**3GPP TSG-WG2 Meeting #130R2-250xxxx**

**St Julia’s, Malta, 19th – 23th May, 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **38.300** | **CR** | **-** | **rev** | **-** | **Current version:** | **18.5.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Running CR for Rel-19 MIMO Phase 5  |
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| ***Source to WG:*** | CMCC |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_MIMO\_Ph5-Core |  | ***Date:*** | 2025-04-23 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | Introduce the Rel-19 MIMO features based on the agreements in Annex.  |
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| ***Summary of change:*** | 1. Introducing the clause 6.X of Rel-19 MIMO.
2. Refine and add functions according to agreements in RAN2#129bis.
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| ***Consequences if not approved:*** | Rel-19 MIMO features cannot be supported. |
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| ***Clauses affected:*** | 6.X(new), 10.6, 11 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.331 CR XXTS 38.321 CR XX |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** |  |

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| *Start of changes* |

## 6.X Asymmetric Downlink Single-TRP and Uplink Multi-TRP

For Asymmetric UL Multiple Transmit/Receive Point (multi-TRP) transmission and DL single-TRP transmission, the UE may receive DL transmissions from the gNB while transmitting UL to either the gNB or other non-colocated nodes in different power rating to improve UL throughput. Under such deployment scenarios, the pathloss measured from the gNB’s pathloss RS may become inaccurate for the UL transmissions towards non-colocated nodes via UL-only TRP. To support such deployment scenario, it is necessary to configure the UE with pathloss offset to facilitate accurate calculation of the pathloss associated with non-colocated nodes. For PUCCH, PUSCH, SRS, and PDCCH-order CFRA transmission of UL-only TRP, pathloss offset values between UL-only TRP and DL single-TRP can be associated with a flexible number of UL/Joint TCI states, which are configured via RRC signaling and updated by the latest PL offset value received in RRC or MAC CE, in which each PL offset value is explicitly indicated for each UL/Joint TCI state, as defined in 3GPP TS 38.321[6].

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| *Next change* |

## 10.6 Activation/Deactivation Mechanism

To enable reasonable UE battery consumption when CA is configured, an activation/deactivation mechanism of Cells is supported. When an SCell is deactivated, the UE does not need to receive the corresponding PDCCH or PDSCH, cannot transmit in the corresponding uplink, nor is it required to perform CQI measurements. Conversely, when an SCell is active, the UE shall receive PDSCH and PDCCH (if the UE is configured to monitor PDCCH from this SCell) and is expected to be able to perform CQI measurements. NG-RAN ensures that while PUCCH SCell (a Secondary Cell configured with PUCCH) is deactivated, SCells of secondary PUCCH group (a group of SCells whose PUCCH signalling is associated with the PUCCH on the PUCCH SCell) should not be activated. NG-RAN ensures that SCells mapped to PUCCH SCell are deactivated before the PUCCH SCell is changed or removed.

When reconfiguring the set of serving cells:

- SCells added to the set are initially activated or deactivated;

- SCells which remain in the set (either unchanged or reconfigured) do not change their activation status (*activated* or *deactivated*).

At handover, LTM cell switch execution or connection resume from RRC\_INACTIVE:

- SCells are activated or deactivated.

To enable reasonable UE battery consumption when BA is configured, only one UL BWP for each uplink carrier and one DL BWP or only one DL/UL BWP pair can be active at a time in an active serving cell, all other BWPs that the UE is configured with being deactivated. On deactivated BWPs, the UE does not monitor the PDCCH, does not transmit on PUCCH, PRACH and UL-SCH.

To enable fast SCell activation when CA is configured, one dormant BWP can be configured for an SCell. If the active BWP of the activated SCell is a dormant BWP, the UE stops monitoring PDCCH and transmitting SRS/PUSCH/PUCCH on the SCell but continues performing CSI measurements and reporting periodic CSI for the BWP, AGC and beam management, if configured. A DCI is used to control entering/leaving the dormant BWP for one or more SCell(s) or one or more SCell group(s).

The dormant BWP is one of the UE's dedicated BWPs configured by network via dedicated RRC signalling. The SpCell and PUCCH SCell cannot be configured with a dormant BWP.

To enable fast SCell activation when CA is configured, aperiodic CSI-RS for tracking for fast SCell activation can be configured for an SCell to assist AGC and time/frequency synchronization. A MAC CE is used to trigger activation of one or more SCell(s) and trigger the aperiodic CSI-RS for tracking for fast SCell activation for a (set of) deactivated SCell(s).

To reduce unknown SCell activation delay, the measurement reporting for fast unknown SCell activation can be configured. The RRC measurement report is initiated when UE receives SCell Activation MAC CE to activate, at least, one SCell which is unknown SCell and has the valid L3 measurement result according to the requirements specified in clause 6.3 of TS 38.133 [13]. In addition, the delay requirement of unknown SCell activation can be reduced by beam sweeping factor reduction or shorter measurement interval based on UE capability as specified in TS 38.133 [13].

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| *Next change* |

# 11 UE Power Saving

The PDCCH monitoring activity of the UE in RRC connected mode is governed by DRX, BA, DCP and cell DTX (see clause 15.4.2.3).

When DRX is configured, the UE does not have to continuously monitor PDCCH. DRX is characterized by the following:

- **on-duration**: duration that the UE waits for, after waking up, to receive PDCCHs. If the UE successfully decodes a PDCCH, the UE stays awake and starts the inactivity timer;

- **inactivity-timer**: duration that the UE waits to successfully decode a PDCCH, from the last successful decoding of a PDCCH, failing which it can go back to sleep. The UE shall restart the inactivity timer following a single successful decoding of a PDCCH for a first transmission only (i.e. not for retransmissions);

- **retransmission-timer**: duration until a retransmission can be expected;

- **cycle**: specifies the periodic repetition of the on-duration followed by a possible period of inactivity (see figure 11-1 below);

**- active-time**: total duration that the UE monitors PDCCH. This includes the "on-duration" of the DRX cycle, the time UE is performing continuous reception while the inactivity timer has not expired, and the time when the UE is performing continuous reception while waiting for a retransmission opportunity, and the time after a new UCI for UE-initiated beam reporting is sent on first PUCCH in Mode A of UE-initiated CSI reporting.



Figure 11-1: DRX Cycle

A SL UE can be configured with DRX, in which case, PDCCH providing SL grants can be send to the UE only during its active time.

When BA is configured, the UE only has to monitor PDCCH on the one active BWP i.e. it does not have to monitor PDCCH on the entire DL frequency of the cell. A BWP inactivity timer (independent from the DRX inactivity-timer described above) is used to switch the active BWP to the default one: the timer is restarted upon successful PDCCH decoding and the switch to the default BWP takes place when it expires.

In addition, the UE may be indicated, when configured accordingly, whether it is required to monitor or not the PDCCH during the next occurrence of the on-duration by a DCP monitored on the active BWP. If the UE does not detect a DCP on the active BWP, it does not monitor the PDCCH during the next occurrence of the on-duration, unless it is explicitly configured to do so in that case.

A UE can only be configured to monitor DCP when connected mode DRX is configured, and at occasion(s) at a configured offset before the on-duration. More than one monitoring occasion can be configured before the on-duration. The UE does not monitor DCP on occasions occurring during active-time, measurement gaps, BWP switching, or when it monitors response for a CFRA preamble transmission for beam failure recovery (see clause 9.2.6), in which case it monitors the PDCCH during the next on-duration. If no DCP is configured in the active BWP, UE follows normal DRX operation.

When CA is configured, DCP is only configured on the PCell.

One DCP can be configured to control PDCCH monitoring during on-duration for one or more UEs independently.

Power saving in RRC\_IDLE and RRC\_INACTIVE can also be achieved by UE relaxing neighbour cells RRM measurements when it meets the criteria determining it is in low mobility and/or not at cell edge. When UE is configured with both high speed measurements and RRM measurement relaxation as specified in TS 38.331 [12], it is up to UE implementation whether to apply the FR1 high speed RRM requirements or the relaxed RRM requirements when the low mobility related criterion is configured and fulfilled as specified in TS 38.133 [13].

UE power saving may be enabled by adapting the DL maximum number of MIMO layers by BWP switching.

Power saving is also enabled during active-time via cross-slot scheduling, which facilitates UE to achieve power saving with the assumption that it won't be scheduled to receive PDSCH, triggered to receive A-CSI or transmit a PUSCH scheduled by the PDCCH until the minimum scheduling offsets K0 and K2. Dynamic adaptation of the minimum scheduling offsets K0 and K2 is controlled by PDCCH.

Serving Cells of a MAC entity may be configured by RRC in two DRX groups with separate DRX parameters. When RRC does not configure a secondary DRX group, there is only one DRX group and all Serving Cells belong to that one DRX group. When two DRX groups are configured, each Serving Cell is uniquely assigned to either of the two groups. The DRX parameters that are separately configured for each DRX group are on-duration and inactivity-timer.

UE power saving in RRC\_IDLE/RRC\_INACTIVE may be achieved by providing the configuration for TRS with CSI-RS for tracking in TRS occasions. The TRS in TRS occasions may allow UEs in RRC\_IDLE/RRC\_INACTIVE to sleep longer before waking-up for its paging occasion. The TRS occasions configuration is provided in either SIB17 or SIB17bis. The availability of TRS in the TRS occasions is indicated by L1 availability indication. These TRSs may also be used by the UEs configured with eDRX.

UE power saving may be achieved by UE relaxing measurements for RLM/BFD. When configured, UE determines whether it is in low mobility state and/or whether its serving cell radio link quality is better than a threshold. The configuration for low mobility and good serving cell quality criterion is provided through dedicated RRC signalling.

RLM and BFD relaxation may be enabled/disabled separately through RRC Configuration. Additionally, RLM relaxation may be enabled/disabled on per Cell Group basis while BFD relaxation may be enabled/disabled on per serving cell basis.

The UE is only allowed to perform RLM and/or BFD relaxation when relaxed measurement criterion for low mobility and/or for good serving cell quality is met. If configured to do so, the UE shall trigger reporting of its RLM and/or BFD relaxation status through UE assistance information if the UE changes its respective RLM and/or BFD relaxation status while meeting the UE minimum requirements specified in TS 38.133 [13].

UE power saving may also be achieved through PDCCH monitoring adaptation mechanisms when configured by the network, including skipping of PDCCH monitoring and Search space set group (SSSG) switching. In this case UE does not monitor PDCCH during the PDCCH skipping duration except for the cases as specified in TS 38.213 [38], or monitors PDCCH according to the search space sets applied in SSSG.

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| *End of changes* |

Annex: RAN2 agreements

RAN2#128 agreements:

**Agreements on asymmetric DL sTRP and UL mTRP**

* New MAC CE is introduced for PL offset update for asymmetric DL sTRP/UL mTRP. This new MAC CE is identified by new eLCID.
* Absolute value of PL offset is indicated in the new MAC CE. For the offset value, the value range is [-12, 60] dB and the step size is 4dB.
* In the MAC CE, PL offset value can be updated for any configured TCI states with RRC configured PL offset, i.e., not limited to the activated TCI states.

RAN2#129 agreements:

**Agreements on Asymmetric DL sTRP/UL mTRP**

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| * One PL offset value is indicated for each TCI state included in the new MAC CE.
* The new MAC CE contains one serving cell ID and one BWP ID
* TCI state ID is used to indicate a TCI state in the new MAC CE (i.e., no bitmap for TCI states is needed)
* The new MAC CE can include flexible number of PL offset values.

Working assumption: * UE applies the latest PL offset value received in RRC or MAC CE. Can revisit if new issue is found.

Agreement* RAN2 understands that if a joint/UL TCI state is configured with a PL offset, PHR trigger is based on the PL change of the PL-RS associated to the joint/UL TCI, where the PL change takes into account the PL offset. FFS whether/how to capture this.
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RAN2#129bis agreements:

**Agreements on Asymmetric DL sTRP/UL mTRP**

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| * No need to add a maximum number restriction of the TCI states indicated by the PL offset MAC CE.
* RAN2 understand the PL offset update MAC CE is at least applicable to PUCCH, PUSCH, SRS, and PDCCH-order CFRA.
* We will capture in a note to reflect the previous understanding ‘RAN2 understands that if a joint/UL TCI state is configured with a PL offset, PHR trigger is based on the PL change of the PL-RS associated to the joint/UL TCI, where the PL change takes into account the PL offset.’. FFS on exact wording.
* From RAN2 point of view, UE applies the latest PL offset value received in RRC or MAC CE.
* For 2TA in asymmetric DL sTRP/UL mTRP scenario with pathloss offset configured Rel-18 2TA operation is applied with the following RRC changes:
	+ - remove the restriction that RRC field tag2 is configured only if coresetPoolIndex is configured with more than one value;
		- a single n-TimingAdvanceoffset is configured, i.e., n-TimingAdvanceOffset2 is not configured for 2TA in asymmetric DL sTRP/UL mTRP scenario.
* For PRACH transmission, PL offset is applicable only to PDCCH-order CFRA.
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Agreements on other aspects

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| MAC impact:* In Mode A of UE-initiated CSI reporting, the active time of a DRX operation includes the time after a new UCI for UE-initiated beam reporting is sent on first PUCCH.
* Confirm the following RAN2 understandings:
	+ - The CG type-1 PUSCH carrying the beam report of Mode-B does not carry MAC PDU (i.e. UL-SCH).
		- The DG PUSCH carrying the beam report of Mode-A carries MAC PDU (i.e. UL-SCH) as legacy.
* FFS if any other MAC impact for UL skipping
* The UE continues to perform CSI measurements for the UEIBM procedure when the active BWP is the dormant BWP.
* If the BWP in an SCell is a dormant BWP, the UE should not report mode-A beam measurement results. The UE cannot perform mode-B beam reporting on this BWP.
* RAN2 understand the event evaluation and report triggering for UE-initiated beam report is captured by RAN1 spec.

RRC impac:* enabledCurrentBeamReport-r19 is added as an optional need-R field.
* Reuse resourcesForChannelMeasurement in CSI-ReportConfig. Clarify in the field description that for UEI BM, the new beam to be measured is either CSI-RS (nzp-CSI-RS-ResourceSetList) or SSB (csi-SSB-ResourceSetList).
* ng-n1-n2-r19, cri-typeI-SinglePanel-ri-restriction-r19/cri-typeII-ri-restriction-r19 and cri-typeI-SinglePanel-CBSR-r19/cri-typeII-CBSR-r19 in the same way as corresponding legacy fields i.e.:
	+ - ng-n1-n2-r19 is defined in the same way as ng-n1-n2 in R15 typeI-multiPanel
		- cri-typeI-SinglePanel-ri-restriction-r19/cri-typeII-ri-restriction-r19 are defined in the same way as legacy RI restrictions
		- cri-typeI-SinglePanel-CBSR-r19/cri-typeII-CBSR-r19 are defined in the same way as n1-n2-codebookSubsetRestriction-r18.
* mrSelectedResources is defined as a SEQUENCE structure containing two fields with integer values from one to eight.
* delayOffsetCompensation can be located under CSI-AperiodicTriggerState and outside of CSI-AssociatedReportConfigInfo and that the parameter triggeringScheme is not needed.
* Define numberofSubbandsPO as a list (with size up to the number of subbands) where each element is an integer value within the maximum size of a BWP.
* The following is used the signaling of typeI-CBSR and typeII-CBSR and typeI-softScalingRank:
	+ - (N1, N2) can be signaled as a separate parameter, and CBSR can be signaled as a CHOICE of (X1, X2) and a CHOICE of N1N2;
 |