDCCH in Type-3 CSS
  + SPS-PDSCH
* UL
  + SR
  + Periodic/Semi-persistent CSI report
  + Periodic/Semi-persistent SRS
  + CG-PUSCH

Other signals/channels are not precluded

## RAN1 #112bis (Apr-2023)

**Agreement**

From RAN1 point of view, Rel-18 UE supporting cell DTX does not expect to receive and/or process the following signals/channels from the gNB, during non-active periods of cell DTX. The list of signals/channels may be updated based on RAN2/RAN4 input and other signals/channels are not precluded from further discussions.

* Periodic/Semi-persistent CSI-RS configured in CSI report configuration in CSI-ReportConfig with reportQuantity including RI (for CSI reporting)
* FFS:
  + PDCCH in USS
    - UE behavior for retransmission
    - if some specific RNTI scrambled PDCCH in USS will be excluded from cell DTX operation
  + PDCCH in Type-3 CSS
    - UE behavior for retransmission
    - if some specific RNTI scrambled PDCCH in Type-3 CSS will be excluded from cell DTX operation
  + PRS
  + CSI-RS configured by measObjectNR (for RRM)
  + CSI-RS associated with RadioLinkMonitoringConfig and BeamFailureDectection (for RLM and BFD)
  + Periodic CSI-RS configured with trs-Info ‘true’ (for tracking)
  + Periodic/Semi-persistent CSI-RS (for BM)
    - FFS on how to differentiate (if needed) with other CSI-RS used for CSI reports for BM
* FFS: Whether the same or different UE behavior is applicable with or without C-DRX
* FFS: Whether the list of impacted signals/channels can be configurable
* FFS: Whether there will be exception case(s) for UE receiving and/or processing listed signals/channels during non-active periods of DTX
* FFS: RAN1 to consider impact on system if the channels/signals are not transmitted during non-active period

**Agreement**

Study L1 signalling for enhancing cell DTX/DRX including activation/deactivation for a single configuration which will have the following characteristics:

* PDCCH based signaling
  + FFS: Whether enhancing legacy DCI or introducing new DCI
  + FFS: DCI content
  + FFS: Whether L1 signaling is UE specific DCI or group common DCI
  + FFS: Timer or validity duration based activation/deactivation of cell DTX/DRX
  + FFS: whether to specify a reference time for activation/deactivation of cell DTX/DRX
  + FFS: If multiple Cell DTX/DRX patterns are to be supported
* FFS on detailed UE behavior upon reception of L1 signaling at least including application delay
* FFS how to guarantee reliability of the L1 signaling
* FFS whether the L1 signal can be monitored in non-active periods.

**Agreement**

From RAN1 point of view, Rel-18 UE supporting cell DRX is not expected to transmit the following signals/channels to the gNB during non-active periods of cell DRX. The list of signals/channels may be updated based on RAN2/RAN4 input and other signals/channels are not precluded from further discussions.

* Periodic/Semi-persistent CSI report
* Periodic/Semi-persistent SRS
  + FFS: SRS for positioning
* FFS:
  + HARQ feedback for SPS PDSCH
* FFS whether there will be exception case(s) for UE transmitting listed signals/channels during non-active periods of DRX
* FFS Whether the listed signals/channels can be configurable by gNB
* FFS: Whether the same or different UE behavior is applicable with or without C-DRX
* FFS: RAN1 to consider impact on system if the channels/signals are not transmitted during non-active period

**Further study the following in RAN1:**

* Handling of HARQ-ACK codebook generation when configured with cell DTX/DRX
* Handling of PUCCH deferral operation during non-active periods of cell DRX
* Handling of overlapping channels where a least a channel overlaps with non-active periods of cell DTX/DRX
* Handling of signals/channels that can be received/transmitted repeatedly during non-active periods of cell DTX/DRX
* Handling of PUCCH switching during non-active period to an active cell
* Other enhancements are not precluded.

**Agreement**

For PDDCH monitoring, further work on Rel-18 NES in RAN1 is to follow the RAN2 agreement below:

*10. The understanding for the gNB scheduling behaviour for new transmissions during Cell DTX non-active period is that the gNB does not schedule UE-specific dynamic grants/assignments, even if the UE is in C-DRX Active Time. UE doesn’t monitor PDCCH for dynamic grants/assignments for new transmissions during Cell DTX non-active period, even if the UE is in C-DRX Active time. FFS how to deal with any exceptions (e.g. SR if agreed and RACH).*

**Working Assumption**

* Support of L1 signaling at least for activation/deactivation of a cell DTX and/or DRX configuration is feasible (e.g., in terms of enabling/disenabling the feature) from RAN1 perspective.
  + This does not imply that L1 activation/deactivation is supported in Rel-18\
  + Note: Reliability, overhead, and benefits are FFS

## RAN1 #113 (May-2023)

**Agreement**

RAN1 supports the group common L1 signaling using PDCCH for cell DTX/DRX activation and deactivation without HARQ feedback

* Send an LS to RAN2 to consider the additional support of a MAC CE based indication
* Subject to UE capability

**Agreement**

Confirmation of WA from previous meeting with removal of the two sub-bullets.

**Working Assumption**

* + Support of L1 signaling at least for activation/deactivation of a cell DTX and/or DRX configuration is feasible (e.g., in terms of enabling/disenabling the feature) from RAN1 perspective.
    - ~~This does not imply that L1 activation/deactivation is supported in Rel-18\~~
    - ~~Note: Reliability, overhead, and benefits are FFS~~

**Agreement**

DCI format for group common L1 signaling using PDCCH for cell DTX/DRX activation and deactivation (downselect just one among alternatives)

* Alt 1) DCI Format 2\_6 (power saving information outside DRX Active Time)
  + FFS: Monitoring within DRX active time
  + FFS: Field content
* Alt 2) Based on new DCI format 2\_X
  + Field content format
    - Block number 1, block number 2, …, block number N
    - For each block should at least support the following:
      * DTX configuration activation/deactivation
      * DRX configuration activation/deactivation
    - FFS: other field details, mapping of UE and each blocks
  + DCI size indicated by higher layers
  + FFS: RNTI
* FFS: application delay, timers for activation/deactivation
* FFS: handling of multiple cells including when UE supports different number of cells
* FFS: details on PDCCH monitoring aspects, including but not limited to:
  + Search Space
  + PDCCH monitoring occasion
  + slots to monitor (during cell DTX/DRX non-active periods, and active periods)
  + BD/CE aspects
* FFS: UE behavior upon reception of the group common PDCCH (during cell DTX/DRX non-active periods, and active periods), including fallback behavior (if any)

. **Agreement**

For the group common L1 signaling using PDCCH for cell DTX/DRX activation and deactivation

* Alt 2) Based on new DCI format 2\_X
  + DCI size budget is not increased
  + Number of required BDs is not increased
  + FFS: PDCCH monitoring configuration for the new DCI format is identical to PDCCH monitoring configuration for DCI format 2\_6 if the UE monitors both DCI formats
    - FFS: New RNTI is used

## RAN1 #114 (August-2023)

**Agreement**

DCI format 2\_X, for activation and deactivation of cell DTX and DRX configuration,

* at least includes following fields,
  + N information block field(s),
  + Spare/reserved padding bits to match the size configured for DCI 2\_X (if needed)
* payload size is configurable and within the bounds set by existing RAN1 specification
* an information block field contains signaling of activation or deactivation of ‘a configuration of cell DTX and/or DRX’ of ‘a serving cell’
* for serving cell configured with SUL, the same bit is applicable for both NUL and SUL

Above applies at least for sTRP case.

**Agreement**

For at least the case where one cell DTX/DRX pattern is configured, an information block field of DCI format 2\_X for activation and deactivation of cell DTX and DRX configuration supports the following:

* Separate (activation/deactivation) signaling for cell DTX and cell DRX, i.e. one activation/deactivation signaling sub-field for cell DTX configuration and one activation/deactivation signaling sub-field for cell DRX configuration
  + Separate 1 bit indication for each of activation/deactivation for one cell DTX and one cell DRX

Above does not imply that multiple DTX/DRX patterns is not supported.

**Agreement**

Support new RNTI (e.g. nes-RNTI) which is configured by higher layer, for scrambling of DCI format 2\_X

**Agreement**

From RAN1 point of view, DCI format 2\_X supports activation/deactivation of cell DTX/DRX configuration of multiple serving cells and support activation/deactivation per cell

* UE monitor DCI format 2\_X in one serving cell

**Agreement**

Delay that is applied after DCI Format 2\_X reception that activate/deactivate cell DTX/DRX configuration is introduced in Rel-18.

**Agreement**

DCI format 2\_X is monitored in the common search space

Note: Search space set configuration for DCI format 2\_X is separately provided by higher layers

**Agreement**

The following high layer signaling are to be included to the RRC parameter list for new DCI format 2\_X for activation and deactivation of cell DTX/DRX

* search space set configuration with new DCI format 2\_X
* DCI size for new DCI format 2\_X

**Agreement**

* An information block field of DCI format 2\_X is variable size either 1 or 2 bits.
  + Higher layer signaling configures whether the activation/deactivation of cell DTX and/or cell DRX is indicated in DCI format 2\_X for a serving cell.
    - If both cell DTX and cell DRX are configured for a serving cell,
      * 1st bit corresponds to activation/deactivation of cell DTX configuration, and
      * 2nd bit corresponds to activation/deactivation of cell DRX configuration,
    - otherwise, the 1 bit corresponds to the configured cell DTX or cell DRX configuration.
  + Note: this does not imply there may be separate higher layer signaling to enable L1 signaling based activation/deactivation for a cell DTX and/or cell DRX configuration. Signaling design is up to RAN2.

**Agreement**

For each serving cell configured with L1 signaling based activation/deactivation of cell DTX and/or cell DRX configuration, starting bit position of an information block of DCI format 2\_X is provided by UE specific higher layer signaling.

**Agreement**

* UE is expected to apply cell DTX or DRX activation/deactivation change at beginning of the slot X where the SCS of slot X is with respect to the active DL or UL BWP of the serving cell, respectively.
* Slot X is the first slot whose beginning is no earlier than (i.e., same or after) beginning of slot n + D, where D is the delay and n is the slot containing the PDCCH of DCI format 2\_X based on SCS of PDCCH.

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| SCS of PDCCH (kHz) | Value of D (in unit of slot) |
| 15 | 3 |
| 30 | 6 |
| 60 | 12 |
| 120 | 24 |
| 480 | 96 |
| 960 | 192 |

**Agreement**

Rel-18 UE supporting cell DTX is not required to monitor the following signals/channels from the gNB, during non-active periods of cell DTX

* PDCCHs associated with DCI format 2\_0 – DCI Format 2\_5

**Agreement**

For the FFS from agreement from RAN1 #112bis

* SRS for positioning is not impacted by cell DRX operation.

**Conclusion**

* The following channels are not impacted by non-active period of cell DRX
  + HARQ-ACK of a DCI format without scheduling a PDSCH

## RAN1 #114-bis (October-2023)

**Agreement**

Send LS to RAN2 to ask to consider the following RAN1 agreements and ask RAN2 to capture them in RAN2 specification appropriately.

* Agreement (from RAN1 #114)
  + Rel-18 UE supporting cell DTX is not required to monitor the following signals/channels from the gNB, during non-active periods of cell DTX
    - PDCCHs associated with DCI format 2\_0 – DCI Format 2\_5
* Conclusion:
  + HARQ-ACK of SPS PDSCH transmitted is not impacted by non-active period of cell DRX.
* Conclusion
  + The following channels are not impacted by non-active period of cell DRX
    - HARQ-ACK of a DCI format without scheduling a PDSCH
* Part of the Agreement (from RAN1 #112-bis-e)
  + From RAN1 point of view, Rel-18 UE supporting cell DRX is not expected to transmit the following signals/channels to the gNB during non-active periods of cell DRX.
    - Periodic/Semi-persistent CSI report

Include a note saying that for the conclusions, RAN1 does not expect any specification impact.

Final LS is endorsed in R1-2310476.

**Agreement**

The following TP is endorsed for TS38.212.

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| ***Reason for change****: The current wording doesn’t clearly capture the cases where both cell DTX and cell DRX are configured or only cell DTX or cell DTX is configured .* |
| ***Summary of change****: Replace “*Activating or de-activating the cell DTX/DRX configuration of one or multiple serving cells for one or more UEs.” by “Activating or de-activating the cell DTX and/or DRX configuration of one or multiple serving cells for one or more UEs.” |
| ***Consequences if not approved:*** *unclear specification* |
| **\*\*\* Unchanged parts are omitted \*\*\***  Table 7.3.1-1: DCI formats   |  |  | | --- | --- | | **DCI format** | **Usage** | | 0\_0 | Scheduling of PUSCH in one cell | | 0\_1 | Scheduling of one or multiple PUSCH in one cell, or indicating downlink feedback information for configured grant PUSCH (CG-DFI) | | 0\_2 | Scheduling of PUSCH in one cell | | 1\_0 | Scheduling of PDSCH in one cell | | 1\_1 | Scheduling of one or multiple PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback | | 1\_2 | Scheduling of PDSCH in one cell | | 2\_0 | Notifying a group of UEs of the slot format, available RB sets, COT duration and search space set group switching | | 2\_1 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE | | 2\_2 | Transmission of TPC commands for PUCCH and PUSCH | | 2\_3 | Transmission of a group of TPC commands for SRS transmissions by one or more UEs | | 2\_4 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE cancels the corresponding UL transmission from the UE | | 2\_5 | Notifying the availability of soft resources as defined in Clause 9.3.1 of [10, TS 38.473] | | 2\_6 | Notifying the power saving information outside DRX Active Time for one or more UEs | | 2\_7 | Notifying paging early indication and TRS availability indication for one or more UEs. | | 2\_9 | Activating or de-activating the cell DTX~~/DRX~~ and/or DRX configuration of one or multiple serving cells for one or more UEs. | | 3\_0 | Scheduling of NR sidelink in one cell | | 3\_1 | Scheduling of LTE sidelink in one cell | | 4\_0 | Schedulng of PDSCH with CRC scrambled by MCCH-RNTI/G-RNTI for broadcast | | 4\_1 | Schedulng of PDSCH with CRC scrambled by G-RNTI/G-CS-RNTI for multicast | | 4\_2 | Schedulng of PDSCH with CRC scrambled by G-RNTI/G-CS-RNTI for multicast |   **\*\*\* Unchanged parts are omitted \*\*\*** |

**Agreement**

For CSI report associated with P/SP CSI-RS resource and configured with reportQuantity including RI, when cell DTX is configured

* the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion of each P/SP CSI-RS resource for channel measurement and/or interference measurement for the CSI report in cell DTX active period no later than CSI reference resource and drops the report otherwise.

**Agreement**

Cell DTX/DRX operation is only supported for sTRP.

**Agreement**

TP #22-4 (old #16-1) (TS38.214)

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| **Reasons for change:**  For a CSI reporting configured with *reportQuantity* comprising at least ‘RI’, if the time domain restriction for channel measurements or interference measurements is enabled and the most recent CSI-RS associated with the CSI resource setting occurs during non-active periods of cell DTX, UE has to skip this CSI reporting, which may impact the system performance. |
| **Summary of change:**  When cell DTX operation is configured and the time domain restriction for channel measurements or interference measurements is enabled, the CSI-RS used for the corresponding measurements can be redefined as the most recent CSI-RS within the active periods of cell DTX. |
| **Consequences if not approved:**  For a CSI reporting, if the time domain restriction for channel measurements or interference measurements is enabled and the most recent CSI-RS associated with the CSI resource setting occurs during non-active periods of cell DTX, UE has to skip this CSI reporting, which may impact the system performance. |
| ---------------------------- Start of Text Proposal for TS 38.214 -----------------------------  **5.2.2.1 Channel quality indicator (CQI)**  < Unchanged parts are omitted >  If the higher layer parameter *timeRestrictionForChannelMeasurements* is set to "*notConfigured*", the UE shall derive the channel measurements for computing CSI value reported in uplink slot *n* based on only the NZP CSI-RS, no later than the CSI reference resource, (defined in TS 38.211[4]) associated with the CSI resource setting.  If the higher layer parameter *timeRestrictionForChannelMeasurements* in *CSI-ReportConfig* is set to "*Configured*", the UE shall derive the channel measurements for computing CSI reported in uplink slot *n* based on only the most recent, no later than the CSI reference resource, in cell DTX active time if cell DTX is activated, occasion of NZP CSI-RS (defined in [4, TS 38.211]) associated with the CSI resource setting.  If the higher layer parameter *timeRestrictionForInterferenceMeasurements* is set to "*notConfigured*", the UE shall derive the interference measurements for computing CSI value reported in uplink slot *n* based on only the CSI-IM and/or NZP CSI-RS for interference measurement no later than the CSI reference resource associated with the CSI resource setting.  If the higher layer parameter *timeRestrictionForInterferenceMeasurements* in *CSI-ReportConfig* is set to "*Configured*", the UE shall derive the interference measurements for computing the CSI value reported in uplink slot *n* based on the most recent, no later than the CSI reference resource, in cell DTX active time if cell DTX is activated, occasion of CSI-IM and/or NZP CSI-RS for interference measurement (defined in [4, TS 38.211]) associated with the CSI resource setting.  < Unchanged parts are omitted >  --------------------------------------- End of Text Proposal ---------------------------------- |

**Agreement**

TP #6-1 (TS38.213)

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| **Reasons for change:**  There are multiple types of CSS, and specification unclear which CSS could be applicable for DCI format 2-9. |
| **Summary of change:**  Specify DCI format 2-9 uses Type 3 CSS. |
| **Consequences if not adopted:**  Ambiguous specification. |
| **11.5 Adaptation of cell operation**  A UE configured for operation on a serving cell according to one or both of a cell DTX operation by *cellDTXConfig* and a cell DRX operation by *cellDRXConfig* for the serving cell [11, TS 38.331], can be additionally provided by *dci-Format2-9* a search space set to monitor PDCCH for detection of DCI format 2\_9 according to a Type3-PDCCH common search space as described in clause 10.1, and a location in DCI format 2\_9 by *position-inDCI-NES* of a cell DTX/DRX indicator field for the serving cell  \*\*\* Unchanged parts are omitted \*\*\* |

## RAN1 #115 (November-2023)

**Agreement**

* In DCI format 2-9, add NES-mode indication in block for Pcell.
  + NES-mode indication may be 0 or 1 bit for Pcell depending on the indication for CHO is configured.
  + Number of bits for cell DTX/DRX (de)activation between 0, 1, and 2 bits and number of bits for NES-mode between 0 and 1 bit is determined by RRC parameters.

**Agreement**

* Adopt the follow TP for TS38.213

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| **Reason for change:** The parameter that defines cell DTX/DRX patterns in RAN1 spec does not align with RAN2 running CR. |
| **Summary of change:** Align parameter name with RAN2 . |
| **Consequences if not approved:** Unmatched specs. |
| \*\*\* Unchanged parts are omitted \*\*\* 11.5 Adaptation of cell operation A UE configured for operation on a serving cell according to one or both of a cell DTX operation ~~by~~ *~~cellDTXConfig~~*and a cell DRX operation by c*ellDTXDRX-Config* *~~cellDRXConfig~~*for the serving cell [11, TS 38.331], can be additionally provided by *dci-Format2-9* a Type3-PDCCH search spaceCSS set to monitor PDCCH for detection of DCI format 2\_9 according to a common search space as described in clause 10.1, and a location in DCI format 2\_9 by *position-inDCI-NES* of a cell DTX/DRX indicator field for the serving cell  - if the UE is configured with both cell DTX operation and cell DRX operation for the serving cell, the cell DTX/DRX indicator field includes two bits where the first bit indicates the cell DTX operation and the second bit indicates the cell DRX operation  - if the UE is configured with only one of the cell DTX operation and cell DRX operation for the serving cell, the cell DTX/DRX indicator field includes one bit indicating one of the cell DTX operation and cell DRX operation, respectively, for the serving cell  - a '0' value for a bit of the cell DTX/DRX indicator field indicates deactivation of cell DTX or of cell DRX  - a '1' value for a bit of the cell DTX/DRX indicator field indicates activation of cell DTX or of cell DRX  - if the serving cell is configured with a SUL carrier, the cell DTX/DRX indicator field indication for activation or deactivation of cell DRX applies to both the UL carrier and the SUL carrier  A UE does not expect to monitor PDCCH for detection of DCI format 2\_9 on more than one serving cells.  \*\*\* Unchanged parts are omitted \*\*\* |

**Agreement**

UE transmits a subset of the repetitions in a CG bundle that do not overlap with the cell DRX non-active period

**Agreement**

Send an LS to RAN2 to ask RAN2 to decide whether/how to capture the following agreement. Final LS in [R1-2312409](file:///C:\Users\daewonle\OneDrive%20-%20Intel%20Corporation\Documents\ngs\3gpp\Docs\R1-2312409.zip).

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| **Agreement**  Cell DTX/DRX operation is only supported for sTRP. |

**Agreement**

UE is expected to monitor DCI format 2\_9 during active periods of C-DRX

**Conclusion**

There is no consensus in RAN1 on whether or not the UE is expected to monitor DCI format 2\_9 during non-active periods on C-DRX

**Agreement**

Adopt the following specification change in TS38.213

11.5 Adaptation of cell operation

A UE does not expect to monitor PDCCH for detection of DCI format 2\_9 on more than one serving cells in one cell group.

\*\*\* Unchanged parts are omitted \*\*\*

**Agreement**

* For Cell DTX/DRX indication of a block in DCI format 2\_9
  + if [cellDTXDRX-L1activation] is configured,
    - 2 bits if c*ellDTXDRXconfigType* is configured to *dtxdrx* for the serving cell;
    - 1 bit if *cellDTXDRXconfigType* is configured to either *dtx* or *drx* for the serving cell*;*
  + otherwise 0 bit.
  + [cellDTXDRX-L1activation] is a new RRC parameter

**Agreement**

* Introduce a new RRC parameter [cellDTXDRX-L1activation], that indicates configuration of L1 based cell DTX/DRX activation/deactivation for each serving cell.
* Adopt the follow TP for TS38.212

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| **Reason for change**:  Clarify that 2 bits are needed if both cell DTX and cell DRX are configured for a serving cell; otherwise (i.e. only one cell DTX or cell DRX is configured), 1 bit is needed which corresponds to cell DTX or cell DRX configuration activation/deactivation and if not cell DTX and DRX is not configured 0 bits.  Clarify that 1 bit for NES mode indication if configured by higher layers.  Update RRC parameter names in the specification. |
| **Summary of change**:   * update NES-RNTI as cellDTRX-RNTI. * Associate the starting position of a block in DCI format 2\_9 with a serving cell. * clarify the bitwidth of dynamic cell DTX/DRX information field in DCI format 2\_9. * add NES-mode indication to block definition. |
| **Consequences if not approved:**  The starting position and bitwidth of dynamic cell DTX/DRX information field in DCI format 2\_9 is unclear.  NES-mode indication associated with nesEvent configuration is missing from specification. |
| 7.3.1.3.10 Format 2\_9 DCI format 2\_9 is used for activating or de-activating the cell DTX and/or DRX configuration of one or multiple serving cells for one or more UEs and/or to provide NES-mode indication.  The following information is transmitted by means of the DCI format 2\_9 with CRC scrambled by ~~NES~~cellDTRX-RNTI:  - block number 1, block number 2,…, block number *N*  where the starting position of a block associated with a serving cell is determined by the parameter *positionInDCI-cellDTRX* provided by higher layers for the UE.  If the UE is configured *~~with higher layer parameter~~* to monitor DCI 2\_9 with CRC scrambled by *~~XYZ~~* cellDTRX-RNTI, one or more blocks are configured for the UE by higher layers, with the following field defined in the following order for each block:  - Cell DTX/DRX indication –  - if [*cellDTXDRX-L1activation*] is configured, 2 bits if *~~XYZ~~cellDTXDRXconfigType* is configured to *dtxdrx* for the serving cell, with the MSB corresponding to cell DTX configuration and the LSB corresponding to cell DRX configuration; 1 bit if *cellDTXDRXconfigType* is configured to either *dtx* or *drx* for the serving cell*;*  - otherwise 0~~1~~ bit.  - NES-mode indication – 1 bit if *nesEvent* is configured and the serving cell is Pcell; otherwise, 0 bit.  The size of DCI format 2\_9 is indicated by the higher layer parameter *sizeDCI-2-9*.  \*\*\* Unchanged parts are omitted \*\*\* |

**Agreement**

Adopt the following TP for TS38.213

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| **Reasons for change:**  Unclear how HARQ feedback for cancelled SPS PDSCH in cell DRX/DRX operation should be handled by specification.  **Summary of change:**  Clarify that HARQ feedback of cancelled SPS PDSCH by non-active period of cell DTX is not transmitted by UE.  **Consequences if not adopted:**  Incomplete specification |
| **9.1.2 Type-1 HARQ-ACK codebook determination**  \*\*\* Unchanged text omitted \*\*\*  In the following pseudo-code, SPS PDSCH receptions associated with a SPS PDSCH configuration are activated by a DCI format with CRC scrambled by a CS-RNTI or by a DCI format with CRC scrambled by a G-CS-RNTI.  Set to the number of serving cells configured to the UE  Set to the number of SPS PDSCH configurations configured to the UE for serving cell  Set to the number of DL slots for SPS PDSCH receptions on serving cell with HARQ-ACK information multiplexed on the PUCCH  Set – HARQ-ACK information bit index  Set – serving cell index: lower indexes correspond to lower RRC indexes of corresponding cell  while  Set – SPS PDSCH configuration index: lower indexes correspond to lower RRC indexes of corresponding SPS configurations  while  Set – slot index  while  if {  a UE is configured to receive SPS PDSCHs from slot to slot for SPS PDSCH configuration on serving cell , excluding SPS PDSCHs that are not required to be received in any slot among overlapping SPS PDSCHs, if any according to [6, TS 38.214], or based on a UE capability for a number of PDSCH receptions in a slot according to [6, TS 38.214], or due to overlapping with a set of symbols indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or by *tdd-UL-DL-ConfigurationDedicated*, or due to overlapping with non-active period of cell DTX where, for unicast SPS PDSCHs, is provided by *pdsch-AggregationFactor-r16* in *SPS-Config* or, if *pdsch-AggregationFactor-r16* is not included in *SPS-Config*, by *pdsch-AggregationFactor* in *PDSCH-config* and, for multicast SPS PDSCHs, is provided by if contained in an entry indicated by the time domain resource assignment field in the DCI format scheduling the PDSCH repetition, or provided by *pdsch-AggregationFactor-r16* if included in *SPS-Config* or, otherwise,, and  HARQ-ACK information for the SPS PDSCH is associated with the PUCCH  }  = HARQ-ACK information bit for this SPS PDSCH reception  ;  end if  ;  end while  ;  end while  ;  end while  \*\*\* Unchanged text omitted \*\*\* |

**Agreement**

Adopt the follow TP for TS38.213

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| **Reasons for change:**  TS38.331 specification does not provide the definition of 0 or 1 for NES-mode indication and is current missing from 3GPP specification. Field naming between TS38.212 and TS38.213 is not consistent.  **Summary of change:**  Clarify that 0 refers to NES-specific CHO execution condition is not met, and 1 refers to condition met.  Align the field names between TS38.212 and TS38.213.  **Consequence if not adopted:**  Incomplete specifications. |
| **11.5 Adaptation of cell operation**  A UE configured for operation on a serving cell according to one or both of a cell DTX operation by *cellDTXConfig* and a cell DRX operation by *cellDRXConfig* for the serving cell [11, TS 38.331], can be additionally provided by *dci-Format2-9* a search space set to monitor PDCCH for detection of DCI format 2\_9 according to a common search space as described in clause 10.1, and a location in DCI format 2\_9 by *~~position-inDCI-NES~~positionInDCI-cellDTRX* of a cell DTX/DRX indication~~indicator~~ field for the serving cell and/or a NES-mode indication field for Pcell  - if the UE is configured with both cell DTX operation and cell DRX operation for the serving cell and if [*cellDTXDRX-L1activation*] is configured, the cell DTX/DRX indication~~indicator~~ field includes two bits where the first bit indicates the cell DTX operation and the second bit indicates the cell DRX operation  - if the UE is configured with only one of the cell DTX operation and cell DRX operation for the serving cell, the cell DTX/DRX indication~~indicator~~ field includes one bit indicating one of the cell DTX operation and cell DRX operation, respectively, for the serving cell  - a '0' value for a bit of the cell DTX/DRX indication~~indicator~~ field indicates deactivation of cell DTX or of cell DRX  - a '1' value for a bit of the cell DTX/DRX indication~~indicator~~ field indicates activation of cell DTX or of cell DRX  - if *nesEvent* is configured, the NES-mode indication field includes one bit indicating NES-specific CHO execution condition, as described in [12, TS 38.331]  - a ‘0’ value for a bit of the NES-mode indication field, indicates NES-specific CHO execution condition is disabled [12, TS 38.331]  a '1' value for a bit of the NES-mode indication field, indicates NES-specific CHO execution condition is enabled [12, TS 38.331] |

**Agreement**

Adopt the following TP for TS38.214

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| **Reasons for change:**  For a CSI reporting, the most recent CSI-RS measurement occasion is unclear when cell DTX is activated by RRC or DCI format 2-9.  **Summary of change:**  When cell DTX is activated by RRC or DCI format 2-9, the most recent CSI-RS measurement occasion occurs in active period of cell DTX.  **Consequences if not approved:**  For a CSI reporting, the most recent CSI-RS measurement occasion is unclear when cell DTX is activated. |
| 5.1.6.1 CSI-RS reception procedure < Unchanged parts are omitted >  If the UE is configured with DRX,  - if the UE is configured to monitor DCI format 2\_6 and configured by higher layer parameter *ps-TransmitOtherPeriodicCSI* to report CSI with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to quantities other than 'cri-RSRP' and 'ssb-Index-RSRP' when *drx-onDurationTimer* in *DRX-Config* is not started, the most recent CSI measurement occasion occurs in DRX active time or during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside DRX active time for CSI to be reported;  - if the UE is configured to monitor DCI format 2\_6 and configured by higher layer parameter *ps-TransmitPeriodicL1-RSRP* to report L1-RSRP with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to cri-RSRP when *drx-onDurationTimer* in *DRX-Config* is not started, the most recent CSI measurement occasion occurs in DRX active time or during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside DRX active time for CSI to be reported;  - otherwise, the most recent CSI measurement occasion occurs in active time for CSI to be reported.  During non-active periods of cell DTX, the UE configured with cell DTX is not expected to receive the periodic CSI-RS and semi-persistent CSI-RS configured in CSI report configuration in CSI-*ReportConfig* associated with the higher layer parameter *reportQuantity* comprising at least ‘RI’. If the cell DTX is activated, the most recent CSI measurement occasion of semi-persistent CSI-RS resource or periodic CSI-RS resource occurs in active periods of cell DTX for CSI report configured by *CSI-ReportConfig* associated with the higher layer parameter *reportQuantity* comprising at least ‘RI’.  < Unchanged parts are omitted > |

**Agreement**

If a UE would transmit multiple overlapping PUCCHs in a slot or overlapping PUCCH(s) and PUSCH(s) in a slot, where at least one PUCCH/PUSCH overlaps with non-active periods of cell DRX on the respective serving cell, down-select form the following options for the interaction between the Operation A (Resolve the overlapping among PUCCHs/PUSCHs (TS 38.213 clause 9 including sub-clauses)) and Operation B (Determine whether to transmit a PUCCH/PUSCH overlapping with non-active period of cell DRX.)

* Option 1: UE first performs Operation A and then performs Operation B

**Agreement**

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| **Reason for change:** The order of resolving overlapping PUCCH(s) and/or PUSCH(s) and performing cell DRX operation is not clear in spec.  **Summary of change:** First resolving overlapping PUCCH(s) and/or PUSCH(s) and then performing cell DRX operation  **Consequences if not approved:**The order of resolving overlapping PUCCH(s) and/or PUSCH(s) and performing cell DRX operation is not defined in spec. |
| 9      UE procedure for reporting control information  \*\*\* Unchanged text is omitted \*\*\*  When a UE determines overlapping for PUCCH and/or PUSCH transmissions of the same priority index other than PUCCH transmissions with SL HARQ-ACK reports before considering limitations for UE transmission due to cell DRX operation or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2, including repetitions if any,  -       first, the UE resolves the overlapping for PUCCHs with repetitions as described in clause 9.2.6, if any  -       second, the UE resolves the overlapping for PUCCHs without repetitions as described in clauses 9.2.5  -    third, the UE resolves the overlapping for PUSCHs and PUCCHs with repetitions as described in clause 9.2.6  -    fourth, the UE resolves the overlapping for PUSCHs and PUCCHs without repetitions as is subsequently described in this clause.  If a UE  -    is provided *simultaneousPUCCH-PUSCH* and would transmit a PUCCH with a first priority index and PUSCHs with a second priority index that is different than the first priority index, where the PUCCH and the PUSCHs overlap in time  -    can simultaneously transmit the PUCCH and the PUSCHs [18, TS 38.306],  the UE excludes the PUSCHs for resolving the time overlapping between the PUCCH and PUSCHs, where the timeline conditions are not required for the excluded PUSCHs.  When a UE determines overlapping for PUCCH and/or PUSCH transmissions of different priority indexes, other than PUCCH transmissions with SL HARQ-ACK reports, before considering limitations for transmission due to cell DRX operation or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2, including repetitions if any, if the UE is provided *uci-MuxWithDiffPrio* and the timeline conditions in clause 9.2.5 for multiplexing UCI in a PUCCH or a PUSCH are satisfied  \*\*\* Unchanged text is omitted \*\*\*  When a UE determines overlapping for PUCCH and/or PUSCH transmissions of different priority indexes, other than PUCCH transmissions with SL HARQ-ACK reports, before considering limitations for transmissions including with repetitions, if any, due to cell DRX operation or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2, if the UE is not provided *uci-MuxWithDiffPrio*, the UE first resolves overlapping for PUCCH and/or PUSCH transmissions of smaller priority index as described in clauses 9.2.5 and 9.2.6. Then,  -    if a transmission of a first PUCCH of larger priority index scheduled by a DCI format in a PDCCH reception would overlap in time with a repetition of a transmission of a second PUSCH or a second PUCCH of smaller priority index, the UE cancels the repetition of a transmission of the second PUSCH or the second PUCCH before the first symbol that would overlap with the first PUCCH transmission  -    if a transmission of a first PUSCH of larger priority index scheduled by a DCI format in a PDCCH reception would overlap in time with a repetition of the transmission of a second PUCCH of smaller priority index, the UE cancels the repetition of the transmission of the second PUCCH before the first symbol that would overlap with the first PUSCH transmission  where  -    the overlapping is applicable before or after resolving overlapping among channels of larger priority index, if any, as described in clauses 9.2.5 and 9.2.6  -    any remaining PUCCH and/or PUSCH transmission after overlapping resolution is subjected to the limitations for UE transmission due to cell DRX operation or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2,  -    the UE expects that the transmission of the first PUCCH or the first PUSCH, respectively, would not start before after a last symbol of the corresponding PDCCH reception  -      is the PUSCH preparation time for a corresponding UE processing capability assuming [6, TS 38.214], based on and as subsequently defined in this clause, and is determined by a reported UE capability  \*\*\* Unchanged text is omitted \*\*\*  In the remaining of this clause, a UE multiplexes UCIs with same priority index in a PUCCH or a PUSCH before considering limitations for UE transmission due to cell DRX operation or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2. A PUCCH or a PUSCH is assumed to have a same priority index as a priority index of UCIs a UE multiplexes in the PUCCH or the PUSCH.  \*\*\* Unchanged text is omitted \*\*\* |

## RAN1 #116 (February-2024)

**Agreement**

**Reason for change**: The UE behavior is not defined for *CSI-ReportConfig* configured with time restriction set to "*Configured*", when cell DTX is activated on the serving cell with the CSI resource Setting linked to the *CSI-ReportConfig*.

**Summary of change:** Defines the UE behavior for *CSI-ReportConfig* configured with time restriction set to "*Configured*", when cell DTX is activated on the serving cell with the CSI resource Setting linked to the *CSI-ReportConfig*.

**Consequences if not approved:**Undefined UE behavior on performing CSI report corresponding to *CSI-ReportConfig* configured with time restriction, when cell DTX is activated on the serving cell with the CSI resource Setting linked to the *CSI-ReportConfig*.

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| **5.2.2.1                  Channel quality indicator (CQI)**  \*\*\* Unchanged text is omitted \*\*\*  If the higher layer parameter *timeRestrictionForChannelMeasurements* in *CSI-ReportConfig* is set to "*Configured*", the UE shall derive the channel measurements for computing CSI reported in uplink slot *n* based on only the most recent, no later than the CSI reference resource, in cell DTX active time of a serving cell if cell DTX is activated, occasion of NZP CSI-RS (defined in [4, TS 38.211]) associated with the CSI resource setting on the serving cell.  \*\*\* Unchanged text is omitted \*\*\*  If the higher layer parameter *timeRestrictionForInterferenceMeasurements* in *CSI-ReportConfig* is set to "*Configured*", the UE shall derive the interference measurements for computing the CSI value reported in uplink slot *n* based on the most recent, no later than the CSI reference resource, in cell DTX active time of a serving cell if cell DTX is activated, occasion of CSI-IM and/or NZP CSI-RS for interference measurement (defined in [4, TS 38.211]) associated with the CSI resource setting on the serving cell.  \*\*\* Unchanged text is omitted \*\*\* |

**Agreement**

**Reason for change**: The UE behavior is not defined for *CSI-ReportConfig* configured with the higher layer parameter *reportQuantity* comprising at least 'RI', when cell DTX is activated on the serving cell for the corresponding measurement resource.

**Summary of change:** Defines the UE behavior for *CSI-ReportConfig* configured with the higher layer parameter *reportQuantity* comprising at least 'RI', when cell DTX is activated on the serving cell for the corresponding measurement resource.

**Consequences if not approved:**Undefined UE behavior on performing CSI report or receiving CSI-RS corresponding to *CSI-ReportConfig* configured with the higher layer parameter *reportQuantity* comprising at least 'RI', when cell DTX is activated on the serving cell for the corresponding measurement resource.

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| 5.1.6.1                  CSI-RS reception procedure  \*\*\* Unchanged text is omitted \*\*\*  During non-active periods of cell DTX if cell DTX is activated for a serving cell, the UE ~~configured with cell DTX~~ is not expected to receive the periodic CSI-RS and semi-persistent CSI-RS on the serving cell configured in CSI report configuration in CSI-*ReportConfig* associated with the higher layer parameter *reportQuantity* comprising at least 'RI'. If the cell DTX is activated for a serving cell [10, TS 38.321], the most recent CSI measurement occasion of semi-persistent CSI-RS resource or periodic CSI-RS resource on the serving cell occurs in active periods of cell DTX for CSI report configured by *CSI-ReportConfig* associated with the higher layer parameter *reportQuantity* comprising at least 'RI'.  \*\*\* Unchanged text is omitted \*\*\*  5.2.2.5                  CSI reference resource definition  \*\*\* Unchanged text is omitted \*\*\*  For the CSI report configuration in CSI-*ReportConfig* associated with the higher layer parameter *reportQuantity* comprising at least 'RI' ~~on a serving cell with cell DTX activated [10, TS 38.321]~~, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion of each periodic CSI-RS resource or semi-persistent CSI-RS resource on a serving cell with cell DTX activated [10, TS 38.321] for channel measurement and/or interference measurement in active periods of cell DTX of the serving cell no later than CSI reference resource, and the UE drops the CSI report otherwise.  \*\*\* Unchanged text is omitted \*\*\* |

**Agreement**

**Reason of change**: the parameter name in RAN1 specification is different from that of in RAN2 specification, while they are assumed to be the same parameter.

**Summary of change**: align the parameter name between RAN1 and RAN2 by replacing NES-RNTI with cellDTRX-RNT

**Consequences if not approved**: A same parameter being represented by different names in RAN1 and RAN2 specification may cause confusing.

------------ start of TP for TS 38.213-----------------------

**10.1 UE procedure for determining physical downlink control channel assignment**

<unchanged parts are omitted>

- a Type3-PDCCH CSS set configured by

- *SearchSpace* in *PDCCH-Config* with *searchSpaceType* = *common* for DCI formats with CRC scrambled by INT-RNTI, SFI-RNTI, TPC-PUSCH-RNTI, TPC-PUCCH-RNTI, TPC-SRS-RNTI, CI-RNTI, or ~~NES-RNTI~~ cellDTRX-RNTI and, only for the primary cell, C-RNTI, MCS-C-RNTI, CS-RNTI(s), or PS-RNTI, or

<unchanged parts are omitted>

------------ end of TP for TS 38.213 -----------------------

**Agreement**

**Reason for change:** The order of resolving overlapping PUCCH(s) and/or PUSCH(s) and performing cell DRX operation is not clear in spec.

**Summary of change:** First resolving overlapping PUCCH(s) and/or PUSCH(s) and then performing cell DRX operation.

**Consequences if not approved:** The order of resolving overlapping PUCCH(s) and/or PUSCH(s) and performing cell DRX operation is not defined in spec.

===== Start of TP for TS38.213 ======

9      UE procedure for reporting control information

\*\*\* Unchanged text is omitted \*\*\*

- else

- if the UE would transmit the following channels that would overlap in time where, if a channel transmission is with repetitions, the following are applicable per repetition

- a first PUCCH transmission of larger priority index and a second PUCCH transmission of smaller priority index

- a first PUCCH transmission of larger priority index and a second PUSCH transmission of smaller priority index when the UE cannot simultaneously transmit the first PUCCH and second PUSCH

- a first PUCCH transmission of smaller priority index and a second PUSCH transmission of larger priority index when the UE cannot simultaneously transmit the first PUCCH and second PUSCH

the UE

- transmits the PUCCH or the PUSCH of the larger priority index subject to the limitations for UE transmissions due to cell DRX operation or as described in clauses 11.1, 11.1.1, 11.2A, and 15 and

- does not transmit a PUCCH or a PUSCH of smaller priority index

\*\*\* Unchanged text is omitted \*\*\*

===== End of TP for TS38.213 =======

**Agreement**

Include cellDTXDRX-L1activation to the updated RRC parameter list to be shared with RAN2.

* Description for parameter: Configure L1 signaling based on DCI 2\_9 to enable dynamic activation/deactivation of cell DTX/DRX configuration per serving cell. Note: cellDTXDRX-L1activation can be configured individually per cell for subset of serving cells.
* Signaling to be provided per serving cell.

**Agreement**

**Reasons for change:**

It is already agreed the HARQ feedback of cancelled SPS PDSCH by non-active period of cell DTX is not transmitted by UE. But for Type 2 HARQ-ACK codebook for SPS PDSCHs, it is not differentiated SPS PDSCH with or without non-active period of cell DTX in the current specification.

**Summary of change:**

UE does not generate a HARQ-ACK information bit for anSPS PDSCH overlapping with non-active period of cell DTX for Type 2 HARQ-ACK codebook for SPS PDSCHs.

**Consequences if not adopted:**

Un-aligned UE behaviour for Type 1 and Type 2 HARQ-ACK codebook generation

========== Start of TP for TS38.213 ===========

**9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel**

\*\*\* Unchanged text omitted \*\*\*

If a UE is configured to receive SPS PDSCH and the UE multiplexes HARQ-ACK information for one activated SPS PDSCH reception based on *downlinkHARQ-FeedbackDisabled* if provided [12, TS 38.331], including the ones associated with the corresponding activation DCI, in the PUCCH in slot , the UE generates one HARQ-ACK information bit associated with the SPS PDSCH reception not overlapping with non-active period of cell DTX of a serving cell, if cell DTX is activated for the serving cell with the SPS PDSCH reception, and appends it to the HARQ-ACK information bits.

If a UE is configured to receive SPS PDSCH and the UE multiplexes HARQ-ACK information for multiple activated SPS PDSCH receptions, including the ones associated with the corresponding activation DCI and excluding the ones that provide only transport blocks for HARQ processes associated with disabled HARQ-ACK information if *downlinkHARQ-FeedbackDisabled* is provided, in the PUCCH in slot , the UE generates the HARQ-ACK information as described in clause 9.1.2 and appends it to the HARQ-ACK information bits.

\*\*\* Unchanged text omitted \*\*\*

========== End of TP for TS38.213 ============

**Agreement**

**Reason for change:** Ambiguous UE behavior is during resolution of the overlapping among PDSCHs (TS 38.214 clause 5) and determination of whether to receive a SPS PDSCH overlapping with non-active period of cell DTX.’

**Summary of change:** the UE first performs determination of whether to receive a SPS PDSCH overlapping with non-active period of cell DTX and then performs resolution of the overlapping among PDSCHs (TS 38.214 clause 5.1).

**Consequences if not approved:**Unclear UE behavior on which PDSCH should be received among the overlapping PDSCHs due to cell DTX operation

===== Start of TP for TS38.214 =======

**5.1 UE procedure for receiving the physical downlink shared channel**

\*\*\* Unchanged text is omitted \*\*\*

If more than one PDSCH on a serving cell each without a corresponding PDCCH transmission are in a slot, after resolving overlapping with symbols in the slot indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or by *tdd-UL-DL-ConfigurationDedicated*,or determined as non-active periods of cell DTX, if the serving cell is activated with cell DTX, based on [10, TS38.321], a UE receives one or more PDSCHs without corresponding PDCCH transmissions in the slot as specified below.

‒ Step 0: set *j=0*, where *j* is thenumber of selected PDSCH(s) for decoding. *Q* is the set of activated PDSCHs without corresponding PDCCH transmissions within the slot

‒ Step 1: A UE receives one PDSCH with the lowest configured *sps-ConfigIndex* within *Q*, set *j=j+1*. Designate the received PDSCH as survivor PDSCH.

‒ Step 2: The survivor PDSCH in step 1 and any other PDSCH(s) overlapping (even partially) with the survivor PDSCH in step 1 are excluded from *Q*.

‒ Step 3: Repeat step 1 and 2 until Q is empty or j is equal to the number of unicast/multicast PDSCHs in a slot supported by the UE

===== End of TP for TS38.214 =======

**Agreement**

**Reasons for change:**

Unclear UE behaviour if a PUCCH with HARQ-ACK and CSI/SR overlaps with non-active period of cell DRX.

Unclear UE behaviour if a PUSCH with HARQ-ACK overlaps with non-active period of cell DRX if the PUSCH is not associated with a corresponding PDCCH.

**Summary of change:**

UE drops the PUCCH without HARQ-ACK and drops the PUSCH without a corresponding PDCCH if HARQ-ACK is not multiplexed in the PUSCH if cell DRX is activated for a serving cell and the PUCCH or the PUSCH overlaps with the non-active period of the serving cell, respectively.

**Consequences if not adopted:**

Incomplete specification.

===== Start of TP for TS38.213 ======

**9 UE procedure for reporting control information**

\*\*\* Unchanged Text Omitted \*\*\*

When a UE determines overlapping for PUCCH and/or PUSCH transmissions of the same priority index other than PUCCH transmissions with SL HARQ-ACK reports before considering limitations for UE transmission due to cell DRX operation [11, TS 38.321] or as described in clauses 11.1, 11.1.1, 11.2A, 15 and 17.2 including repetitions if any,

- first, the UE resolves the overlapping for PUCCHs with repetitions as described in clause 9.2.6, if any

- second, the UE resolves the overlapping for PUCCHs without repetitions as described in clauses 9.2.5

- third, the UE resolves the overlapping for PUSCHs and PUCCHs with repetitions as described in clause 9.2.6

- fourth, the UE resolves the overlapping for PUSCHs and PUCCHs without repetitions as is subsequently described in this clause.

After resolving the overlapping for PUCCH and/or PUSCH transmissions and if cell DRX is activated for a serving cell and a PUCCH or PUSCH overlaps with the non-active period of cell DRX of the serving cell, the UE drops the PUCCH, if HARQ-ACK is not multiplexed in the PUCCH, or drops the PUSCH, if HARQ-ACK is not multiplexed in the PUSCH and the PUSCH is without a corresponding PDCCH, respectively.

If a UE

- is provided *simultaneousPUCCH-PUSCH* and would transmit a PUCCH with a first priority index and PUSCHs with a second priority index that is different than the first priority index, where the PUCCH and the PUSCHs overlap in time on different respective cells

- can simultaneously transmit the PUCCH and the PUSCHs with different priority indexes [18, TS 38.306],

the UE excludes the PUSCHs for resolving the time overlapping between the PUCCH and PUSCHs with different priority indexes, where the timeline conditions for resolving the overlapping PUCCH and PUSCHs are not required for the excluded PUSCHs.

===== End of TP for TS38.213 ======

**Agreement**

* UE transmit a subset of the repetitions of a PUCCH with SR and/or P/SP-CSI that do not overlap with the cell DRX non-active period.
* UE transmit a subset of the repetitions of a SRS that do not overlap with the cell DRX non-active period.
  + Above does not apply for SRS for positioning
* UE receives a subset of the repetitions of a SPS PDSCH that do not overlap with the cell DTX non-active period.

**Agreement**

Send LS to RAN2 to ask to capture the following RAN1 agreement and any additional RAN1 agreement regarding handling of repetition of PUCCH, PUSCH, and SPS PDSCH into RAN2 specification.

|  |
| --- |
| Agreement  UE transmits a subset of the repetitions in a CG bundle that do not overlap with the cell DRX non-active period |

Final LS in R1-2401810.

# Appendix B: RAN2 Agreements

## RAN2 #121 (Feb-2023)

Agreements

1. There will be no impact to RACH, paging, and SIBs in idle/inactive for both gNB and Rel-18 and legacy UEs

2. Rel-18 NES capable CONNECTED UE(s) can perform RACH and receive SIBs in non-active duration of cell DTX and/or DRX (i.e., same behavior for cell DTX and cell DRX). No further enhancements for CBRA and CFRA will be pursued.

3. Pattern configuration for cell DRX/DTX is common for Rel-18 UEs in the cell. FFS whether we have DTX UE specific inactivity timer . FFS on configuration signaling and stage 3.

4. Confirm study item agreement that we can have separate DTX and DRX configuration. We will focus on designing DTX/DRX for at least single configuration. FFS whether multiple configuration of cell DTX or DRX will be supported.

Agreements:

1. RAN2 confirms that non-NES UEs can access to NES cells if NES solution is backwards compatible

## RAN2 #121-bis-e (April-2023)

Agreements

1. A periodic cell DTX/DRX configuration is explicitly signalled to the UEs.

2. A periodic cell DTX/DRX pattern is configured by UE specific RRC signalling.

3. The Cell DTX/DRX configuration contains at least: periodicity, start slot/offset, on duration.

4. As a baseline Cell DTX/DRX is activated/deactivated implicitly by RRC signalling, i.e. activated immediately once configured by RRC and deactivated once the RRC configuration is released.

5. From RAN2 point of view, majority companies see a benefit with L1 signalling for Cell DTX/DRX activation/deactivation, send a LS to RAN1 (email 308) with our preference and ask about feasibility and design details. Ask about feasibility and reliability of using L1 signaling. Clarify that the question is about activation/deactivation copy the agreement from last meeting that we are focusing on single configuration. Extract a few key benefits of dynamic signaling from email discussion and online discussions

6. As baseline, UE doesn’t monitor SPS occasions during Cell DTX non-active period. As baseline, gNB is assumed to be not transmitting PDSCH to that UE on such SPS occasions during the Cell DTX non-active period

7. As baseline, UE does not transmit on CG occasions during Cell DRX non-active periods

8. As baseline, UE does not transmit SR occasions overlapping with Cell DRX non-active periods, e.g. SR transmissions are dropped during the non-active period

FFS: whether we will allow to configure the UE per SR configuration with whether SR can be transmitted during Cell DRX non-active period to to support high priority traffic

9. (for the SRs that will be dropped) If SR is not to be transmitted on an PUCCH occasion during Cell DRX non-active time, the UE keep the SR pending, i.e., the UE delays the SR transmission till the Cell DRX active period without triggering RACH. For the FFS case there may be some exceptions.

10. The understanding for the gNB scheduling behaviour for new transmissions during Cell DTX non-active period is that the gNB does not schedule UE-specific dynamic grants/assignments, even if the UE is in C-DRX Active Time. UE doesn’t monitor PDCCH for dynamic grants/assignments for new transmissions during Cell DTX non-active period, even if the UE is in C-DRX Active time. FFS how to deal with any exceptions (e.g. SR if agreed and RACH).

FFS how to deal with retransmissions

## RAN2 #122 (May-2023)

Agreements:

1 UE monitors PDCCH for RAR during Cell DTX non-active time. The ra-ResponseWindow could be started as legacy.

2 UE monitors PDCCH for msg4 during Cell DTX non-active time. The ra-ContentionResolutionTimer could be started as legacy.

3 Working assumption: When the retransmission timer is running (if C-DRX is configured), the UE is expected to monitor PDCCH, like in legacy. It is up to the network whether it schedules retransmissions out of the Cell DTX active period, i.e., when the DRX retransmission timer is running, the UE should monitor PDCCH regardless of the Cell DTX.

4 Once gNB recognizes there is an emergency call or public safety related service (e.g. MPS/MCS), the NW should ensure there is no impact to the emergency call (e.g. may deactivate Cell DTX/DRX). The behavior is captured in stage 2 spec

5 When an DG grant is received, by the gNB during cell DRX/DTX, the UE follows the grant assignment (i.e. like in legacy). This includes DL HARQ feedback.

## RAN2 #123 (August-2023)

**Agreements:**

1 Activation/deactivation is per serving cell. FFS if the configuration is per cell or per MAC entity

2 RAN2 will reuse the start timer formula of the onDurationTimer from UE C-DRX (including SlotOffset) to specify the start of cellDTX-onDurationTimer (and cellDRX-onDurationTimer) in 38.321.

3 The gNB should ensures that there is at least partial overlapping between UE C-DRX on-duration and cell DTX/DRX on-duration. It is up to network implementation to ensure the alignment. We will capture this in stage 2 specification.

Understanding is that alignment means that the cell DTX/DRX and C-DRX periodicity should be multiple of each other. FFS if we anything needs to be specified in stage 3 (i.e. in IE description)

4 As a baseline legacy C-DRX reconfiguration is used to change UE C-DRX configuration once Cell DTX/DRX is activated/deactivated.

5 RAN2 specifies cellDTX-onDurationTimer (and cellDRX-onDurationTimer) to have the same value range as UE C-DRX on-duration timer.

6 RAN2 specifies cellDTX-Cycle (and cellDRX-Cycle) to have the same value range as UE C-DRX Long cycle.

7 Separate DTX and DRX configuration means that the features can be enabled separately (i.e. Cell DTX can be configured without Cell DRX)

8 On-duration and Cycle parameters are common between cell DTX and DRX, when both are configured. FFS if we have different start offset configuration for cell DTX and cell DRX

9 RAN2 will not introduce a MAC CE for cell DTX/DRX (de)activation.

10 Confirm working assumption, when the retransmission timer is running (if C-DRX is configured), the UE is expected to monitor PDCCH, like in legacy. It is up to the network whether it schedules retransmissions out of the Cell DTX active period, i.e., when the DRX retransmission timer is running, the UE should monitor PDCCH regardless of the Cell DTX.

11 We focus on the case where DTX in RRC can only be configured when C-DRX is configured. We will not optimize for the case where C-DRX is not configured.

## RAN2 #123-bis (October-2023)

**Agreements**

1. Cell DTX/DRX configuration is provided per Serving Cell with the following restrictions:

* A maximum of two cell DTX/DRX patterns can be configured per MAC entity
* The two configured patterns are aligned,
  + The start and slot offset are common for the two patterns.
  + one periodicity is an integer multiple of the other.

2. Working assumption: UE triggers RACH upon determining that an emergency call is initiated during the cell DTX/DRX non active period. We rely on the UE implementation to determine whether an emergency call is initiated. We will take time to check until next meeting to confirm the WA.

**Agreements on CP open issues:**

1. Introduce explicit activation/deactivation in RRC once DTX/DRX is configured (i.e. not for dynamic activation/deactivation). This reverses previous agreement on implicit activation.

2. Start offset and slot offset configuration is also common between Cell DTX and Cell DRX when both are configured

3. Standalone cell DRX configuration is possible to configure

4. Multiple configurations of Cell DTX/DRX are not pursued in Rel-18 for serving cell.

**Agreements for MAC open issues:**

1. The case that Cell DRX activation is received between delivering a configured grant to the HARQ entity and HARQ processing for the CGO will not be addressed by RAN2, as it is not valid for the MAC model.

**Agreements for CHO**

Group common DCI format 2-X is reused to notify the UE that source cell is entering NES mode.

• add one bit of DCI 2-X to trigger both use cases of Cell DTX/DRX activation and cell turning off. RAN2 send LS to RAN1 to request this signaling change.

## RAN2 #124 (November-2023)

**Agreements:**

1. RAN2 will capture the NES-RNTI monitoring behavior in February meeting (once discussion is finalized)

**Agreements**

1. Confirm WA emergency call: UE triggers RACH upon determining that an emergency call is initiated during the cell DTX/DRX non active period

2. In running MAC CR, capture a NOTE similar to section 5.3.13.2 of TS 38.331 (i.e., “NOTE: How the MAC layer in the UE is aware of an ongoing emergency service is up to UE implementation.”)

3. No need to explicitly specify that the UE keeps monitoring PDCCH for followed transmission after successful completion of RA, i.e., it is left to NW implementation to complete followed transmission (e.g., emergency call) after RA (e.g., initiate followed transmission when the retransmission timer is running)

4. No need to restrict that the cell DRX is only configured when C-DRX is configured

5. Adopt the TP to capture the RAN2 requirement “UE doesn’t monitor PDCCH for dynamic grants/assignments for new transmissions during Cell DTX non-active period, even if the UE is in C-DRX Active time”.

For each Serving Cell configured with cell DTX and each configured downlink assignment, the MAC entity may:

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

2> not monitor PDCCH irrespective of the requirements of clause 5.7, unless explicitly stated otherwise in this clause;

**Agreements**

1. We will not optimize for the case where DTX/DRX is activated simultaneously with multicast/broadcast

**Agreements on CHO:**

1. Proposal 2 If one condReconfigId is configured with one legacy and one NES-specific CHO execution events, the UE triggers CHO execution as long as one of the events is fulfilled.

## RAN2 #125 (February-2024)

**Agreements**

1. cellDTRX-RNTI is added in the RNTI monitoring list in section 5.7 of TS 38.321. The UE monitors cellDTRX-RNTI only in the C-DRX active time.

2. Capture the agreement that cell DTX/DRX operation is only supported for sTRP in stage 2 and adopt the TP from Annex 2.

3. Update the MAC spec to prohibit the MAC entity from reporting semi-persistent CSI via either PUSCH or PUCCH during non-active periods of cell DRX.

4 Clarify the agreement in MAC that the UE does not monitor PDCCH for UL grant/DL assignment and the DCI formats agreed by RAN1, i.e. the PDCCH controlled by UE’s DRX functionalities during Cell DTX non-active period (i.e. all RNTIs listed in DRX section)

**Agreement**

1 Define UE behaviour based on 1 barring bit and 3 UE capability options. A UE supporting any of the 3 cell DTX/DRX capabilities is allowed to access a cell operating in DTX/DRX mode. Refer to the UE DTX/DRX capability. It is up to NW implementation how to treat such a UE in connected mode if the capabilities mismatch the NW mode of operation (e.g. UE supports only cell DRX and the NW operates in cell DTX).

**Agreements**

=> The RRC indication will activated both DTX/DRX (if configured) (i.e. no separate activation status indication is introduced)

**Agreements**

1 The Cell DTX/DRX configuration is released upon RRC release to RRC\_INACTIVE