**3GPP TSG- Meeting # *25xxxxx***

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

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| ***Title:*** | TEI19: Simultaneous NZP-CSI-RS resource counting with NES | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI19 | | | | |  | ***Date:*** | | | 2025-06-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TEI19 agreement in RAN1#121:  Agreement   * For simultaneous CSI-RS reception when operating Network Energy saving UE features 42-1/1a/1b/1c, and 42-2/2a/2b/2c, define the following new UE capability:   + Simultaneous NZP-CSI-RS resource counting NES: To allow the UE to indicate that CSI-RS ports within one periodic/semi-persistent CSI-RS resource, as well as the periodic/semi-persistent CSI-RS resource, are counted as one resource even if the periodic/semi-persistent CSI-RS resource is referred multiple times by one or more CSI Reporting Settings with at least one CSI Reporting Setting configured with higher layer parameter *csi-ReportSubConfigToAddModList.*   RAN1#121 agreed on a text proposal reflected in this CR. | | | | | | | | |
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| ***Summary of change:*** | | Specifying that the UE indicating the new capability either uses the maximum of the SRS-CS switching time or the UL Tx Switching time, or a sum of the two switching times in the respective carrier swtiching. | | | | | | | | |
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| ***Consequences if not approved:*** | | The agreed TEI item is not supported by the specification | | | | | | | | |
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| ***Clauses affected:*** | | 5.2.1.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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5.2.1.6 CSI processing criteria

The UE indicates the number of supported simultaneous CSI calculations with parameter *simultaneousCSI-ReportsPerCC* or *simultaneousCSI-SubReportsPerCC-r18* in a component carrier, and *simultaneousCSI-ReportsAllCC* or *simultaneousCSI-SubReportsAllCC-r18* across all component carriers. If UE is configured with at least one CSI report setting with sub-configuration in a component carrier, UE shall use parameter *simultaneousCSI-SubReportsPerCC-r18* in the component carrier; otherwise, UE shall use *simultaneousCSI-ReportsPerCC* in the component carrier. If UE is configured with at least one CSI reporting setting with sub-configuration in any component carrier, UE shall use *simultaneousCSI-SubReportsAllCC-r18*; otherwise, UE shall use *simultaneousCSI-ReportsAllCC*. If a UE supports simultaneous CSI calculations it is said to have CSI processing units for processing CSI reports. If *L* CPUs are occupied for calculation of CSI reports in a given OFDM symbol, the UE has unoccupied CPUs. If *N* CSI reports start occupying their respective CPUs on the same OFDM symbol on which CPUs are unoccupied, where each CSI report corresponds to , the UE is not required to update the requested CSI reports with lowest priority (according to Clause 5.2.5), where is the largest value such that holds.

A UE is not expected to be configured with an aperiodic CSI trigger state containing more than Reporting Settings. Processing of a CSI report occupies a number of CPUs for a number of symbols as follows:

- for a CSI report with CSI-ReportConfig with higher layer parameter *reportQuantity* set to 'none' and *CSI-RS-ResourceSet* with higher layer parameter *trs-Info* configured

- for a CSI report with *ltm-CSI-ReportConfig* or a CSI report with *CSI-ReportConfig* with higher layer parameter *reportQuantity* set to 'cri-RSRP', 'ssb-Index-RSRP', 'cri-SINR', 'ssb-Index-SINR', 'cri-RSRP- Index', 'ssb-Index-RSRP- Index', 'cri-SINR- Index', 'ssb-Index-SINR- Index ' or 'none' (and *CSI-RS-ResourceSet* with higher layer parameter *trs-Info* not configured)

- , for a CSI report with *CSI-ReportConfig* with higher layer parameter *reportQuantity* set to 'tdcp' and with number of delays configured by higher layer parameter *Y*, where the value of is reported by UE capability.

- for a CSI report with *CSI-ReportConfig* with higher layer parameter *reportQuantity* set to 'cri-RI-PMI-CQI', 'cri-RI-i1', 'cri-RI-i1-CQI', 'cri-RI-CQI', or 'cri-RI-LI-PMI-CQI',

- if max{ *µPDCCH*, *µCSI-RS, µUL*} ≤ 3, and if a CSI report is aperiodically triggered without transmitting a PUSCH with either transport block or HARQ-ACK or both when *L* = 0 CPUs are occupied, where the CSI corresponds to a single CSI with wideband frequency-granularity and to at most 4 CSI-RS ports in a single resource without CRI report and where *codebookType* is set to 'typeI-SinglePanel' or where *reportQuantity* is set to 'cri-RI-CQI', ,

- if a *CSI-ReportConfig* is configured with *codebookType* set to 'typeI-SinglePanel' and the corresponding CSI-RS Resource Set for channel measurement is configured with two Resource Groups and Resource Pairs, , where is the number of CPUs occupied by a pair of CMRs subject to *mTRP-CSI-numCPU-r17* and is defined in clause 5.2.1.4.2,

- if a *CSI-ReportConfig* contains a list of *L* sub-configurations provided by the higher layer parameter *csi-ReportSubConfigToAddModList*,

- for periodic CSI reporting, where is the total number of CSI-RS resources in the CSI-RS resource set for channel measurement corresponding to the *i*-th sub-configuration.

- for aperiodic and semi-persistent CSI reporting, where is the total number of CSI-RS resources in the CSI-RS resource set for channel measurement corresponding to the *i*-th sub-configuration, and where the *i*-th sub-configuration is from *N* indicated sub-configurations out of *L* sub-configurations contained in a *CSI-ReportConfig*, where and .

- if a *CSI-ReportConfig* is configured with the higher layer parameter *reportQuantity* set to 'cri-RI-PMI-CQI', *codebookType* set to 'typeII-CJT-r18' or 'typeII-CJT-PortSelection-r18' and the corresponding *NZP-CSI-RS-ResourceSet* for channel measurement is configured with resources, , where is reported by UE capability indication,

- if a *CSI-ReportConfig* is configured with the higher layer parameter *reportQuantity* set to 'cri-RI-PMI-CQI' and with *codebookType* set to 'typeII-Doppler-r18' or 'typeII-Doppler-PortSelection-r18',

- if the corresponding CSI-RS Resource Set for channel measurement is aperiodic and configured with CSI-RS resources, for and for , where is reported by UE capability indication,

- if the corresponding CSI-RS Resource Set for channel measurement is periodic or semi-persistent and configured with a single CSI-RS resource, for and ) for , where the value of is configured by the higher layer parameter *vectorLengthDD*, and is reported by UE capability indication,

- otherwise, , where is the number of CSI-RS resources in the CSI-RS resource set for channel measurement.

For a CSI report with *CSI-ReportConfig* with higher layer parameter *reportQuantity* not set to 'none', or a CSI report with *LTM-CSI-ReportConfig*, the CPU(s) are occupied for a number of OFDM symbols as follows:

- A periodic or semi-persistent CSI report (excluding an initial semi-persistent CSI report on PUSCH after the PDCCH triggering the report and a semi-persistent CSI report on PUSCH configured with the higher layer parameter *codebookType* set to 'typeII-Doppler-r18' or 'typeII-Doppler-PortSelection-r18') occupies CPU(s) from the first symbol of the earliest one of each CSI-RS/CSI-IM/SSB resource, or each CSI-RS/CSI-IM resource associated with all configured sub-configurations for periodic CSI report corresponding to a *CSI-ReportConfig* that contains a list of sub-configurations provided by *csi-ReportSubConfigToAddModList*, or each CSI-RS/CSI-IM resource associated with all activated/triggered sub-configurations for semi-persistent CSI report corresponding to a *CSI-ReportConfig* that contains a list of sub-configurations provided by *csi-ReportSubConfigToAddModList*, for channel or interference measurement, respective latest CSI-RS/CSI-IM/SSB occasion no later than the corresponding CSI reference resource, until the last symbol of the configured PUSCH/PUCCH carrying the report.

- An aperiodic CSI report occupies CPU(s) from the first symbol after the PDCCH triggering the CSI report until the last symbol of the scheduled PUSCH carrying the report. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], for the purpose of determining the CPU occupation duration, the PDCCH candidate that ends later in time is used.

- An initial semi-persistent CSI report on PUSCH after the PDCCH trigger occupies CPU(s) from the first symbol after the PDCCH until the last symbol of the scheduled PUSCH carrying the report. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], for the purpose of determining the CPU occupation duration, the PDCCH candidate that ends later in time is used.

- A semi-persistent CSI report on PUSCH configured with the higher layer parameter *codebookType* set to 'typeII-Doppler-r18' or 'typeII-Doppler-PortSelection-r18' occupies CPU(s) from the first symbol of *KP*-th latest consecutive periodic/semi-persistent CSI-RS occasions no later than CSI reference resource, until the last symbol of the PUSCH carrying the report, where the value of is indicated by UE capability.

For a CSI report with *CSI-ReportConfig* with higher layer parameter *reportQuantity* set to 'none' and *CSI-RS-ResourceSet* with higher layer parameter *trs-Info* not configured, the CPU(s) are occupied for a number of OFDM symbols as follows:

- A semi-persistent CSI report (excluding an initial semi-persistent CSI report on PUSCH after the PDCCH triggering the report) occupies CPU(s) from the first symbol of the earliest one of each transmission occasion of periodic or semi-persistent CSI-RS/SSB resource for channel measurement for L1-RSRP computation, until symbols after the last symbol of the latest one of the CSI-RS/SSB resource for channel measurement for L1-RSRP computation in each transmission occasion.

- An aperiodic CSI report occupies CPU(s) from the first symbol after the PDCCH triggering the CSI report until the last symbol between symbols after the first symbol after the PDCCH triggering the CSI report and symbols after the last symbol of the latest one of each CSI-RS/SSB resource for channel measurement for L1-RSRP computation.

where are defined in the table 5.4-2.

In any slot, the UE is not expected to have more active CSI-RS ports or active CSI-RS resources in active BWPs than reported as capability. NZP CSI-RS resource is active in a duration of time defined as follows. For aperiodic CSI-RS, starting from the end of the PDCCH containing the request and ending at the end of the scheduled PUSCH containing the report associated with this aperiodic CSI-RS. When the PDCCH candidates are associated with a search space set configured with *searchSpaceLinkingId*, for the purpose of determining the NZP CSI-RS resource active duration, the PDCCH candidate that ends later in time among the two linked PDCCH candidates is used. For semi-persistent CSI-RS, starting from the end of when the activation command is applied, and ending at the end of when the deactivation command is applied. For periodic CSI-RS, starting when the periodic CSI-RS is configured by higher layer signalling, and ending when the periodic CSI-RS configuration is released.

If a CSI-RS resource is referred *N* times by one or more CSI Reporting Settings not configured with higher layer parameter *csi-ReportSubConfigToAddModList*, the CSI-RS resource and the CSI-RS ports within the CSI-RS resource are counted *N* times.

For a CSI-RS Resource Set for channel measurement configured with two Resource Groups and Resource Pairs, if a CSI-RS resource is referred times by one of the CSI-RS resources, where is defined in clause 5.2.1.4.2, and/or one or two Resource Pairs, the CSI-RS resource and the CSI-RS ports within the CSI-RS resource are counted times.

If the UE indicates [simultaneous NZP-CSI-RS resource counting\_NES] and the CSI-RS resource is configured as periodic or semi-persistent and is referred *N* times by one or more CSI Reporting Settings with at least one CSI Reporting Setting configured with higher layer parameter *csi-ReportSubConfigToAddModList*, the CSI-RS resource is counted once and the CSI-RS ports within the CSI-RS resource are counted *P,* where *P* is the number of ports configured by *nrofPorts.*

If the UE does not indicate [simultaneous NZP-CSI-RS resource counting\_NES] or the UE indicates [simultaneous NZP-CSI-RS resource counting\_NES] and the CSI-RS resource is not configured as periodic or semi-persistent:

- For a *CSI-ReportConfig* containing a list of *L* sub-configuration(s) provided by higher layer parameter *csi-ReportSubConfigToAddModList,* if a CSI-RS resource is referred by *M* sub-configurations among *N* triggered sub-configurations for CSI reporting for aperiodic CSI-RS resource, or *L* configured sub-configurations for CSI reporting for periodic or semi-persistent CSI-RS resource, the CSI-RS resource is counted *M* times and the CSI-RS ports within the CSI-RS resource are counted , where *P* is the number of ports configured by *nrofPorts* and is the number of CSI-RS ports in *s*-th sub-configuration from *M* sub-configurations derived from the corresponding antenna port subset indicator *portSubsetIndicator* according to clause 5.2.1.4.2 if configured, otherwise .

For a periodic or semi-persistent CSI-RS resource in a CSI-RS resource set for channel measurement linked to a *CSI-ReportConfig* configured with the higher layer parameter *codebookType* set to 'typeII-Doppler-r18' or 'typeII-Doppler-PortSelection-r18', the CSI-RS resource and the CSI-RS ports within the CSI-RS resource are counted times, where the value of is indicated by UE capability.

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