**3GPP TSG RAN WG1 #114bis R1-2310338**

**Xiamen, China, October 9th – October 13th, 2023**

**Source: Moderator (Intel Corporation)**

**Title: Discussion summary #2 for enhancements on cell DTX/DRX mechanism**

**Agenda item: 8.5.2**

**Document for: Discussion**

# Introduction

In this contribution, moderator summarizes issues identified by the submitted technical contributions for RAN1 #114-bis agenda 8.5.2 Enhancements on cell DTX/DRX mechanism.

# Suggested Proposals for Agreement/Conclusion issues

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

# Summary of issues

## 2.1 General – LS proposals

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| **Company** | **Proposals & Observations** |
| [2] Nokia |

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| Agreement**@RAN1#112bis-e**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 behaviour for retransmission
		- if some specific RNTI scrambled PDCCH in USS will be excluded from cell DTX operation
	+ PDCCH in Type-3 CSS
		- UE behaviour 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 behaviour 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**@RAN1#112bis-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. 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 periodAgreement**@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.
* ~~Note: HARQ-ACK of SPS PDSCH not received due to non-active period of cell DTX is impacted.~~

Agreement**@RAN1#114**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 |

Proposal 6: RAN1 WG send LS to RAN2 WG, and kindly ask RAN2 to capture the above RAN1 agreements/conclusions on impact of channels/signals during non-active period of cell DTX/DRX in TS 38.321.Proposal 7: RAN1 should further clarify in the LS to RAN2 or with a new conclusion, states that, there is no impact to the UE reception and/or processing from the gNB of PRS and CSI-RS for RRM/RLM/BFD/BM/Tracking, and the legacy behaviors should be applied for those signals during the non-active period of cell DTX. |
| [25] MediaTek | Proposal 2: LS to RAN2 for capturing skip of P/SP-CSI reporting during non-active periods of cell DRX, regarding similar UE behavior as CSI masking as captured in TS 38.321 * **Include the following RAN1 agreement in the LS**

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| Agreement (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. 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

(text omitted) |

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| [26] NTT Docomo | Proposal 4:* Delete the descriptions for CSI-RS transmissions during non-active periods of cell DTX in clause 5.1.6.1 in TS.38.214.
* Send an LS to RAN2 to inform agreements on the CSI-RS transmissions during non-active periods of cell DTX and ask to update TS.38.321 accordingly.

Proposal 5:* Send an LS to RAN2 to inform agreements on the PDCCH monitoring for DCI format 2\_0 – 2\_5 during non-active periods of cell DRX and ask to update TS.38.321 accordingly.

Proposal 6:* Delete the descriptions for SRS transmissions during non-active periods of cell DRX in clause 6.2.1 in TS.38.214.
* Send an LS to RAN2 to inform agreements on the SRS transmissions during non-active periods of cell DRX and ask to update TS.38.321 accordingly.
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### Summary of Issues

Three companies suggested to send LS to RAN2 to inform them of RAN2 specification updated needed from RAN1 agreements. For agreements that require updates to RAN2 specification, moderator thinks it would be good to send LS to RAN2 to make it explicitly clear that RAN2 should capture them in specification.

Suggest discussing the potential LS to RAN2 and any other agreements/conclusions that need to be shared with RAN2.

### Suggestions for Discussions

##### Proposal 1-1:

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

* Agreement**@RAN1#112bis-e**
	+ 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 behaviour for retransmission~~
				+ ~~if some specific RNTI scrambled PDCCH in USS will be excluded from cell DTX operation~~
			* ~~PDCCH in Type-3 CSS~~
				+ ~~UE behaviour 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 behaviour 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**@RAN1#112bis-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. 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~~
* Agreement**@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.
	+ ~~Note: HARQ-ACK of SPS PDSCH not received due to non-active period of cell DTX is impacted.~~
* Agreement**@RAN1#114**
	+ 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

### Summary of Discussion from Monday Offline Session

##### Proposal 1-1A:

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

* #5 Agreement**@RAN1#112bis-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. 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
* #24 Agreement**@RAN1#114**
	+ For the FFS from agreement from RAN1 #112bis
		- SRS for positioning is not impacted by cell DRX operation.
* #22 Agreement**@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
* **#23 Conclusion:**
	+ HARQ-ACK of SPS PDSCH transmitted is not impacted by non-active period of cell DRX.
* **#25 Conclusion:**
	+ The following channels are not impacted by non-active period of cell DRX
		- HARQ-ACK of a DCI format without scheduling a PDSCH

If there are agreements/conclusion that needs to be captured in RAN2 spec, agree in principle to send LS to RAN2, that capture list of RAN1 agreement/conclusions that is not addressed by RAN1 specification and ask to capture them appropriately. Try to finalize the list of agreement/conclusion to send by end of the week.

Moderator/Company to find full list of agreement/conclusions implemented by RAN1 CR and identify missing agreements/conclusions. RAN2 running-CR can be checked as well. Moderato has enumerated all the RAN1 agreements and conclusions in the appendix. Moderator suggested using the agreement/conclusion enumeration in the document for further discussions.

Moderator notes that the following agreements/conclusions are captured in current RAN1 CR.

* #3, #5 (SRS part only), #11, #12, #13, #14, #15, #16, #17, #19, #20, #21, #24

Moderator notes that following agreements/conclusions do not need to be captured in the RAN1 CR.

* #1 (study), #2 (study), #4 (study), #6 (confirm RAN2 agreement), #7 (for LS), #8 (for LS), #9 (for LS), #10 (list of alt), #18 (RRC parameter update)

Moderator notes that following agreements have **not** been captured in current RAN1 CR.

* #5 (CSI report part only), #22

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| #5 AgreementFrom 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

#22 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
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Moderator notes that following conclusions that does not need to be captured in RAN1 CR.

* #23, #25

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| #23 Conclusion:* HARQ-ACK of SPS PDSCH transmitted is not impacted by non-active period of cell DRX.

#25 Conclusion* The following channels are not impacted by non-active period of cell DRX
	+ HARQ-ACK of a DCI format without scheduling a PDSCH
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##### Proposal #1-2

Down-select from alt 1 or alt 2

Alt 1)

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

Editor to capture the following previous RAN1 agreement in RAN1 specification.

* 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. 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

Alt 2)

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
* 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. 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

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments for Proposal #1-1A, #1-2 and identification of agreements/conclusions not implemented by RAN1 CR and is missing.

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| Company | Comments |
| Huawei, HiSilicon | In principle we are fine with sending a LS to RAN2. However, since we are modifying some of the agreements, for example either by removing “FFS” and/or sentences like “The list of signals/channels may be updated based on RAN2/RAN4 input and other signals/channels are not precluded from further discussions.”We propose to mark them as revised. For example, #3 agreement #3 Agreement-Revised 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~~

 Include any tracking is not needed in the revised agreements. In the example above, we just show the modifications (tracking in red) that we think is needed for the agreement #3. Regarding Proposal #1-2, Since there might be some future TPs and agreements during this meeting then we could go with Alt1) and based on the future agreements and/or future possible TPs in RAN1 we could keep RAN2 updated with any future changes.  |

## 2.2 General - Impact of cell DTX/DRX on signals/channels

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| **Company** | **Proposals & Observations** |
| [3] Spreadtrum | Proposal 1: For PDCCH for grants/assignments for retransmission, RAN1 can follow RAN2 agreements, if any.Proposal 2: For PDCCH for triggering semi-persistent grants/assignments, RAN1 can follow RAN2 agreements, if any.Proposal 3: DCI format 2\_6 is monitored by UE during non-active period of cell DTX.Proposal 4: DCI format 2\_7 is monitored by UE during non-active period of cell DTX.Proposal 5: DCI format 2\_9 is monitored by UE during non-active period of cell DTX.Proposal 6: If TRS periodicity is short enough, TRS is NOT transmitted by gNB during non-active period of cell DTX.Proposal 7: CSI-RS for RLM/BFD is NOT transmitted by gNB during non-active period of cell DTX.Proposal 8: CSI-RS for RRM measurement is transmitted by gNB during non-active period of cell DTX.Proposal 9: CSI-RS for BM is transmitted by gNB during non-active period of cell DTX.Proposal 10: SRS for Positioning is transmitted by UE during non-active period of cell DRX.Proposal 11: Whether UL channel is transmitted by UE during non-active period of cell DRX is left for RAN2 discussion. |
| [4] vivo | Proposal 3: UE doesn’t expect a CSI-RS for RLM/BFD is available in non-active period of cell DTX in a serving cell. |
| [7] CEWiT | Observation 1: Following observation is made about deprioritizing signals and channels over cell DTX/DRX • Deprioritizing results in delay and performance loss at UE• Rescheduling the entire set of deprioritized signals/channels after cell DTX/DRX pattern results in additional signaling and redundancyProposal 1: Reassigning the deprioritized operations after non-active period of cell DTX/DRX pattern using a time offset is supported. |
| [8] NEC | Observation 1: Transmission of CSI-RS for RRM/RLM/BFD/BM during Cell DTX non-active time would not be essential due to presence of SSBProposal 10: Transmission of CSI-RS for tracking (TRS) and positioning reference signal (PRS) during Cell DTX non-active time of the cell should be configurableProposal 11: Support dedicated TRS configuration, e.g., larger periodicity, which is valid only in the Cell DTX non-active time. |
| [11] Samsung | Proposal 1: RAN1 conclude that TRS is not impacted by cell DTX.Proposal 6: UE receives/transmits the following channels overlapping with both active and non-active periods of cell DTX/DRX, respectively.- SPS PDSCH- PDCCH that are not monitoring during non-active periods of cell DTX- P/SP-CSI-RS for CSI- P/SP CSI report - P/SP SRS- SR- CG PUSCH |
| [12] Xiaomi | Proposal 3: Periodic reference signals related to RLM/BFD/BFR procedures should be transmitted during non-active period of cell DTX.Proposal 4: PRS should be maintained since turning off which will impact R18 RRC idle/inactive UE positioning.Proposal 5: CSI-RS for RRM should be turned off during non-active period of cell DTX.Proposal 6: TRS for RRC idle/inactive UE should be maintained while TRS for RRC connected UE can be turned off during non-active period of cell DTX.Proposal 7: Support UE to transmit high priority SR during Cell DRX non-active period.Proposal 8: During cell DTX non-active period CSI report with reportQuantity including RI is not transmitted.Proposal 9: During cell DRX non-active period, CSI-RS/CSI-IM related to periodic/semi-persistent CSI report is not transmitted. |
| [13] CATT | Proposal 12: Rel-18 UE supporting cell DTX does not expect to receive and/or process the following signals/channels from the gNB except to DCI format 2\_6, during non-active time of cell DTX. * 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)
 |
| [14] China Telecom | Proposal 1:Support gNB not to transmit the following signals/channels to UE during the non-active period of cell-DTX.* P CSI-RS for RLM and BFD/BFR
* P/SP PRS\

Proposal 5: The signals/channels that transmitted/received repeatedly during non-active periods of cell DTX/DRX should be ignored. |
| [15] OPPO | Proposal 1: UE is not expected to receive and/or process the following signals/channels from the gNB during non-active periods of cell DTX:* PDCCH in USS for retransmission or some specific RNTI
* PDCCH in Type-3 CSS for retransmission or some specific RNTI
* Periodic/Semi-persistent CSI-RS (for BM)

Proposal 2: UE can receive and/or process the following signals/channels from the gNB during non-active periods of cell DTX:* 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)

Proposal 3: RACH procedure can be performed normally during non-active periods of cell DTX.Proposal 5: UE shall transmit a PUSCH/PUCCH/SRS which is at least partially overlapped with non-active period of cell DRX if this PUSCH/PUCCH/SRS is dynamically scheduled by a DCI. |
| [16] Fujitsu | Proposal 2. For the CSI-RS resource configured by CSI-RS-Resource-Mobility,* If cell DTX cycle is no larger than 80 msec, Rel.18 UE is not required to perform measurement of CSI-RS resources during cell DTX non-active period.
* If cell DTX cycle is larger than 80 msec, Rel.18 UE may not expect CSI-RS resources are available during cell DTX non-active period.
 |
| [18] ETRI | Proposal 6: PRS is not impacted by cell DTX operation.Proposal 7: UE does not expect to receive and/or process the following signals/channels during cell DTX non-active duration (with no support of configurability):* CSI-RS for RRM
* CSI-RS for RLM and BFD
* Periodic/Semi-persistent CSI-RS for CSI reporting
* Periodic/semi-persistent CSI-RS for BM
 |
| [20] Apple | Proposal 3: To not impact legacy UEs that do not support NES feature, TRS is still maintained during non-active duration of cell DTX.Observation 1: Allowing P/SP CSI-RS to be stopped during cell DTX/DRX non-active duration may significantly increase UE measurement latency.Proposal 4: Support network configuration of a list of P/SP CSI-RS for L1-RSRP/SINR measurement, RRM, RLM, for UE to not expect to receive and/or process during non-active period of cell DTX. Proposal 5: Whether UE supports not receiving and/or processing P/SP CSI-RS during non-active period of cell DTX is reported as UE capability. |
| [22] Interdigital | Proposal 3: UE is not expected to measure periodic/semi-persistent CSI-RS (for tracking, BM, RLM and BFD) during non-active periods of cell DTXProposal 4: UE is not expected to measure PRS during non-active periods of cell DTX |
| [23] Panasonic | Proposal 1: For CSI-RS configured for tracking, beam and radio link monitoring and UE mobility, the availability can be configurable during non-active periods of Cell DTX.Proposal 2: For Cell DTX, UE behaviour is not impacted and can receive PRS during Cell DTX non-active period. If network wants to save energy and does not transmit PRS during non-active period, it can be achieved by gNB implementation of configuration. |

### Summary of Issues

Companies have provided list of signals and channels that should or should not be impacted by the cell DTX/DRX operations. RAN1 has debated the additional impact to signals and channels, but was not able to reach consensus before. Moderator suggests to only discuss this issue further only for signal/channels companies absolutely necessary for completion of Rel-18 and wants to bring up for discussion.

### Suggestions for Discussions

Companies to provide comments on select proposals on others signals/channels that do not have any prior RAN1 agreement for impact from cell DTX/DRX operations. Please only provide comments for signals/channels that are believed to be absolutely necessary for completion of Rel-18.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

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| Company | Comments |
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## 2.3 General - Cell DTX/DRX for signal/channels with repetition

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| **Company** | **Proposals & Observations** |
| [9] LGE | Proposal #5: For signals/channels (e.g., PDCCH/PDSCH/CSI-RS/PUCCH/PUSCH/SRS) configured with repeated transmission, if the resources of signals/channels are included in or partially overlapped with the Cell DTX/DRX inactive period, the resource may skip or defer transmission or reception until the end of the inactive period. |
| [18] ETRI | Proposal 9: If a PUCCH repetition or a SPS HARQ-ACK (when Rel-17 SPS HARQ-ACK deferral is configured) collides with a symbol belonging to the cell DRX non-active duration, the PUCCH repetition or the SPS HARQ-ACK is deferred to a next valid UL resource.* The symbol belonging to the cell DRX non-active duration is regarded as an invalid symbol
 |
| [24] Lenovo | Proposal 1: The UE behavior for multi-slot signals/channels that partially overlap with a cell DTX/DRX inactive period is addressed in the maintenance phase of cell DTX/DRX enhancementsProposal 2 Assuming a multi-slot signal/channel that partially overlaps with a cell DTX/DRX inactive period, specify the corresponding UE behavior for at least the following three scenarios:* Scenario 1: the first X slots of the signal/channel fall within a cell DTX/DRX active period, whereas the remaining slots fall within a cell DTX/DRX inactive period
* Scenario 2: the first Y slots of the signal/channel fall within a cell DTX/DRX inactive period, whereas the remaining slots fall within a cell DTX/DRX active period
* Scenario 3: the first Z slots of the signal/channel precede the activation of cell DTX/DRX, whereas at least one of the remaining slots falls within a cell DTX/DRX inactive period

Proposal 3: For multi-slot repetition signals/channels that partially overlap with the cell DTX/DRX inactive period, the subset of slots that overlap with cell DTX/DRX inactive periods are dropped, whereas the remainder of the slots that fall within the cell DTX/DRX active periods are monitored/transmitted assuming cell DTX/DRX, respectivelyProposal 4 For multi-slot non-repetition signals/channels where different slots carry different content, and the signal/channel partially overlaps with a cell DTX/DRX inactive period, down select between the following behavior alternatives:* Alt1: All slots of the multi-slot signal/channel are dropped, i.e., the signal/channel is not monitored/transmitted assuming cell DTX/DRX, respectively
* Alt2: All slots of the multi-slot signal/channel are monitored/transmitted, including the subset of slots falling within cell DTX/DRX inactive periods, respectively
 |

### Summary of Issues

Three companies have provided proposal on handling of signals/channels that span multiple slots or are transmitted in multiple slots as repetition. However, the companies have not provided explicit TPs on what specification changes are needed.

### Suggestions for Discussions

Moderator asks proponent to provide a text proposal (with reasons for change/summary of change/consequence if not approved) for the proposals listed in this section.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Huawei, HiSilicon | We support the need to clarify the spec behavior in case of signals/channels spans multiple slots where some slots are impacted by cell DTX/DRX. And we can discuss case by case once TPs are provided  |

## 2.4 General - cell DTX/DRX and C-DRX interactions

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [12] Xiaomi | Proposal 15: For CA scenario, the Cell DTX/DRX configuration for multiple cells should be restricted to have overlapping active durations as much as possible. |
| [15] OPPO | Proposal 6: The alignment of cell DTX/DRX and UE C-DRX cycles or the alignment of UE C-DRX cycles for different UE can be left to gNB implementation.Proposal 7: When both cell DTX/DRX and UE-specific C-DRX are configured, the cell DTX non-active time will always be the non-active time for UE, i.e. in cell DTX/DRX non-active, the UE always follows the behaviour designed for cell DTX/DRX non-active.Proposal 8: When both cell DTX/DRX and UE-specific C-DRX are configured, UE C-DRX active time is only possible in the cell DTX/DRX active time, i.e. in cell DTX/DRX active, the UE always follows the behaviour designed for UE-specific C-DRX. |
| [16] Fujitsu | Proposal 4. When both UE C-DRX and cell DTX/DRX are configured, support the following UE behavior:* For Case 1 where both cell DTX / DRX and UE C-DRX are active, the normal UE behavior is performed.
* For Case 2 where cell DTX / DRX is in active period and UE C-DRX is in inactive time, the UE behavior follows the UE C-DRX.
* For Case 3 where cell DTX / DRX is in non-active period and UE C-DRX is in active time, the UE behavior follows the cell DTX/DRX.
* For Case 4 where both cell DTX / DRX and UE C-DRX are non-active, the UE behavior follows the one with more stringent constrains, between cell DTX/DRX and UE C-DRX.
 |
| [23] Panasonic | Proposal 7: The UE behaviour in Table, when both Cell DTX and UE C-DRX are configured, should be further discussed. |

### Summary of Issues

Three companies have provided proposal on general aspects of handling of UE C-DRX interactions with cell DTX/DRX. However, the companies have not provided explicit TPs on what specification changes are needed.

### Suggestions for Discussions

Moderator asks proponent to provide a text proposal (with reasons for change/summary of change/consequence if not approved) for the proposals listed in this section.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| NEC | If C-DRX cycle of a UE overlaps with the cell DTX cycle such that UE’s inactive duration overlaps with cell’s active and inactive duration, UE remains OFF for its entire inactive duration. Cell DTX/DRX overrides the UE behavior on UE C-DRX if C-DRX cycle(s) is within cell inactivity period. |
| Huawei, HiSilicon | This discussion seems happening in RAN2 and there is no foreseen RAN1 impact. Additionally it can be solved by gNB implementation.  |

## 2.5 PDCCH - DCI format 2-9

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [2] Nokia | Proposal 1: [TP#5-1 to TS 38.212, Sec. 7.3.1, Table 7.3.1-1] Capture in TS 38.212 that the (de)-activation could be applied for both cell DTX and cell DRX when both are configured for a serving cell, or applied for only cell DTX or cell DRX if only one of it is configured.Proposal 2: [TP#5-2 to TS 38.212, Sec. 7.3.1.3.10] Capture in TS 38.212 the two cases where both cell DTX and cell DRX are configured for a serving cell or only one cell DTX or cell DRX is configured.Proposal 3: [TP#5-2 to TS 38.212, Sec. 7.3.1.3.10] Regarding “2 bits are needed for activation or deactivation of cell DTX and cell DRX configurations when both cell DTX and DRX are configured for the serving cell, otherwise only 1 bit is needed for activation or deactivation of cell DTX or cell DRX configuration when only cell DTX or cell DRX is configured”, more explicit description is needed. Proposal 4: [TP#5-3 to TS 38.213, Sec. 11.5] To align the terminology of description, the corresponding part of “first bit” and “second bit” in TS 38.213 should be updated with MSB and LSB, as being used in TS 38.212. |
| [3] Spreadtrum | Proposal 12: UE monitors DCI format 2\_9 outside active time of UE C-DRX.Observation 1: For miss detection of DCI format 2\_9, if UE assumes activation of cell DTX/DRX, UE will skip some scheduling information and measurement occasions, and gNB will miss takes some useless signals/channels.Observation 2: For miss detection of DCI format 2\_9, if UE assumes deactivation of cell DTX/DRX, UE will miss takes some useless signals/channels, and gNB will skip some UL information and measurement occasions.Proposal 13: For miss detection of DCI format 2\_9, for DL reception, UE assumes activation of cell DTX.Proposal 14: for miss detection of DCI format 2\_9, for UL transmission, UE assumes deactivation of cell DRX. |
| [4] vivo | Proposal 4: UE doesn’t monitor PDCCH scrambled by NES-RNTI for L1 cell DTX/DRX activation/deactivation in non-active period of UE DRX.Proposal 5: Send a LS to RAN2 to add NES-RNTI as an additional RNTI that UE DRX functionality can control. |
| [5] ZTE, Sanechips | Proposal 3: If the UE is configured multiple cells that supports cell DTX/DRX operation, UE needs to know which serving cell(s) has the corresponding cell DTX/DRX operation indication block in DCI format 2-9.Observation 2: The configuration of parameter positionInDCI-cellDTRX is not associated with any serving cell information according to the definition of parameter positionInDCI-cellDTRX as “Configure the starting bit position of an information block of DCI format 2\_X per serving cell” in [5].Proposal 4: It is proposed that a combination of a starting position of cell DTX/DRX operation information block within DCI payload and serving cell index should be configured for the UE to provide the most flexibility of cell DTX/DRX operation indication among multiple serving cells.Proposal 7: It is proposed that parameters positionInDCI-cellDTRX, cellDTXConfig and cellDRXConfig are used to indicate whether the activation/deactivation of cell DTX and/or cell DRX is indicated in DCI format 2\_9 for a serving cell. |
| [7] CEWiT | Observation 3: The energy saving at gNB can be improved if the cell DTX/DRX pattern can adapt to the network conditions.Proposal 3: Dynamic adaptation of ON duration of the cell DTX/DRX pattern using DCI format for cell DTX/DRX activation and deactivation is supported. |
| [8] NEC | Proposal 1: For cell DTX/DRX activation/deactivation, support 2 bits or 4 bits for the support of multiple cell DTX/DRX patterns. |
| [9] LGE | Proposal #7: If some serving cells operate cell DTX/DRX and other serving cells do not, how to handle PDCCH monitoring, PUCCH transmission, and CSI reporting should be discussed. |
| [10] Futurewei | Observation 1: For an NES-capable UE that is configured to monitor DCI 2\_9 with CRC scrambled by NES-RNTI, reception of the information blocks within DCI 2\_9 signals the activation and deactivation of the corresponding cell DTX/DRX. Additional higher layer signaling is therefore not necessary. |
| [13] CATT | Proposal 1: For cell DTX/DRX activation and deactivation, the following methods are supported: * Cell DTX/DRX is activated and deactivated dynamically by DCI format 2\_9 at different time.
* Cell DTX/DRX is activated and deactivated semi-statically by RRC signaling at different time.
* Cell DTX/DRX is activated by DCI format 2\_9 and deactivated by RRC signaling.
* Cell DTX/DRX is activated by RRC signaling and deactivated by DCI format 2\_9.,

Proposal 7: For cell DTX/DRX activation and deactivation, the DCI format 2\_9 contains N information blocks corresponding to M serving cells, and UE may be configured with more than one information block for a serving cell. Proposal 8: For DCI format 2\_9 based cell DTX/DRX activation and deactivation, when a UE is configured with more than one information blocks for a serving cell containing a cell-specific information block and a UE-group-specific information block, UE determines the cell DTX/DRX activation and deactivation based on the indication of UE-group-specific information block. |

### Summary of Issues

Companies have provided proposals to further update aspects of DCI format 2-9. The following TPs were provided.

##### TP #5-1 (TS38.212)

|  |
| --- |
| ***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 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 \*\*\* |

##### TP #5-2 (TS38.212)

|  |
| --- |
| ***Reason for change****: Clarify that 2 bits will be 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 will be needed which corresponds to cell DTX or cell DRX configuration activation or deactivation.* |
| ***Summary of change****: Explicit description of “2 bits are needed for activation or deactivation of cell DTX and cell DRX configurations when both cell DTX and DRX are configured for the serving cell, otherwise only 1 bit is needed for activation or deactivation of cell DTX or cell DRX configuration when only cell DTX or cell DRX is configured”.* |
| ***Consequences if not approved:*** *unclear specification* |
| \*\*\* Unchanged parts are omitted \*\*\*7.3.1.3.10 Format 2\_9DCI 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. The following information is transmitted by means of the DCI format 2\_9 with CRC scrambled by NES-RNTI:- block number 1, block number 2,…, block number *N* where the starting position of a block is determined by the parameter *positionInDCI-cellDTRX* provided by higher layers for the UE.If the UE is configured with higher layer parameter *XYZ*, one or more blocks are configured for the UE by higher layers, with the following field defined for each block:- Cell DTX/DRX indication – 2 bits if *XYZ*, with the MSB corresponding to the activation or deactivation of cell DTX configuration and the activation or deactivation of LSB corresponding to cell DRX configuration; otherwise 1 bit corresponding to cell DTX or DRX configuration activation or deactivation. The size of DCI format 2\_9 is indicated by the higher layer parameter *sizeDCI-2-9*. \*\*\* Unchanged parts are omitted \*\*\* |

##### TP #5-3 (TS38.212)

|  |
| --- |
| ***Reason for change****: align the terminology with TS 38.212, on the definition of the cell DTX/DRX indicator field.* |
| ***Summary of change****: replace “first” by “MSB” and “second” by “LSB”.* |
| ***Consequences if not approved:*** *misalignment between specifications*  |
| \*\*\* 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 *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* 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 MSB bit indicates the cell DTX operation and the LSB bit indicates the cell DRX operation\*\*\* Unchanged parts are omitted \*\*\* |

##### TP #5-4 (TS38.212)

|  |
| --- |
| ***Reason for change****:*  |
| ***Summary of change****:*  |
| ***Consequences if not approved:***  |
| \*\*\* Unchanged parts are omitted \*\*\*7.3.1.3.10 Format 2\_9DCI format 2\_9 is used for activating or de-activating the cell DTX/DRX configuration of one or multiple serving cells for one or more UEs. The following information is transmitted by means of the DCI format 2\_9 with CRC scrambled by NES-RNTI:- block number 1, block number 2,…, block number *N* where the starting position of a block associated with a serving cell ID is determined by the parameter *positionInDCI-cellDTRX* provided by higher layers for the UE.If the UE is configured with higher layer parameter *~~XYZ~~cellDTRX-DCI-config*, one or more blocks are configured for the UE by higher layers, with the following field defined for each block:- Cell DTX/DRX indication – 2 bits if *~~XYZ~~*both *cellDTXConfig* and *cellDRXConfig* are configured, with the MSB corresponding to cell DTX configuration and the LSB corresponding to cell DRX configuration; otherwise 1 bit if *cellDTXConfig* or *cellDRXConfig* is configured. The size of DCI format 2\_9 is indicated by the higher layer parameter *sizeDCI-2-9*. |

##### TP #5-5 (TS38.213)

|  |
| --- |
| ***Reason for change****:*  |
| ***Summary of change****:*  |
| ***Consequences if not approved:***  |
| 11.5 Adaptation of cell operationA 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* of a cell DTX/DRX indicator field for the serving cell associated with the serving cell ID configured by higher layer parameter - 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\*\*\* Unchanged parts are omitted \*\*\* |

##### TP #5-6 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 7.3.1.3.10 Format 2\_9*DCI format 2\_9 is used for activating or de-activating the cell DTX/DRX configuration of one or multiple serving cells for one or more UEs.* *The following information is transmitted by means of the DCI format 2\_9 with CRC scrambled by NES-RNTI:**- block number 1, block number 2,…, block number N* *where the starting position of a block 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~~ NES-RNTI, one or more blocks are configured for the UE by higher layers, with the following field defined for each block:**- Cell DTX/DRX indication – 2 bits if XYZ, with the MSB corresponding to cell DTX configuration and the LSB corresponding to cell DRX configuration; otherwise 1 bit.* *The size of DCI format 2\_9 is indicated by the higher layer parameter sizeDCI-2-9.*  |

TP #4-7 (TS38.212)

|  |
| --- |
| **Reason for change:** The RRC parameter for DCI format 2\_9 is not specified. |
| **Summary of change:** The RRC parameter *cellDTRX-DCI-config* configures the activation/deactivation of cell DTX/DRX for a serving cell. |
| **Consequences if not approved:**UE is not clear about the indication of DCI format 2\_9. |
| 7.3.1.3.10 Format 2\_9DCI format 2\_9 is used for activating or de-activating the cell DTX/DRX configuration of one or multiple serving cells for one or more UEs. The following information is transmitted by means of the DCI format 2\_9 with CRC scrambled by NES-RNTI:- block number 1, block number 2,…, block number *N* where the starting position of a block is determined by the parameter *positionInDCI-cellDTRX* provided by higher layers for the UE.If the UE is configured with higher layer parameter *~~XYZ~~ cellDTRX-DCI-config* for a serving cell, ~~one or more blocks are configured for the UE by higher layers, with~~ the following field is defined for ~~each~~ a corresponding block:- Cell DTX/DRX indication – 2 bits if *~~XYZ~~* *cellDTRX-DCI-config* configures both cell DTX and cell DRX, with the MSB corresponding to cell DTX configuration and the LSB corresponding to cell DRX configuration; otherwise 1 bit. The size of DCI format 2\_9 is indicated by the higher layer parameter *sizeDCI-2-9*. |

TP #4-8 (TS38.213)

|  |
| --- |
| **Reason for change:** The RRC parameter for DCI format 2\_9 is not specified. |
| **Summary of change:** The RRC parameter *cellDTRX-DCI-config* configures the activation/deactivation of cell DTX/DRX for a serving cell. |
| **Consequences if not approved:**UE and gNB may have different understanding regarding the indication of DCI format 2\_9. |
| 11.5 Adaptation of cell operationA 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* 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 by *cellDTRX-DCI-config*, 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 by *cellDTRX-DCI-config*, 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 |

### Suggestions for Discussions

Moderator suggests discussing TP #5-1, #5-2, #5-3, #5-4, #5-5, #5-6 further.

For TP#5-4, #5-5, #5-6, moderator askes proponents to provide short description for reasons for change, summary of change, and consequences if not approved.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Huawei, HiSilicon | Fine with TP #5-1, #5-2, #5-3For the other TPs that try to clarify the RRC parameters “XYZ”, we can wait the result of the discussion of RRC parameters and then editors can chose the right names. |

## 2.6 PDCCH - PDCCH monitoring

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [2] Nokia | Observation 1: Based on the agreements from the previous meeting, it is understood that the new DCI format 2\_9 for (de-)activation of cell DTX/DRX will be monitored by UE in the configured common search space of both active periods and non-active periods of cell DTX.Observation 2: Practically, as a tradeoff between network energy saving and system performance, the monitoring of DCI format 2\_9 during the cell DTX non-active period can be less often than the monitoring of DCI format 2\_9 during the active period.Proposal 5: The common search space configuration, i.e. periodicity, for monitoring of DCI format 2\_9 during the cell DTX non-active period can be different from the monitoring of DCI format 2\_9 during the active period. |
| [4] vivo | Proposal 2: Adopt TP #9-1 to support the following: UE terminates PDCCH skipping for the serving cell if entering outside active time of cell DTX. |
| [5] ZTE, Sanechips | Proposal 9: It is proposed to confirm that DCI format 2-9 is monitored in the Type3-PDCCH common search space.Capture following agreement:**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 cellUE monitor DCI format 2\_X in one serving cell |
| [8] NEC | Proposal 3: Support default or fallback PDCCH search space monitoring during the cell DTX/DRX non-active period in cell DTX/DRX activation DCI. |
| [9] LGE | Proposal #8: Clarify UE behaviours for DCI format 2\_9 monitoring when cell DTX/DRX configuration and the UE C-DRX configuration apply simultaneously. |
| [11] Samsung | Proposal 3: RAN1 conclude that a UE monitors DCI format 2\_9 during non-active periods of cell DTX.Proposal 9: If a UE does not detect a PDCCH providing DCI format 2\_9 at a monitoring occasion for DCI format 2\_9, the UE shall assume that the current operation state on the cell is maintained.Observation 1: It should be up to gNB implementation to configure whether PDCCH monitoring configuration for the new DCI format 2\_9 is identical to PDCCH monitoring configuration for DCI format 2\_6 if the UE monitors both DCI formats, i.e., no spec impact is needed. |
| [12] Xiaomi | Observation 1: Current specification already support to use the high layer parameter ps-Wakeup to configure whether start the next on duration if DCI 2-6 is not monitored, Proposal 2: UE does not monitor DCI 2-6 during cell DTX non-active period.Proposal 10: UE monitor DCI 2-X on Pcell, no matter multiple cell DTX/DRX groups are configured or not.Proposal 12: UE can monitor DCI 2-X only once during cell DTX active period before the end of the validity duration. |
| [13] CATT | Proposal 2: The activation and deactivation of cell DTX/DRX by DCI format 2\_9 should consider the following aspects:* The cell DTX/DRX is a semi-static procedure and is not activated or deactivated frequently.
* The activation and deactivation of cell DTX/DRX should reduce the impact to the UE power consumption.

Proposal 3: For cell DTX/DRX activation and deactivation, UE does not monitor DCI format 2\_9 during cell DTX non-active time.Proposal 4: For cell DTX/DRX activation and deactivation, if the PDCCH monitoring occasion of DCI format 2\_9 is determined based on common search space configuration, the periodicity of common search space is determined by the periodicity of cell DTX.Proposal 5: A time window is introduced to monitor DCI format 2\_9 for cell DTX/DRX activation and deactivation.Proposal 6: For cell DTX/DRX activation and deactivation, if a periodic time window for monitoring DCI format 2\_9 is introduced, one of the following alternatives for determining the time window is supported:* Alt 1: The periodicity of time window is determined and derived by the periodicity of cell DTX.
* Alt 2: The time window is determined by the reference point, which could be the start of the cell DTX non-active time or the end of the cell DTX active time.

Proposal 9: The Type 3-PDCCH CSS for monitoring DCI format 2\_9 is supported.Proposal 10: For cell DTX/DRX activation and deactivation, DCI format 2\_9 is not transmitted in every monitoring occasion and is on-demand transmitted in some monitoring occasions if necessary.Proposal 11: When UE does not detect DCI format 2\_9 in monitoring occasion, UE assumes the cell state is not changed:* When cell DTX/DRX is activated and DCI format 2\_9 is not detected, UE assumes that the cell is in cell DTX/DRX state;
* When cell DTX/DRX is deactivated and DCI format 2\_9 is not detected, UE assumes that the cell is in normal state.
 |
| [17] CMCC | Proposal 1: DCI format 2\_9 is monitored on the serving cell that configured with search space of DCI format 2\_9. |
| [18] ETRI | Proposal 1: For the monitoring of DCI format 2\_9, UE can be configured with up to two Type 3 CSS sets. (TP #5-3)Proposal 3: UE does not monitor USS sets and Type 3 CSS sets for DCI format 2\_0~2\_5 during C-DRX inactive time even if it is within cell DTX active time.Proposal 4: UE monitors Type 3 CSS set for DCI format 2\_8 only when it is within cell DTX active time and C-DRX active time.Proposal 5: UE monitors Type 3 CSS set for DCI format 2\_9 without being impacted by the cell DTX and the C-DRX operations. |
| [19] Transsion Holdings | Proposal 1 DCI format 2\_6 or DCI format 2\_7 should not be affected during non-active periods of cell DTX/DRX. |
| [21] ASUSTek | Support TP #5-4 |
| [22] Interdigital | Proposal 1: UE is not expected to monitor PDCCH for detecting DCI format 2\_x during the CDRX non-active time and during the cell DTX non-active period (e.g. if cell DTX configuration is activated) |
| [23] Panasonic | Proposal 3: Monitoring of DCI format 2\_9 is not impacted during non-active time of Cell DTX, which can optionally follow a configured time window.Proposal 4: Monitoring of DCI format 2\_6 is not impacted during non-active time of Cell DTX. |
| [26] NTT Docomo | Proposal 1 (for conclusion):A UE configured to monitor PDCCH for DCI format 2\_9 monitors DCI format 2\_9 on a serving cell which is PCell or SCell according to the configuration.Proposal 2:A UE configured to monitor PDCCH for DCI format 2\_9 does not expect to process information from more than one DCI format 2\_9 per slot. |
| [27] Ericsson | Proposal 1 DCI 2\_9 is monitored in at least Type 3 CSS. |
| [28] Qualcomm | Proposal 1: The UE does not monitor DCI format 2-9 outside the active time of UE C-DRX. |

### Summary of Issues

Companies have provided proposals to further update aspects of PDCCH monitoring for cell DTX/DRX operations. The following TPs were provided.

##### TP #6-1 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 11.5 Adaptation of cell operationA 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 \*\*\* |

##### TP #6-2 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 11.5 Adaptation of cell operationA 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 \*\*\* |

##### TP #6-3 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 11.5 Adaptation of cell operationA 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~~ up to search space sets 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 |

##### TP #6-4 (TS38.213)

|  |
| --- |
| **Reasons for change:**To harvest the most gain of network energy saving, it is important to turn-off a channel or signal during non-active period of Cell DTX/DRX, unless it is deem necessary to be available. Since anyway the active period and non-active period is controlled by configuration of gNB, gNB could already arrange the flexibility to activate/deactivate cell/DTX/DRX via proper availability of active period. Therefore, to avoid unnecessary monitoring or corrupted reception by the UE, UE should also assume such channel and signal are not available during non-active period of Cell DTX. |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 11.5 Adaptation of cell operationA 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* 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 carrierA UE does not expect to monitor PDCCH for detection of DCI format 2\_9 on more than one serving cells.A UE does not expect to monitor or receive the following channel or signal during non-active periods of cell DTX when cell DTX is activated:- PDCCH in USS- DCI format 2\_0, DCI format 2\_1, DCI format 2\_2, DCI format 2\_3, DCI format 2\_4, DCI format 2\_5, and DCI format 2\_9- CSI-RS other than periodic CSI-RS configured with higher layer parameter trs-InfoWhen a UE receives in slot $m$ on the active DL BWP of a first serving cell a PDCCH providing DCI format 2\_9 that indicates a change in activation or deactivation of a current cell DTX operation or cell DRX operation for a second serving cell, the UE operates on the second serving cell according to the indicated cell DTX operation or cell DRX operation starting from a slot on the active DL BWP or on the active UL BWP of the second serving cell, respectively, that is not before the beginning of the slot $m+d$ on the active DL BWP of the first serving cell where $d$ is a number of slots for the SCS of the active DL BWP of the first serving cell in Table 11.5-1. |

##### TP #6-5 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| **10.4 Search space set group switching and skipping of PDCCH monitoring**\*\*\* Unchanged text omitted \*\*\*When the PDCCH monitoring adaptation field indicates to a UE to skip PDCCH monitoring for a duration on the active DL BWP of a serving cell, the UE starts skipping of PDCCH monitoring at the beginning of a first slot that is after the last symbol of the PDCCH reception providing the DCI format with the PDCCH monitoring adaptation field. If the UE transmits a PUCCH providing a positive SR before the UE detects a DCI format providing the PDCCH monitoring adaptation field indicating to the UE to skip PDCCH monitoring for the duration on the active DL BWP of the serving cell, the UE shall monitor PDCCH regardless of PDCCH skipping indication on all serving cells of the corresponding Cell Group when the SR is pending [11, TS 38.321]. If the UE transmits a PUCCH providing a positive SR after the UE detects a DCI format providing the PDCCH monitoring adaptation field indicating to the UE to skip PDCCH monitoring for the duration on the active DL BWP of the serving cell, the UE resumes PDCCH monitoring starting at the beginning of a first slot that is after a last symbol of the PUCCH transmission in all serving cells of the corresponding Cell Group. During the time of *ra-ResponseWindow* or *msgB-ResponseWindow* or the duration where *ra-ContentionResolutionTimer* is running, the UE shall not skip PDCCH monitoring on SpCell. After the UE detects a DCI format providing the PDCCH monitoring adaptation field indicating to the UE to skip PDCCH monitoring for the duration on the active DL BWP of a SpCell, when contention resolution is successful [11, TS 38.321], the UE resumes PDCCH monitoring on the SpCell. After the UE detects a DCI format providing the PDCCH monitoring adaptation field indicating to the UE to skip PDCCH monitoring for the duration on the active DL BWP of a serving cell, when a pending SR is cancelled [11, TS 38.321], the UE resumes PDCCH monitoring in all serving cells of the corresponding Cell Group. If UE transmits a RACH due to positive SR, the UE shall not skip PDCCH monitoring on any serving cell of the corresponding Cell Group during the time of *ra-ResponseWindow* or *msgB-ResponseWindow* or the duration where *ra-ContentionResolutionTimer* is running. If the DRX group of the serving cell is configured and enters outside Active Time, the UE terminates PDCCH skipping for the serving cell. If cell DTX is configured for the serving cell and enters outside active time, the UE terminates PDCCH skipping for the serving cell.\*\*\* Unchanged text omitted \*\*\* |

### Suggestions for Discussions

Moderator suggests discussing TP #6-1, #6-2, #6-3, #6-4, #6-5 further.

For all the TPs, moderator askes proponents to provide short description for reasons for change, summary of change, and consequences if not approved.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### Summary of Discussion from Monday Offline Session

One of the issues discussed during Monday offline session is the monitoring of DCI format 2-9 during non-active periods of C-DRX. The following is the one of the main issues for interaction of cell DTX/DRX and C-DRX.

Monitoring of DCI Format 2-9 during non-active periods of C-DRX

* Alt 1) UE is not expected to DCI format 2-9 during non-active periods of C-DRX.
	+ MediaTek, CATT, Qualcomm, Apple, Docomo, Lenovo, IDC, Samsung, vivo, Xiaomi
	+ Main motivation:
		- Monitoring of DCI format 2-6 during non-active periods of C-DRX is the only exception, and monitoring of other DCI (e.g. DCI format 2-9) should not be performed as they were not optimized and designed for such scenarios.
* Alt 2) UE is expected to monitor DCI format 2-9 during non-active periods of C-DRX
	+ E//, Spreadtrum, HW, LGE, Nokia, ETRI, CMCC, ZTE
	+ Main motivation:
		- Enables the functionality of using DCI format 2-6 for activation/deactivation
		- Allows gNB to activation/deactivate large group of UEs, instead of sending DCI format 2-9 during each active instances of each UE

##### Proposal #6-6

Down-select and agree to one of the following alternative:

* Alt 1) UE is not expected to DCI format 2-9 during non-active periods of C-DRX.
* Alt 2) UE is expected to monitor DCI format 2-9 during non-active periods of C-DRX

Another issue that was discussed during the offline session was whether to monitor DCI format 2-9 during non-active periods of cell DTX. From moderator’s understanding, this was discussed in previous meeting and there was no consensus on not monitor DCI format 2-9 and therefore by default it is understood that without further agreements/changes to specification, UE is expected to monitor DCI format 2-9 for all configured monitoring occasions of the search space configured for DCI Format 2-9. With this said, some companies felt that DCI format 2-9 is something new and therefore warrants discussion on whether it should be monitored or not.

There was also some comments with respect to default behavior when DCI format 2-9 is not recevied during DCI format 2-9 monitoring occasions. Similarly, moderator assumes DCI format 2-9 indicates activation and deactivation, and lack of the signaling means UE to retain its previous signaling/conditions.

Given the re-iteration of the issues in every meeting, moderator suggestion to have a conclusion to finalize the issue.

##### Proposal #6-7

Conclusion:

* UE is expected to continue monitoring all configured DCI formats in non-active periods of cell DTX unless there is an explicit agreement to not perform monitoring.
* UE is expected to only update the L1-based cell DTX/DRX activation/deactivation configuration upon successful reception of DCI format 2-9. The UE retains previous activation and deactivation of the cell DTX/DRX configuration when UE has not received DCI format 2-9 during monitoring occasions.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments on the TPs, Proposal #6-6 and conclusion #6-7. RAN1 should down-select among alternative 1 and 2.

|  |  |
| --- | --- |
| Company | Comments |
| - | - |

### Summary of Discussion from Monday Session

RAN1 was not able to reach consensus for any of the alternative for Proposal #6-6.

One potential compromise was suggested to the moderator, which moderator has formulated in Proposal #6-6A.

##### Proposal #6-6A

* If monitoring of DCI format 2-6 is configured and during non-active periods of C-DRX,
	+ UE only monitors DCI format 2-9 on the same PDCCH monitoring instance as DCI Format 2-6
	+ Note: DCI format 2-9 size may or may not be same as DCI format 2-6
* For all other cases,
	+ UE monitors DCI format 2-9 based on configured search space for DCI format 2-9

### 2nd Round Discussions

#### Company Comments:

Moderator asks companies to provide comments on the TPs, Proposal #6-6A and conclusion #6-7. RAN1 should down-select among alternative 1 and 2.

|  |  |
| --- | --- |
| Company | Comments |
| CMCC | Generally fine with the TP, for TP3, it seems some text missing. “up to ? search space sets”For conclusion#6-7, we are generally OK. It seems not to “update the L1-based cell DTX/DRX activation/deactivation configuration” but “update the activation or deactivation of a current cell DTX operation”.For proposal #6-6A, we already agree the following, considering different motivation of DCI format 2\_6 and 2\_9, we don’t think they should share monitoring instance.#17 AgreementDCI format 2\_X is monitored in the common search spaceNote: Search space set configuration for DCI format 2\_X is separately provided by higher layers |
| Huawei, HiSilicon | We are not fine with the first bullet of the proposal because there is no advantage by connecting 2-6 monitoring behavior and 2-9. And this will not help in solving the problem when UEs has different C-DRX patterns which are not aligned. Additionally, this bullet restrict the flexibility for (de)activation of cell DTX/DRX. For the second bullet it is fine.Fine with TP #6-1, #6-2. The reason of TP #6-3 is not clear hence it is not fine. For TP #6-4, this is related to the ongoing discussion of the LS and was already discussed during the draft CR where it was concluded by the editor to better capture this in RAN2. For us this seems can be captured in RAN2 spec as well. |

## 2.7 PDCCH - Cell DTX/DRX (de)activation application delay

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [5] ZTE, Sanechips | Observation 1: If SCS of the first serving cell changes due to BWP switching during the application delay, the determination of application delay of dynamic cell activation/deactivation change indication is ambiguous based on current TS38.213.Proposal 1: It is proposed that the slot m+d is determined by the SCS of DL BWP when DCI format 2-9 is received instead of active DL BWP in the first serving cell to avoid the ambiguous timeline between UE and gNB.IMG_256Figure 1 Application delay for cell DTX/DRX operation if BWP switches  |
| [12] Xiaomi | Proposal 11: Validity duration for cell DTX/DRX can be carried in DCI 2-x.Proposal 13: Within the application delay which is defined by the largest delay of all corresponding cells, of DCI 2-X, UE does not expect to receive another DCI 2-X which has different activation/ deactivation indication from the previous DCI 2-X. |
| [16] Fujitsu | Proposal 1: * When activation/deactivation of cell DTX is based on RRC signaling, a UE does not transmit the HARQ-ACK feedback for a SPS PDSCH that overlaps with the cell DTX non-active period.
* When activation/deactivation of cell DTX is based on DCI, a UE transmit the HARQ-ACK feedback for a SPS PDSCH that overlaps with the cell DTX non-active period.
 |
| [17] CMCC | Propose 2: When considering slot X when UE is expected to apply cell DTX or DRX activation/deactivation change, search space duration with multiple slots needs to be considered.Propose 3: 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 last slot among the monitoring duration in each monitoring period based on SCS of PDCCH, where at least one slot in the duration contains the PDCCH of DCI format 2\_9. |
| [19] Transsion Holdings | Proposal 2 Some constraints on active/non-active time between cell DTX and cell DRX should be discussed. |
| [26] NTT Docomo | Adopt TP #10-2 |

### Summary of Issues

Companies have provided proposals related to activation and deactivation delay for DCI format 2-9. The following are list of TPs provided.

##### TP #7-1 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 11.5 Adaptation of cell operation\*\*\* Unchanged parts are omitted \*\*\*When a UE receives in slot $m$ on the active DL BWP of a first serving cell a PDCCH providing DCI format 2\_9 that indicates a change in activation or deactivation of a current cell DTX operation or cell DRX operation for a second serving cell, the UE operates on the second serving cell according to the indicated cell DTX operation or cell DRX operation starting from a slot on the active DL BWP or on the active UL BWP of the second serving cell, respectively, that is not before the beginning of the slot $m+d$ on the ~~active~~ DL BWP of the received DCI format 2\_9 of the first serving cell where $d$ is a number of slots for the SCS of the ~~active~~ DL BWP of the received DCI format 2\_9 of the first serving cell in Table 11.5-1.Table 11.5-1: Minimum time gap value $d$

|  |  |
| --- | --- |
| **SCS (kHz)** | **Number of slots**  |
| 15 | 3 |
| 30 | 6 |
| 60 | 12 |
| 120 | 24 |
| 480 | 96 |
| 960 | 192 |

 |

##### TP #7-2 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 11.5 Adaptation of cell operation When a UE receives in slot $m$ on the active DL BWP of a ~~first~~ serving cell a PDCCH providing DCI format 2\_9 that indicates a change in activation or deactivation of a current cell DTX operation or cell DRX operation for a same or different serving cell, the UE operates on the indicated ~~second~~ serving cell according to the indicated cell DTX operation or cell DRX operation starting from a slot on the active DL BWP or on the active UL BWP of the indicated ~~second~~ serving cell, respectively, that is not before the beginning of the slot $m+d$ on the active DL BWP of the first serving cell where $d$ is a number of slots for the SCS of the active DL BWP of the first serving cell in Table 11.5-1. |

### Suggestions for Discussions

Moderator suggests discussing TP #7-1, #7-2 further.

For all the TPs, moderator askes proponents to provide short description for reasons for change, summary of change, and consequences if not approved.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| NEC | Support Proposal 6-6 Alt2) |
| Xiaomi | Sorry that we didn’t draft a TP for our proposal. Our proposal is not captured in the summary. Here we explain it as follows,It is a usual way that UE does not expect to receive another DCI 2-9 which has different activation/ deactivation indication from the previous DCI 2-9 within the application delay. But for UE with multiple serving cells with different SCSs, the application delay of DCI 2-9 on different cells is different. So we need to define a reference application delay, which in our understanding should be the maximum application delay among all the serving cells. And within the reference application delay, UE does not expect to receive another DCI 2-9 which has different activation/ deactivation indication from the previous DCI 2-9. |
| CMCC | Both TP seems OK, for the second TP, there are still “first serving cell”, it can be updated as following, 11.5 Adaptation of cell operation When a UE receives in slot $m$ on the active DL BWP of a ~~first~~ serving cell a PDCCH providing DCI format 2\_9 that indicates a change in activation or deactivation of a current cell DTX operation or cell DRX operation for a same or different serving cell, the UE operates on the indicated ~~second~~ serving cell according to the indicated cell DTX operation or cell DRX operation starting from a slot on the active DL BWP or on the active UL BWP of the indicated ~~second~~ serving cell, respectively, that is not before the beginning of the slot $m+d$ on the active DL BWP of the ~~first~~ serving cell with DCI format 2\_9 where $d$ is a number of slots for the SCS of the active DL BWP of the same serving cell in Table 11.5-1.And we also suggest to discuss the issue that different UEs may apply the change in activation or deactivation from different slots.Since when gNB sends DCI format 2-9, which needs to be received by UEs under different beams, gNB may have to send it in multiple slots with different beams, especially for FR2.This can be supported by current “duration” parameter in “SearchSpace ”, gNB can configure multiple slots by “duration” for each UE, and UE monitors in the duration with the TCI corresponding to its CORESET, while another UE may monitors in the duration with another TCI, since they may be under different beams. So it will result that UE receive DCI format 2-9 in different slots of each duration. As shown in the figure, the search space duration is 4 slots, gNB sends deactivation indication during non-active period of cell DTX, and UE1 receives DCI format 2\_9 in slot n, suppose SCS =15KHz, then D=3, and UE1 will apply cell DTX deactivation at slot n+3. while UE2 receives DCI format 2\_9 in slot n+3, then UE2 will apply cell DTX deactivation at slot n+6. As a result of this, apply time of cell DTX deactivation will be different for different UEs. Since this is cell DTX/DRX for gNB power saving, it is better to align the activation/deactivation time. So we propose that 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 last slot among the monitoring duration based on SCS of PDCCH, where at least one slot in the duration contains the PDCCH of DCI format 2\_9 .**So we propose to discuss whether to update the “n” definition in following agreement, where “n is the last slot among the monitoring duration in each monitoring period based on SCS of PDCCH, where at least one slot in the duration contains the PDCCH of DCI format 2\_9.”**AgreementFor 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.* 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.
 |
| Huawei, HiSilicon | We are fine with the TPs although we do not see a strong need for both of them since the spec is clear with or without them.  |

## 2.8 UL - UCI multiplexing

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [1] Huawei, HiSiliCon | Proposal 1: If multiple UCIs/PUSCHs overlap in a slot during the non-active periods of cell DRX, and part of the UCIs/PUSCHs are impacted by cell DRX, support UCIs/PUSCHs impacted by cell DRX be considered within UL multiplexing procedure.- Follows the multiplexing rule as legacy.C:\Users\j00781913\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\8B9B1B8.tmpFigure 1 An example when UCIs and/or PUSCHs overlap during the non-active periods of cell DRX [1] |
| [2] Nokia | Proposal 9: RAN1 considers the impact of cell DRX non-active periods on the intra-UE handling of overlapping UL transmissions, in order to avoid unnecessary loss of HARQ-ACK / UCI information, by adopting the following operation/order:* First, exclude/drop any PUSCH from a set of PUSCH that would overlap with a PUCCH if this PUSCH overlaps with a cell DRX non-active period.
* Then, handle the overlapping between the PUCCH and the remaining (non-dropped/ non-excluded) PUSCHs of the set of PUSCHs.
 |
| [8] NEC | Proposal 4: For UL transmission during cell DRX, support indication whether the UCI is allowed to be transmitted.Proposal 7: Support UCI multiplexing during cell DRX non-active duration. |
| [11] Samsung | Proposal 4: A UE does not transmit the HARQ-ACK information bit for a SPS PDSCH if the SPS PDSCH overlaps with the non-active periods and there is no other HARQ-ACK information bit in the same PUCCH slot with the HARQ-ACK information bit for the SPS PDSCH. UE generates a NACK information bit for a SPS PDSCH if the SPS PDSCH overlaps with the non-active periods and there is another HARQ-ACK information bit in the same PUCCH slot with the HARQ-ACK information bit for the SPS PDSCH.Proposal 12: CG PUSCH/PUSCH with SP-CSI overlapping with non-active periods of cell DRX are excluded for resolving the overlapping PUCCHs/PUSCHs. Adopt the following TP for TS 38.213. |
| [23] Panasonic | Observation 1: Pros/cons of dropping/deferring UCI before and after the UCI multiplexing due to Cell DTX.

|  |  |  |
| --- | --- | --- |
| UCI dropping/deferring | Before multiplexing | After multiplexing |
| Pros | * Lower UE processing complexity
* UCIs within active period can always be kept
 | * In some cases, more UCIs can be kept and reported to gNB
* Current UE processing procedure is not broken
 |
| Cons | * Current UE processing procedure needs to be changed
* System performace may be degraded, as UCIs overlaps with non-active period will always be dropped
 | * In some cases, all the UCIs after multiplexing may be dropped. Thus system performance can be degraded.
 |

Proposal 5: The impact to UCI multiplexing by Cell DTX/DRX should be discussed. |

### Summary of Issues

Companies have provided proposals related to UCI multiplexing issues during interaction in cell DTX/DRX operations. The following are list of TPs provided.

##### TP #8-1 (TS38.213)

|  |
| --- |
| **Reasons for change:** To avoid complex UL multiplexing rules for cases that multiple UCIs/PUSCHs overlap in a slot during the non-active periods of cell DRX, and part of the UCIs/PUSCHs are impacted by cell DRX. |
| **Summary of change:**Specify that during the non-active periods of cell DRX, while multiple UCIs/PUSCHs overlap in a slot and part of them are impacted by cell DRX, the UCIs/PUSCHs impacted by cell DRX should be considered within the UL multiplexing procedure. And the UE follows the multiplexing rule as legacy. |
| **Consequence if not approved:**When there is a detection error in DCI format 2\_9, the understanding of UL multiplexing during the non-active periods of cell DRX from the UE and NW side can be totally different (e.g., the payload of the UL transmission, and the UL resource it uses), so that the gNB cannot receive the UL transmission sent by UE. |
| ---------------------------- Start of Text Proposal for TS 38.213 -----------------------------< Unchanged parts are omitted >9.2.5 UE procedure for reporting multiple UCI types< Unchanged parts are omitted >If a UE would transmit multiple overlapping PUCCHs in a slot or overlapping PUCCH(s) and PUSCH(s) in a slot, one of the PUCCHs includes HARQ-ACK information in response to an SPS PDSCH reception, and any PUSCH is not in response to a DCI format detection, the UE expects that the first symbol $S\_{0}$ of the earliest PUCCH or PUSCH satisfies the first of the previous timeline conditions with the exception that components associated to a SCS configuration for a PDCCH scheduling a PDSCH or a PUSCH are absent from the timeline conditions.A UE does not expect a PUCCH or a PUSCH that is in response to a DCI format detection to overlap with any other PUCCH or PUSCH that does not satisfy the above timing conditions.If UE would transmit multiple overlapping PUCCHs in a slot or overlapping PUCCH(s) and PUSCH(s) in a slot, while the slot is in the non-active periods of cell DRX, and part of UCI type associated with PUCCH(s) are impacted by cell DRX or part of PUSCH(s) are impacted by cell DRX, the UE expects to multiplex all corresponding PUCCH(s) or all corresponding PUSCH(s) as described in clauses 9.2.5.0 to 9.2.5.4.If UE would transmit multiple overlapping PUCCHs in a slot or overlapping PUCCH(s) and PUSCH(s) in a slot, while the slot is in the non-active periods of cell DRX, and all of UCI type associated with PUCCH(s) are impacted by cell DRX and all of PUSCH(s) are impacted by cell DRX, the UE drops all the corresponding PUCCH transmission(s) and all corresponding PUSCH transmission(s).< Unchanged parts are omitted >--------------------------------------- End of Text Proposal ---------------------------------- |

##### TP #8-2 (TS38.213)

|  |
| --- |
| **Reason for change:** The overlapping PUCCHs/PUSCHs does not differentiate CG PUSCH transmissions and PUSCH transmissions with SP-CSI with or without non-active period of cell DRX in the current specification  |
| **Summary of change:** the UE excludes CG PUSCH transmissions and PUSCH transmissions with SP-CSI overlapping with non-active periods of cell DRX for resolving overlapping for PUCCH and/or PUSCH transmissions |
| **Consequences if not approved:**Unnecessarily enforce UE to not transmit HARQ-ACK multiplexed in CG PUSCH transmissions and PUSCH transmissions with SP-CSI in non-active periods of cell DRX  |
| A DCI format indicating a SPS PDSCH release, or SCell dormancy without scheduling a PDSCH reception, or indicating a TCI state update without scheduling PDSCH reception, is referred to as a DCI format having associated HARQ-ACK information without scheduling a PDSCH reception. When a UE determines overlapping for PUCCH and/or PUSCH transmissions, the UE excludes CG PUSCH transmissions and PUSCH transmissions with SP-CSI overlapping with non-active periods of cell DRX.For the remaining of this clause, when a UE - is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with a value of 0 for first CORESETs, and is provided *coresetPoolIndex* with a value of 1 for second CORESETs, on active DL BWPs of serving cells, and- is provided *enableSTx2PofmDCI*the UE separately determines and resolves time overlapping among first PUSCH transmissions that use respective first spatial domain filters corresponding to first *TCI-State* or *TCI-UL-State* associated with the first CORESETs, and among second PUSCH transmissions that use respective second spatial domain filters corresponding to second *TCI-State* or *TCI-UL-State* associated with the second CORESETs. |

### Suggestions for Discussions

Moderator suggests discussing TP #8-1, #8-2 further.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Huawei, HiSilicon | Support TP #8-1:1. With the consideration of detecting error in L1 signaling, TP# 8-1 can improve the reliability of UL transmission;
2. TP #8-1 is a general solution that can cover all possible cases in UL multiplexing. Also, this can reduce the workload on the modification of spec.

Also, we are fine with TP #8-2.  |

## 2.9 UL - PUCCH cell switching

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [1] Huawei, HiSiliCon | Proposal 2: When Cell DRX, PUCCH repetition and PUCCH Cell switching are configured, modify “last repetition of the PUCCH transmission” as “last repetition of the PUCCH transmission in active time if cell DRX is configured in PCell”. Figure 3 An example of PUCCH cell semi switching pattern that is not applicable during PUCCH repetitions [1] |
| [2] Nokia | Proposal 11: RAN1 shall account for cell DRX non-active periods in the PUCCH cell switching operation in order to avoid unnecessary loss of HARQ-ACK / UCI information. |
| [9] LGE | Proposal #4: For PUCCH deferral, if the PUCCH transmission corresponding to SPS PDSCH is not allowed during Cell DRX non-active period, the PUCCH transmission corresponding to SPS PDSCH that would be transmitted during Cell DRX non-active period can be deferred until the active period of Cell DRX, with consideration of the configured maximum defer duration. |
| [12] Xiaomi | Proposal 14: During cell DRX non-active period for a cell, PUCCH cell switching to another cell not in DRX non-active period should be considered. |
| [14] China Telecom | Observation 3:For the UE with capability of PUCCH cell switching, the UE can be different according to the condition when cell DRX is adopted.* The PUCCH cell switching can be conducted as current specs if only PCell is configured with cell DRX;
* The UE should decide whether to switch to SCell for PUCCH transmission according to the active state of SCell if only SCell is configured with cell DRX.
* The UE should transmit the PUCCH on the cell in active period if both PCell and SCell are configured with cell DRX.
 |
| [16] Fujitsu | Observation 1. Cell DTX/DRX and PUCCH cell switching would not operate simultaneously. Proposal 3. There is no need to consider cell DRX non-active period in PUCCH cell switching operation. |

### Summary of Issues

Companies have provided proposals related to PUCCH cell switching when cell CRX is configured. The following is list of TP provided.

##### TP #9-1 (TS38.213)

|  |
| --- |
| **Reasons for change:**The semi-static PUCCH Cell switching is not applicable “until the slot of the last repetition of the PUCCH transmission”. When cell DRX is configured in PCell”, it is not clear whether “the last repetition of the PUCCH transmission” is the last repetition which is configured or the last repetition which is really transmitted by UE |
| **Summary of change:**When Cell DRX, PUCCH repetition and PUCCH Cell switching are configured, modify “last repetition of the PUCCH transmission” as “last repetition of the PUCCH transmission in active time if cell DRX is configured in PCell” in TS 38.213. |
| **Consequence if not approved:**When Cell DRX, PUCCH repetition and PUCCH Cell switching are configured, if SR/CSI PUCCH repetition locates in cell DRX non-active periods of PCell, the UE cannot transmit PUCCH on the PCell nor on the PUCCH-sSCell. The spec will not be clear whether “the last repetition of the PUCCH transmission” is the last repetition which is configured or the last repetition which is really transmitted by UE. |
| ---------------------------- Start of Text Proposal for TS 38.213 -----------------------------**9.A PUCCH cell switching**This clause is applicable when a UE is provided a PUCCH-sSCell by *pucch-sSCell* and the PUCCH-sSCell is activated and does not have a dormant UL/DL active BWP. This clause is not applicable for slots with $N\_{sym}^{slot}$ symbols [4, TS 38.211] of a reference SCS configuration provided by *tdd-UL-DL-ConfigurationCommon* for the PCell where the UE would transmit a PUCCH with  repetitions of any priority, starting from the slot following the slot indicated to the UE as described in clause 9.2.3 for HARQ-ACK reporting, or following the slot determined as described in clause 9.2.4 for SR reporting, or in clause 5.2.1.4 of [6, TS 38.214] for CSI reporting, until the slot of the last repetition of the PUCCH transmission, as described in clause 9.2.6 if the UE is provided *PUCCH-sSCellPattern*. When cell DRX is configured in PCell, the last repetition of the PUCCH transmission refers to the last repetition of the PUCCH transmission in cell DRX Active Time.< Unchanged parts are omitted >--------------------------------------- End of Text Proposal ---------------------------------- |

### Suggestions for Discussions

Moderator suggests discussing TP #9-1 further.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| NEC | Fine with proposal. |
| Huawei, HiSilicon | We support this TP #9-1 because, as we described in the “**Consequence if not approved**” the spec will not be clear if this TP is not approved.  |

## 2.10 UL - HARQ-ACK transmission and codebook generation

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| --- | --- |
| **Company** | **Proposals & Observations** |
| [2] Nokia | Observation 3: Accounting for non-active periods of cell DTX in the HARQ-ACK codebook generation can help to reduce the HARQ-ACK payload size drastically especially for Type 1 HARQ-ACK codebook by simply neglecting 'invalid' PDSCH resource allocations.Proposal 8: RAN1 considers the impact of cell DTX non-active periods, specifically the omitting/dropping of some PDSCHs, on existing HARQ-ACK codebook generation (at least considering Type 1 HARQ-ACK codebook) as follows:* For HARQ-ACK codebook generation, the UE omits any PDSCH time allocation, and thus HARQ-ACK bits, corresponding to a PDSCH that would overlap with a cell DTX non-active period.
 |
| [4] vivo | Proposal 1: Adopt TP#7-1 to support the following: if L1 activation/deactivation of cell DTX is not configured, the HARQ feedback is not transmitted for cancelled SPS PDSCH in non-active period of cell DTX; otherwise, it should be transmitted. |
| [7] CEWiT | Observation 2: Transmitting HARQ feedback for SPS-PDSCH in the candidate occasions falling in non-active period of cell DTX pattern is redundant and leads to unnecessary resource consumption. Proposal 2: Not transmitting the HARQ feedback of SPS PDSCH, not received due to non-active period of cell DTX, is supported. |
| [9] LGE | Proposal #2: For HARQ-ACK codebook generation, considering that (SPS) PDSCH may not be received by UE during Cell DTX non-active period, the HARQ-ACK corresponding to (SPS) PDSCH overlapping Cell DTX inactive period can also be omitted.Proposal #3: For HARQ-ACK Type-2 codebook, if all SPS occasions corresponding to a PUCCH slot are included in the Cell DTX inactive period and the corresponding HARQ-ACK bits are multiplexed with other HARQ-ACKs, the HARQ-ACK codebook can be constructed without the HARQ-ACK corresponding to SPS PDSCH(s). |
| [12] Xiaomi | Proposal 1: If the HARQ-ACK codebook only contains the HARQ-ACK information for the SPS PDSCH(s) during cell DTX non-active period, the HARQ-ACK codebook is not transmitted; otherwise, NACK are feedback for those SPS PDSCH(s) at least for Type 1/3 HARQ-ACK codebook.Proposal 13: If the existing HARQ process or a new HARQ process does not complete within cell DRX active time, gNB should extend the cell DRX active time for the completion of UL/DL data transmission before transitioning to the cell DRX non-active time. |
| [14] China Telecom | Proposal 2: Support to confirm the conclusion in RAN1#114 on the cell-DTX, i.e., * HARQ-ACK of SPS PDSCH transmitted is not impacted by non-active period of cell DRX.
* HARQ-ACK of a DCI format without scheduling a PDSCH is not impacted by non-active period of cell DRX.

Observation 2: The overlap of SPS PDSCH and inactivate period of cell DTX can be avoided by gNB configuration, even if not avoided, the UE can simply generate the NACK in the codebook according to the current specification.Proposal 3: The HARQ-ACK codebook generation procedure should be the same as current specifications. |
| [18] ETRI | Proposal 8: For Type I HARQ-ACK codebook, if a SPS PDSCH is not received due to collision with a symbol belonging to the cell DTX non-active duration, a corresponding SPS HARQ-ACK bit is not mapped to the HARQ-ACK codebook (thereby, not transmitted).Proposal 9: If a PUCCH repetition or a SPS HARQ-ACK (when Rel-17 SPS HARQ-ACK deferral is configured) collides with a symbol belonging to the cell DRX non-active duration, the PUCCH repetition or the SPS HARQ-ACK is deferred to a next valid UL resource.* The symbol belonging to the cell DRX non-active duration is regarded as an invalid symbol
 |
| [20] Apple | Proposal 1: HARQ-ACK generation for SPS occasions overlapping with cell DTX non-active period follows legacy behavior as for SPS occasions overlapping with symbols indicated as UL by tdd-UL-DL-ConfigurationCommon or by tdd-UL-DL-ConfigurationDedicated.Proposal 2: HARQ-ACK transmission will not be impacted by cell DRX non-active period. |

### Summary of Issues

Companies have provided proposals related to HACK-ACK transmission and HARQ-ACK codebook generation. The following is list of TP provided.

##### TP #10-1 (TS38.213)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| **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 $N\_{cells}^{DL}$ to the number of serving cells configured to the UESet $N\_{c}^{SPS}$ to the number of SPS PDSCH configurations configured to the UE for serving cell $c$Set $N\_{c}^{DL}$ to the number of DL slots for SPS PDSCH receptions on serving cell $c$ with HARQ-ACK information multiplexed on the PUCCHSet $j=0$ – HARQ-ACK information bit indexSet $c=0$ – serving cell index: lower indexes correspond to lower RRC indexes of corresponding cellwhile $c<N\_{cells}^{DL}$ Set $s=0$ – SPS PDSCH configuration index: lower indexes correspond to lower RRC indexes of corresponding SPS configurations while $s<N\_{c}^{SPS}$Set $n\_{D}=0$ – slot index while $n\_{D}<N\_{c}^{DL}$if {a UE is configured to receive SPS PDSCHs from slot $n\_{D}-N\_{PDSCH}^{repeat}+1$ to slot $n\_{D}$ for SPS PDSCH configuration $s$ on serving cell $c$, 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* where $N\_{PDSCH}^{repeat}$ 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*, or due to overlapping with non-active period of cell DTX if *cellDTXConfig* is provided and positionInDCI-cellDTRX is not provided for the serving cell andHARQ-ACK information for the SPS PDSCH is associated with the PUCCH}$\tilde{o}\_{j}^{ACK}$ = HARQ-ACK information bit for this SPS PDSCH reception $j=j+1$;end if$n\_{D}=n\_{D}+1$;end while$s=s+1$;end while$c=c+1$;end while\*\*\* Unchanged text omitted \*\*\* |

### Suggestions for Discussions

Moderator suggests discussing TP #10-1 further.

For TP #10-1, moderator askes proponents to provide short description for reasons for change, summary of change, and consequences if not approved.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Huawei, HiSilicon | Fine with TP #10-1. |

## 2.11 UL - PUCCH Deferral

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [2] Nokia | Observation 4: PUCCH deferral operations in legacy consist of (i) deferral for PUCCH repetition operation (from Rel-15), and (ii) SPS HARQ-ACK deferral (from Rel-17).Proposal 10: RAN1 shall account for cell DRX non-active periods in the (legacy) deferral for PUCCH repetition operation in order to avoid unnecessary dropping of PUCCH repetitions. |
| [14] China Telecom | Proposal 4: When the cell DRX is adopted, the valid UL symbols/slots for PUCCH deferral should be in the active period of cell DRX. |

### Summary of Issues

Two companies provided proposal for handling PUCCH deferral during cell DRX operations. However, no accompanying TPs were provided.

### Suggestions for Discussions

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Huawei, HiSilicon | Fine with the TP. |

## 2.12 UL - CSI Reports during cell DTX

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [6] Google | Proposal 1: Similar to UE DRX, endorse the following TP for 38.214 to clarify that the UE should drop the CSI when the UE fails to receive one of the CMR/IMR within cell DTX active time. |
| [11] Samsung | Proposal 2: RAN1 conclude that UE transmits PUSCH with AP-CSI during non-active periods of cell DRX if a PDCCH providing a DCI format triggering AP-CSI is received. |
| [25] MediaTek | Observation 1: Impact of CSI reporting due to cell DTX/DRX is not yet captured.Proposal 1: Adopt the following TP #12-2 to Section 5.2.2.5 of TS 38.214 |

### Summary of Issues

Companies have provided proposals related to CSI reporting during cell DTX. The following are list of TPs provided.

##### TP #12-1 (TS38.214)

|  |
| --- |
| **Reasons for Change:**Currently, it is defined that when UE fails to receive one of the CMR/IMR within a DRX active time, the UE should drop the CSI report as follows. The CSI measurement and report behavior is unclear if the UE fails to receive one of the CMR/IMR within cell DTX active time.  |
| **Summary for Change:**Clarify that the UE should drop the CSI when the UE fails to receive one of the CMR/IMR within cell DTX active time. |
| **Consequences if not adopted:**The CSI measurement and report behavior is unclear if the UE fails to receive one of the CMR/IMR within cell DTX active time.  |
| 5.2.2.5 CSI reference resource definition<omitted text>When DRX is configured, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement in DRX Active Time no later than CSI reference resource and drops the report otherwise. When DRX is configured and the CSI-RS Resource Set for channel measurement corresponding to a CSI report is configured with two Resource Groups and $N$ Resource Pairs, as described in clause 5.2.1.4.1, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for each CSI-RS resource in a Resource Pair within the same DRX Active Time no later than CSI reference resource and drops the report otherwise. When the UE is configured to monitor DCI format 2\_6 and if the UE 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', 'ssb-Index-RSRP', 'cri-RSRP- Index', and 'ssb-Index-RSRP- Index ' when *drx-onDurationTimer* is not started, the UE shall report CSI during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside active time according to the procedure described in Clause 5.2.1.4 if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement during the time duration indicated by drx-onDurationTimer in *DRX-Config* outside DRX active time or in DRX Active Time no later than CSI reference resource and drops the report otherwise. When the UE is configured to monitor DCI format 2\_6 and if the UE 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', 'ssb-Index-RSRP', 'cri-RSRP- Index', or 'ssb-Index-RSRP- Index' when *drx-onDurationTimer* is not started, the UE shall report L1-RSRP during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside active time according to the procedure described in clause 5.2.1.4 and when reportQuantity set to 'cri-RSRP' or *'*cri-RSRP- *Index*' if receiving at least one CSI-RS transmission occasion for channel measurement during the time duration indicated by drx-onDurationTimer in *DRX-Config* outside DRX active time or in DRX Active Time no later than CSI reference resource and drops the report otherwise. When cell DTX is configured, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement in cell DTX Active Time no later than CSI reference resource and drops the report otherwise. |

##### TP #12-2 (TS38.214)

|  |
| --- |
| **Reasons for change:** |
| **Summary of change:** |
| **Consequences if not adopted:** |
| 5.2.2.5 CSI reference resource definition<omitted text>When DRX is configured, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement in DRX Active Time no later than CSI reference resource and drops the report otherwise. When DRX is configured and the CSI-RS Resource Set for channel measurement corresponding to a CSI report is configured with two Resource Groups and $N$ Resource Pairs, as described in clause 5.2.1.4.1, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for each CSI-RS resource in a Resource Pair within the same DRX Active Time no later than CSI reference resource and drops the report otherwise. When the UE is configured to monitor DCI format 2\_6 and if the UE 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', 'ssb-Index-RSRP', 'cri-RSRP- Index', and 'ssb-Index-RSRP- Index ' when *drx-onDurationTimer* is not started, the UE shall report CSI during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside active time according to the procedure described in Clause 5.2.1.4 if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement during the time duration indicated by drx-onDurationTimer in *DRX-Config* outside DRX active time or in DRX Active Time no later than CSI reference resource and drops the report otherwise. When the UE is configured to monitor DCI format 2\_6 and if the UE 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', 'ssb-Index-RSRP', 'cri-RSRP- Index', or 'ssb-Index-RSRP- Index' when *drx-onDurationTimer* is not started, the UE shall report L1-RSRP during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside active time according to the procedure described in clause 5.2.1.4 and when reportQuantity set to 'cri-RSRP' or *'*cri-RSRP- *Index*' if receiving at least one CSI-RS transmission occasion for channel measurement during the time duration indicated by drx-onDurationTimer in *DRX-Config* outside DRX active time or in DRX Active Time no later than CSI reference resource and drops the report otherwise.When cell DTX is configured, the UE reports a CSI report with the higher layer parameter *reportQuantity* comprising at least ‘RI’ only if receiving at least one CSI-RS transmission occasion for channel measurement in an active period of cell DTX no later than CSI reference resource and drops the report otherwise.When deriving CSI feedback, the UE is not expected that a NZP CSI -RS resource for channel measurement overlaps with CSI-IM resource for interference measurement or NZP CSI -RS resource for interference measurement.<omitted text> |

### Suggestions for Discussions

Moderator suggests discussing TP #12-1, #12-2 further.

For all the TPs, moderator askes proponents to provide short description for reasons for change, summary of change, and consequences if not approved.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Google | The following is clarified for TP #12-1.Reason for change:Currently, it is defined that when UE fails to receive one of the CMR/IMR within a DRX active time, the UE should drop the CSI report as follows. The CSI measurement and report behavior is unclear if the UE fails to receive one of the CMR/IMR within cell DTX active time.

|  |
| --- |
| When DRX is configured, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement in DRX Active Time no later than CSI reference resource and drops the report otherwise. |

Summary of change:Clarify that the UE should drop the CSI when the UE fails to receive one of the CMR/IMR within cell DTX active time.Consequence if not approved:The CSI measurement and report behavior is unclear if the UE fails to receive one of the CMR/IMR within cell DTX active time.  |

## 2.13 UL - PUCCH transmission during Cell DTX/DRX

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| --- | --- |
| **Company** | **Proposals & Observations** |
| [8] NEC | Proposal 2: Support default or fallback PUCCH resource indication during the cell DTX/DRX non-active period in cell DTX/DRX activation DCI.Proposal 5: For UL control resource configurations during cell DRX, support delta parameters only for PUCCH resource configurations, SR or CSI report configurations and configured grant. |

### Summary of Issues

NEC has provided proposals on PUCCH transmission behaviors during cell DTX/DRX operations. However, NEC has not provided accompanying TPs for the proposals.

### Suggestions for Discussions

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
|  |  |

## 2.14 UL - CG PUSCH transmission occasion

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| --- | --- |
| **Company** | **Proposals & Observations** |
| [9] LGE | Proposal #6: The CG occasions in the cell DRX inactive period can be treated as invalid occasions for indication of the unused CG PUSCH transmission occasions (i.e., UTO-UCI). |
| [22] Interdigital | Proposal 2: UE transmits the repetitions in CG bundle only if the whole bundle overlaps with cell DRX active period  |
| [28] Qualcomm | Proposal 2: If the cell DRX is activated/deactivated by the new DCI format 2\_9, the CG PUSCH repetition that is dropped in non-active time of cell DRX is counted in the configured number of repetitions. |

### Summary of Issues

Companies have provided proposals related to CG PUSCH transmission during cell DRX operations. However, no accompanying TPs were provided.

### Suggestions for Discussions

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
|  |  |

## 2.15 DL - Scheduled PDSCH during cell DTX

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [11] Samsung | Proposal 10: When a PDCCH schedules a PDSCH overlapping with a SPS PDSCH where the SPS PDSCH is not expected to be received by the UE due to cell DTX, the overriding timeline condition does not need to be satisfied. Adopt the following TP for TS 38.214.Proposal 11: A UE first determines SPS PDSCH reception based on cell DTX non-active periods and then the UE resolves the overlapping SPS PDSCHs on a same serving cell. Adopt the following TP for TS 38.214. |
| [15] OPPO | Proposal 4: UE shall receive a PDSCH which is at least partially overlapped with non-active period of cell DTX if this PDSCH is dynamically scheduled by a DCI transmitted during active period of cell DTX. |

### Summary of Issues

Companies have provided proposal on scheduled PDSCH reception during cell DTX operations. The following are list of TPs provided by companies.

##### TP #15-1 (TS38.214)

|  |
| --- |
| **Reason for change:** The overlapping PDSCHs does not differentiate SPS PDSCH with or without non-active period of cell DTX in the current specification  |
| **Summary of change:** SPS PDSCH overlapping with non-active period of cell DTX are excluded from the overlapping PDSCHs for DL scheduling timeline restriction |
| **Consequences if not approved:**Unnecessarily enforce gNB to satisfy a timeline restriction for scheduling PDSCHs |
| The UE is not expected to decode a PDSCH in a serving cell scheduled by a PDCCH with C-RNTI, CS-RNTI, MCS-C-RNTI, G-RNTI, G-CS-RNTI or MCCH-RNTI and one or multiple PDSCH(s) required to be received according to this Clause in the same serving cell without a corresponding PDCCH transmission except the PDSCH(s) overlapping with non-active periods of cell DTX if the PDSCHs partially or fully overlap in time except if the PDCCH scheduling the PDSCH ends at least 14$∙2^{max⁡(0,μ-3)}$ symbols before the earliest starting symbol of the PDSCH(s) without the corresponding PDCCH transmission, where** and the symbol duration are based on the smallest numerology between the scheduling PDCCH and the PDSCH, in which case the UE shall decode the PDSCH scheduled by the PDCCH. When the PDCCH reception incudes two PDCCH candidates from two respective search space sets, as described in clause 10 of [6, TS 38.213], for the purpose of determining the PDCCH with C-RNTI, CS-RNTI or MCS-C-RNTI scheduling the PDSCH ends at least 14$∙2^{max⁡(0,μ-3)}$ symbols before the earliest starting symbol of the PDSCH(s) without the corresponding PDCCH transmission, the PDCCH candidate that ends later in time is used. |

##### TP #15-2 (TS38.214)

|  |
| --- |
| **Reason for change:** The overlapping PDSCHs does not differentiate SPS PDSCH with or without non-active period of cell DTX in the current specification  |
| **Summary of change:** SPS PDSCH overlapping with non-active period of cell DTX are excluded from the overlapping PDSCHs for resolving overlapping SPS PDSCHs |
| **Consequences if not approved:**Unnecessarily enforce gNB to not transmit a SPS PDSCH overlapping with another SPS PDSCH in non-active periods of cell DTX  |
| 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, 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 |

### Suggestions for Discussions

Moderator suggests discussing TP #15-1, #15-2 further.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
|  |  |

## 2.16 DL - CSI-RS measurement during time restriction

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [1] Huawei, HiSilcion | Proposal 3: When cell DTX operation is configured and the time domain restriction for channel measurements and/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. |
| [11] Samsung | Proposal 5: When cell DTX is configured, the UE reports a CSI report only if receiving at least one CSI-RS transmission occasion of P/SP CSI-RS 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. |
| [24] Lenovo | Proposal 5: For a UE configured with a CSI reporting setting, time restriction for channel measurements is configured by default if the monitoring of CSI-RS resource(s) for channel measurement associated with the CSI reporting setting is impacted by cell DTX operationProposal 6: For a UE configured with a CSI reporting setting, time restriction for interference measurements is configured by default if the monitoring of CSI-RS resource(s) for interference measurement associated with the CSI reporting setting is impacted by cell DTX operation |

### Summary of Issues

Three companies have provided proposal on CSI-RS measurements handling during measurement time restrictions when coupled with cell DTX operations. The following is a list of TP that were provided by companies.

##### TP #16-1 (TS38.214)

|  |
| --- |
| **Reasons for change:**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. |
| **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 configured, 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 configured, 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 ---------------------------------- |

### Suggestions for Discussions

Moderator suggests discussing TP #16-1 further.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
|  |  |

## 2.17 Others - multi-TRP operation

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [6] Google | Proposal 2: Endorse the following TP for 38.213 to clarify that the cell DTX/DRX is only applicable for single-TRP operation based on the agreement. |
| [23] Panasonic  | Proposal 6: Multiple cell DTX/DRX configurations should be considered for better energy saving adaptation in future release. The switching between configurations is by further enhancing DCI format 2\_9. |

### Summary of Issues

Two companies have provided proposal regarding cell DTX/DRX operations for multi-TRP scenarios. The following is a list of TP provided by companies.

##### TP #17-1 (TS38.213)

|  |
| --- |
| **Reasons for change:**In RAN1 #114, the following on the group-common DCI based cell DTX/DRX indication is agreed. It has not been agreed that the group-common DCI is applicable to mTRP operation.  |
| **Summary of change:**Clarify that the cell DTX/DRX is only applicable for single-TRP operation based on the agreement. |
| **Consequences if not adopted:**It is unclear whether the cell DTX/DRX is applicable for multi-TRP operation or not. |
| 11.5 Adaptation of cell operationA 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* of a cell DTX/DRX indicator field for the serving cell, if it is not provided *coresetPoolIndex* value of 1 for any CORESET, or is provided *coresetPoolIndex* value of 1 for all CORESETs, in *ControlResourceSet* and no codepoint of a TCI field, if any, in a DCI format of any search space set maps to two TCI states [5, TS 38.212]. - 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 carrierA UE does not expect to monitor PDCCH for detection of DCI format 2\_9 on more than one serving cells. |

### Suggestions for Discussions

Moderator suggests discussing TP #17-1 further.

For the TP, moderator askes proponents to provide short description for reasons for change, summary of change, and consequences if not approved.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| Google | The following is clarified for TP #17-1.Reason for changeIn RAN1 #114, the following on the group-common DCI based cell DTX/DRX indication is agreed. It has not been agreed that the group-common DCI is applicable to mTRP operation.

|  |
| --- |
| **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. |

Summary of change:Clarify that the cell DTX/DRX is only applicable for single-TRP operation based on the agreement.Consequence if not approved:It is unclear whether the cell DTX/DRX is applicable for multi-TRP operation or not. |

## 2.18 Others – Multi-cell operations

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [8] NEC | Proposal 6: Support larger values of HARQ-ACK feedback timing indication.Proposal 9: Cell DTX/DRX activation signaling indicates whether cell DTX overrides C-DRX of UEs or not. |
| [12] Xiaomi | Proposal 15: For CA scenario, the Cell DTX/DRX configuration for multiple cells should be restricted to have overlapping active durations as much as possible. |
| [15] OPPO | Proposal 6: The alignment of cell DTX/DRX and UE C-DRX cycles or the alignment of UE C-DRX cycles for different UE can be left to gNB implementation. |
| [19] Transsion Holdings | Proposal 2 Some constraints on active/non-active time between cell DTX and cell DRX should be discussed.Proposal 3 Configuring different cell DTX/DRX configurations for different power states should be supported. |
| [29] Fraunhofer | Proposal 1: RAN1 to discuss how DCI\_2\_9 can be modified to switch among different Cell DTX/DRX patterns (while Cell DTX/DRX is kept activated)Observation 1: Each additional retransmission consumes not only extra power of the retransmission itself but it also prevents the cell to enter light sleep for a whole additional HARQ RTT, in case of TDD a whole TDD period.Observation 2: With 2.5 ms TDD period a single re-transmission increases the energy consumption on the planned Cell DTX inactive time by 15% and 2 retransmissions increase it by 33%. The effect would be even larger with larger TDD periods.Observation 3: HARQ retransmissions deserve special treatment during Cell DTX/DRX and the number of HARQ retransmissions should be minimized to allow network energy savings.Observation 4: In order to significantly save energy, the activity of the cell should be limited to Cell DTX/DRX on-duration.Observation 5: Introducing a new CQI table (e.g. for 1% BLER) would help the gNB implementation to have precise feedback to achieve a better initial BLER target for Cell DTX/DRX.Proposal 2: A new CQI table (e.g. for 1% BLER) is defined to help achieving higher reliability for initial transmissions when Cell DTX/DRX is activated. |

### Summary of Issues

Several companies have provided proposals on handling of multi-cell for cell DTX/DRX configurations. However, no accompanying TPs were provided.

### Suggestions for Discussions

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments.

|  |  |
| --- | --- |
| Company | Comments |
| NEC | Configuring cell DTX/DRX non-active period specific parameters such as larger values of HARQ-ACK feedback timing indication, delta parameters etc. improves network energy saving, provides flexibility with minimal signaling overhead. |

## 2.19 Others

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [8] NEC | Proposal 6: Support larger values of HARQ-ACK feedback timing indication.Proposal 9: Cell DTX/DRX activation signaling indicates whether cell DTX overrides C-DRX of UEs or not. |
| [19] Transsion Holdings | Proposal 3 Configuring different cell DTX/DRX configurations for different power states should be supported. |
| [29] Fraunhofer | Proposal 1: RAN1 to discuss how DCI\_2\_9 can be modified to switch among different Cell DTX/DRX patterns (while Cell DTX/DRX is kept activated)Observation 1: Each additional retransmission consumes not only extra power of the retransmission itself but it also prevents the cell to enter light sleep for a whole additional HARQ RTT, in case of TDD a whole TDD period.Observation 2: With 2.5 ms TDD period a single re-transmission increases the energy consumption on the planned Cell DTX inactive time by 15% and 2 retransmissions increase it by 33%. The effect would be even larger with larger TDD periods.Observation 3: HARQ retransmissions deserve special treatment during Cell DTX/DRX and the number of HARQ retransmissions should be minimized to allow network energy savings.Observation 4: In order to significantly save energy, the activity of the cell should be limited to Cell DTX/DRX on-duration.Observation 5: Introducing a new CQI table (e.g. for 1% BLER) would help the gNB implementation to have precise feedback to achieve a better initial BLER target for Cell DTX/DRX.Proposal 2: A new CQI table (e.g. for 1% BLER) is defined to help achieving higher reliability for initial transmissions when Cell DTX/DRX is activated. |

### Summary of Issues

Several companies have provided proposals on that moderator was not able to categorize. The proposals did not have any accompanying TPs. The proposals made were either bit ambiguous on what changes are expected or seems to be new features for cell DTX/DRX operations. As such, moderator suggests to only discuss the proposals if there are deemed essential for completion of Rel-18.

### Suggestions for Discussions

Companies to provide comments on select proposals. Please only provide comments on whether the proposals are absolutely necessary for completion of Rel-18.

For proposals that do not have accompanied TPs, moderator asks companies to provide TP for the proposal along with short description for reasons for change, summary of change, and consequences if not approved.

## 2.20 RRC Parameters

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [1] Huawei, HiSilicon | Proposal 4: Support cellDTRX-DCI-config belongs to either CellDTX-Config or CellDRX-Config IE, and can be optional. |
| [4] vivo | Propose following parameters:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **RAN2 Parent IE** | **Parameter name in the spec** | **New or existing?** | **Description** | **Value range** | **Per (UE,…)** |
| SearchSpace | dci-Format2-9 | New | If configured, the UE monitors the DCI format 2\_9 with CRC scrambled by cellDTRX-RNTI in this search space according to TS 38.213, clause [10.X]. |  | Per BWP |
| PDCCH-ServingCellConfig  | cellDTRX-DCI-config | New | Include the configuration for new DCI format 2\_9 for activation/deactivation of cell DTX/DRX. |  | Per serving cell |
| cellDTRX-DCI-config  | cellDTRX-RNTI | New | Configure the RNTI value for scrambling CRC of DCI format 2\_9 for triggering Cell DTX/DRX. | RNTI value | Per serving cell |
| cellDTRX-DCI-config  | sizeDCI-2-x | New | Configure the size of DCI format 2\_9 | within the bounds set by existing RAN1 specification | Per serving cell |
| cellDTRX-DCI-config  | cellDTRX-DCI-combinations | New | Include per cell configuration parameter for new DCI format 2\_9 for one or more serving cells | A list of cellDTRX-DCI-combinationsPerCell | Per serving cell |
| cellDTRX-DCI-combinations | cellDTRX-DCI-combinationsPercell | New | Include per cell configuration parameter for new DCI format 2\_9 for a serving cell | A list of cellDTRX-DCI-combinationsPerCell | Per serving cell |
| cellDTRX-DCI-combinationsPercell | servingCellId | New | Configure the serving cell ID corresponding to positionInDCI-cellDTRX |  | Per serving cell |
| cellDTRX-DCI-combinationsPercell | positionInDCI-cellDTRX | New | Configure the starting bit position of an information block of DCI format 2\_9 | 0..[sizeDCI-2-9]-1 | Per serving cell |

 |
| [5] ZTE, Saneships | Proposal 5: Following RRC parameters are introduced for the list of combinations of a starting position of cell DTX/DRX operation information block within DCI payload and serving cell index.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter name in the spec** | **New or existing?** | **Description** | **Value range** | **Per (UE, cell, TRP, …)** | **Comment** |
| cellDTRXCombToAddModList | New | A list of cellDTRXCombinations for the UE’s serving cells. | 1 .. maxNrofcellDTRXCellsPerCellGroup | Per UE | AgreementFor 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. |
| servingCellId | Existing | The ID of the serving cell corresponding to a information block in DCI format 2-9. | ServCellIndex | Per serving cell |
| cellDTRXCombinationsPerCell | New | Configure the cellDTRXCombinations applicable for one serving cell. |  | Per serving cell |

 |
| [9] LGE | Proposal #1: Do not introduce a separate higher layer signaling, e.g., cellDTRX-DCI-config, for the purpose of enabling L1 signaling based activation/deactivation for a cell DTX and/or cell DRX configuration. |
| [20] Apple | Proposal 6: Row 13 (cellDTXconfig) and 14 (cellDRXconfig) should be pending on RAN2 agreement on whether cell DRX can be individually configured. Proposal 7: Row 15 (cellDTRX-DCI-config) should be the Parent IE for Row 17(cellDTRX-RNTI), 18(sizeDCI-2-x), and 20(positionInDCI-cellDTRX), and no need to explicitly configure whether the activation is for cell DTX and/or cell DRX. Otherwise Row 15 could be deleted and leave RAN2 to determine the structure.Proposal 8: Row 19 (searchSpace) should be the Parent IE of Row 16 (dci-Format2-X). Row 16 should be per search space configured and add in the parameter description that it can be configured in only one serving cell.Proposal 9: Row 17 (cellDTRX-RNTI) and 18 (sizeDCI-2-x) are per UE configured. |
| [26] NTT Docomo | **Proposal 7:*** RAN1 should discuss and decide about the number of PDCCH candidates per aggregation level for DCI format 2\_9, e.g., whether to specify some relaxation/limitation for UE PDCCH monitoring for DCI format 2\_9.

**Proposal 8:*** Apply the following update to the RRC parameters of cell DTX/DRX.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Netw\_Energy\_NR-Core | Cell DTX/DRX | nes-DCI-config | New | Include the configuration for new DCI format 2\_~~X~~9 for activating and/or deactivating ~~triggering~~ Cell DTX/DRX. | FFS | Per serving cell | No | 38.331 |
| Netw\_Energy\_NR-Core | Cell DTX/DRX | dci-Format2-~~X~~9 | New | If configured, the UE monitors the DCI format 2\_ ~~X~~9 with CRC scrambled by NES-RNTI according to TS 38.213, clause [10.X]. | FFS | Per serving cell | No | 38.331 |
| Netw\_Energy\_NR-Core | Cell DTX/DRX | nes-RNTI  | New | RNTI value for scrambling CRC of DCI format 2- ~~X~~9 for activating and/or deactivating ~~triggering~~ Cell DTX/DRX. | RNTI-Value | Per serving cell | No | 38.331 |
| Netw\_Energy\_NR-Core | Cell DTX/DRX | sizeDCI-2-~~x~~9 | New | Size of DCI format 2- ~~X~~9 | 1…140 | Per serving cell | No | 38.331 |

 |
| [27] Ericsson | Delete the following RRC parameters:* cellDTXconfig
* cellDRXconfig

Update the following RRC parameters:* cellDTRX-DCI-config
	+ **Value range:** Includes cellDTRX-RNTI, sizeDCI-2-9. Note : For a UE, DCI format 2\_9 can only be configured on only one cell in the cell group.
	+ **Per:** Per serving cell group
	+ Delete RAN2 parent ID
* dci-Format2-X (change name to 2-9)
	+ **per:** Per UE/serving cell group on which DCI 2\_9 is monitored (SearchSpace)
* cellDTRX-RNTI
	+ **add section:**  cellDTRX-DCI-config
	+ **Per:** Per serving cell group
* sizeDCI-2-x (change name to 2-9)
	+ **add section:**  cellDTRX-DCI-config
	+ **Per:** Per serving cell group
	+ **Value range:** 1 … 140
* searchSpace
	+ **value range:** Existing searchSpace configuration with addition of dci-Format2-9
	+ **per:** Per UE/serving cell group on which DCI 2\_9 is monitored
* positionInDCI-cellDTRX
	+ **description:** Configure the starting bit position of an information block corresponding to cell DTX/DRX for the serving cell in DCI format 2\_9
 |
| [28] Qualcomm | Proposal 3: Consider the following parameters to support Cell DTX/DRX

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter name in the spec** | **Description** | **Value range** | **Per (UE, cell, TRP, …)** |
| ~~cellDTXConfig~~ | ~~Include the configuration for cell DTX operation for at least one cell DTX pattern case, of a serving cell.~~ | ~~FFS~~ | ~~Per serving cell~~ |
| ~~cellDRXConfig~~ | ~~Include the configuration for Cell DRX operation for at least one cell DRX pattern case, of a serving cell.~~ | ~~FFS~~ | ~~Per serving cell~~ |
| cellDTRX-DCI-config | Include at least search space set configuration for DCI format 2\_9 for activation/deactivation of cell DTX/DRX configuration of one or multiple serving cells. | FFS | Per serving cell group |
| dci-Format2-9 | If configured, the UE monitors the DCI format 2\_9 with CRC scrambled by cellDTRX-RNTI according to TS 38.213, clause 11.5. | ~~FFS~~ | ~~Per UE/serving cell group/~~Per serving cell |
| cellDTRX-RNTI  | Configure the RNTI value for scrambling CRC of DCI format 2\_9 for triggering Cell DTX/DRX. | RNTI-Value | ~~per serving cell/~~Per serving cell group |
| sizeDCI-2-9 | Configure the size of DCI format 2\_9 | within the bounds set by existing RAN1 specification | ~~per serving cell/~~Per serving cell group |
| ~~searchSpace~~ | ~~Configure the search space set configuration with new DCI format 2\_X~~ |  | ~~Per UE/serving cell group~~ |

 |

### Summary of Issues

The following is list of unstable RRC parameters noted from RAN1 #114. Several companies have provided proposal for updating the RRC parameters and also provide additional proposal for new RRC parameters required for cell DTX/DRX operations.

**List of unstable RRC parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter name in the spec** | **Description** | **Value range** |
| *CellDTX-Config* | Include the configuration for cell DTX operation for at least one cell DTX pattern case, of a serving cell. | - |
| *CellDRX-Config* | Include the configuration for cell DRX operation for at least one cell DRX pattern case, of a serving cell. | - |
| *cellDTRX-DCI-config* | Include the configuration for new DCI format 2\_9 for activation/deactivation of cell DTX/DRX configuration of one or multiple serving cells. | - |
| *cellDTRX-RNTI* | Configure the RNTI value for scrambling CRC of DCI format 2\_9 for triggering Cell DTX/DRX. | RNTI-Value |
| *sizeDCI-2-9* | Configure the size of DCI format 2\_9 | within the bounds set by existing RAN1 specification |
| *searchSpace* | Configure the search space set configuration with new DCI format 2\_9 | - |
| *dci-Format2-9* | If configured, the UE monitors the DCI format 2\_9 with CRC scrambled by cellDTRX-RNTI according to TS 38.213, clause [10.X]. | - |

### Suggestions for Discussions

Moderator suggests discussing each proposal from the company and try to address all RRC parameter list issues. Moderator suggests using the RRC parameter list from R1-2308677 as basis for further discussion. The RRC parameter list from R1-2308677 is copied for below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **RAN1 specification** | **Section** | **RAN2 Parent IE** | **Parameter name in the spec** | **New or existing?** | **Parameter name in the text** | **Description** |
|  |  |  | cellDTXConfig | New |  | Include the configuration for cell DTX operation for at least one cell DTX pattern case, of a serving cell. |
|  |  |  | cellDRXConfig | New |  | Include the configuration for Cell DRX operation for at least one cell DRX pattern case, of a serving cell. |
|   |   | PDCCH-ServingCellConfig | cellDTRX-DCI-config | New |   | Include the configuration for ~~new~~ DCI format 2\_9~~\_X~~ for activating and/or deactivating ~~triggering~~ Cell DTX/DRX. |
|  38.213 |  11.5 |  searchSpace | dci-Format2-9~~X~~ | New |   | If configured, the UE monitors the DCI format 2\_9~~\_X~~ with CRC scrambled by NES-RNTI according to TS 38.213, clause [10.1~~X~~]. |
|  38.212 | 10.1, 7.3.1.3.10  | cellDTRX-DCI-config | cellDTRX-RNTI | New |   | RNTI value for scrambling CRC of DCI format 2-9~~X~~ for activating and/or deactivating ~~triggering~~ Cell DTX/DRX. |
|  38.212 | 7.3.1.3.10  |  cellDTRX-DCI-config | sizeDCI-2-9~~x~~ | New |   | Size of DCI format 2-9~~X~~ |
|  |  |  | searchSpace | Existing |  | Configure the search space set configuration with new DCI format 2\_X |
|  38.212 | 7.3.1.3.10  |  | positionInDCI-cellDTRX | New | Configure the starting bit position of an information block of DCI format 2\_9~~X~~ | 0..[sizeDCI-2-9~~X~~]-1 |
|  |  |  | servingCellId | Existing | Configure the serving cell ID corresponding to positionInDCI-cellDTRX |  |
|  |  |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter name in the spec** | **Value range** | **Default value aspect** | **Per (UE, cell, TRP, …)** | **Required for initial access or IDLE/INACTIVE** | **Specification** |
| cellDTXConfig | FFS |  | Per serving cell | No | 38.331 |
| cellDRXConfig | FFS |  | Per serving cell | No | 38.331 |
| cellDTRX-DCI-config | FFS |   | Per serving cell groupNote: configured in only one serving cell. | No | 38.331 |
| dci-Format2-9~~X~~ | FFS |   | ~~Per UE/serving cell~~ Per serving cell groupNote: configured in only one serving cell. | No | 38.331 |
| cellDTRX-RNTI | RNTI-Value |   | ~~Per serving cell~~Per UEPer BWP | No | 38.331 |
| sizeDCI-2-9~~x~~ | INTEGER (1..140)~~maxDCI-2-9X-Size). The value of maxDCI-2-X-Size is FFS.~~ |   | ~~Per serving cell~~Per UEPer BWPPer search space | No | 38.331 |
| searchSpace |  |  |  |  |  |
| positionInDCI-cellDTRX |  |  |  |  |  |
| servingCellId |  |  |  |  |  |
|  |  |  |  |  |  |

### 1st Round Discussions

#### Company Comments:

Moderator asks companies to provide comments. Moderator suggests to discuss the issue during offline session to complete the RRC issues.

|  |  |
| --- | --- |
| Company | Comments |
| Huawei/HiSilicon | In the draft CR of 331 in RAN2 R2-2310002. cellDTXConfig cellDRXConfig are designed. Hence, we propose to follow the same design of RAN2 or simply delete these parameters from list of parameters.cellDTRX-DCI-config belongs CellDRX-Config IE (see highlighted below ), and it is optional. Hence, we propose to follow the same design of RAN2 or simply delete these parameters from list of parameters. CellDTX-Config-r18 ::= SEQUENCE { celldtx-onDurationTimer-r18 CHOICE { subMilliSeconds INTEGER (1..31), milliSeconds ENUMERATED { ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80, ms100, ms200, ms300, ms400, ms500, ms600, ms800, ms1000, ms1200, ms1600, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } } OPTIONAL, -- Need M celldtx-CycleStartOffset-r18 CHOICE { ms10 INTEGER(0..9), ms20 INTEGER(0..19), ms32 INTEGER(0..31), ms40 INTEGER(0..39), ms60 INTEGER(0..59), ms64 INTEGER(0..63), ms70 INTEGER(0..69), ms80 INTEGER(0..79), ms128 INTEGER(0..127), ms160 INTEGER(0..159), ms256 INTEGER(0..255), ms320 INTEGER(0..319), ms512 INTEGER(0..511), ms640 INTEGER(0..639), ms1024 INTEGER(0..1023), ms1280 INTEGER(0..1279), ms2048 INTEGER(0..2047), ms2560 INTEGER(0..2559), ms5120 INTEGER(0..5119), ms10240 INTEGER(0..10239) } OPTIONAL, -- Need M celldtx-SlotOffset-r18 INTEGER (0..31) OPTIONAL, -- Need M sameCellDTXDRXconfig-r18 ENUMERATED {true} OPTIONAL -- Need M}...***sameCellDTXDRXconfig***If set to true, the UE shall also apply a cell DRX configuration with the same parameters as in CellDTX-Config. |

## 2.21 UE Capability

|  |  |
| --- | --- |
| **Company** | **Proposals & Observations** |
| [5] ZTE, Sanechips | Proposal 6: The semi-static cell DTX/DRX operation mechanism is a standalone feature. |

### Summary of Issues

ZTE has provided a proposal for UE capability aspects. Moderator suggests discussing UE capability aspects under agenda 8.16.5.

Moderator assumes no further discussion is needed under agenda 8.5.2.

### [Discussion Closed]

# Reference

1. R1-2308893, “Maintenance of CSI enhancements for NES,” Huawei, HiSilicon
2. R1-2308949, “Enhancements on cell DTX/DRX mechanism,” Nokia, Nokia Shanghai Bell
3. R1-2308991, “Remaining issues on enhancements on cell DTX/DRX mechanism,” Spreadtrum Communications
4. R1-2309080, “Remaining issues on enhancements on cell DTX/DRX mechanism,” vivo
5. R1-2309179, “Discussion on cell DTX/DRX,” ZTE, Sanechips
6. R1-2309262, “Network Energy Saving on Cell DTX and DRX,” Google
7. R1-2309291, “Enhancements on cell DTX/DRX mechanism,” CEWiT
8. R1-2309296, “Remaining issues on cell DTX/DRX configuration for Network Energy Saving,” NEC
9. R1-2309303, “Remaining issues of cell DTX/DRX mechanism,” LG Electronics
10. R1-2309312, “DCI 2\_9 for Cell DTX/DTX,” FUTUREWEI
11. R1-2309381, “Remaining issues on cell DTX/DRX mechanism,” Samsung
12. R1-2309462, “Discussions on cell DTX-DRX for network energy saving,” xiaomi
13. R1-2309532, “DTX/DRX for network Energy Saving,” CATT
14. R1-2309553, “Remaining issues on cell DTX/DRX mechanism,” China Telecom
15. R1-2309597, “Discussion on remaining issue for enhancements on cell DTX/DRX mechanism,” OPPO
16. R1-2309648, “Remaining details on cell DTX/DRX mechanism,” Fujitsu
17. R1-2309677, “Remaining issues on cell DTX/DRX mechanism,” CMCC
18. R1-2309705, “Remaining issues on cell DTX/DRX mechanism,” ETRI
19. R1-2309721, “Remaining issues on enhancement on cell DTXDRX mechanism,” Transsion Holdings
20. R1-2309839, “On remaining issues for cell DTX/DRX mechanism,” Apple
21. R1-2309893, “Correction on cell DTX,” ASUSTeK
22. R1-2309941, “Remaining issues on cell DTX/DRX mechanism,” InterDigital, Inc.
23. R1-2309943, “Cell DTX/DRX enhancement for network energy saving,” Panasonic
24. R1-2309950, “Maintenance on enhancements on cell DTX/DRX mechanism,” Lenovo
25. R1-2310008, “Maintenance on cell DTX/DRX mechanism,” MediaTek Inc.
26. R1-2310039, “Maintenance of enhancements on Cell DTX/DRX mechanism,” NTT DOCOMO, INC.
27. R1-2310095, “Maintenance for cell DTX/DRX,” Ericsson
28. R1-2310147, “Remaining aspects of cell DTX and DRX,” Qualcomm Incorporated
29. R1-2310243, “Issues on Cell DTX/DRX,” Fraunhofer IIS, Fraunhofer HHI

# Appendix A: RAN1 Agreements

## RAN1 #112 (Feb-2023)

##### #1 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

##### #2 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)

##### #3 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

##### #4 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.

##### #5 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.

##### #6 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).*

##### #7 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)

##### #8 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

##### #9 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~~

##### #10 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)

##### #11 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)

##### #12 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.

##### #13 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.

##### #14 Agreement

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

##### #15 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

##### #16 Agreement

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

##### #17 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

##### #18 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

##### #19 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.

##### #20 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.

##### #21 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.

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

##### #22 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

##### #23 Conclusion:

* HARQ-ACK of SPS PDSCH transmitted is not impacted by non-active period of cell DRX.

##### #24 Agreement

For the FFS from agreement from RAN1 #112bis

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

##### #25 Conclusion

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

# 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.