**3GPP TSG-RAN WG1 Meeting #106b-e *R1-210xxxx***

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| *CR-Form-v12.1* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.214** | **CR** |  | **rev** | **-** | **Current version:** | **16.7.0** |  |
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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:*** | Introduction of NR UE Power Saving Enhancements | | | | | | | | | |
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| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** | NR\_UE\_pow\_sav\_enh-Core | | | | |  | ***Date:*** | | | 2021-11-01 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | Introduction of UE Power Saving Enhancements | | | | | | | | |
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| ***Summary of change:*** | | In section 5.1.6.1.1 there has been introduced the CSI-RS configuration for RRC\_IDLE or RRC\_INACTIVE UEs. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incomplete support of UE Power Saving Enhancements | | | | | | | | |
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| ***Clauses affected:*** | | 5.1.6.1.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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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##### 5.1.6.1.1 CSI-RS for tracking

A UE in RRC connected mode is expected to receive the higher layer UE specific configuration of a *NZP-CSI-RS-ResourceSet* configured with higher layer parameter *trs-Info*.

For a *NZP-CSI-RS-ResourceSet* configured with the higher layer parameter *trs-Info*, the UE shall assume the antenna port with the same port index of the configured NZP CSI-RS resources in the *NZP-CSI-RS-ResourceSet* is the same.

- For frequency range 1, the UE may be configured with one or more NZP CSI-RS set(s), where a *NZP-CSI-RS-ResourceSet* consists of four periodic NZP CSI-RS resources in two consecutive slots with two periodic NZP CSI-RS resources in each slot. If no two consecutive slots are indicated as downlink slots by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigDedicated*, then the UE may be configured with one or more NZP CSI-RS set(s), where a *NZP-CSI-RS-ResourceSet* consists of two periodic NZP CSI-RS resources in one slot.

- For frequency range 2 the UE may be configured with one or more NZP CSI-RS set(s), where a *NZP-CSI-RS-ResourceSet* consists of two periodic CSI-RS resources in one slot or with a *NZP-CSI-RS-ResourceSet* of four periodic NZP CSI-RS resources in two consecutive slots with two periodic NZP CSI-RS resources in each slot.

A UE configured with *NZP-CSI-RS-ResourceSet(s)* configured with higher layer parameter *trs-Info* may have the CSI-RS resources configured as:

- Periodic, with the CSI-RS resources in the *NZP-CSI-RS-ResourceSet* configured with same periodicity, bandwidth and subcarrier location.

- Periodic CSI-RS resource in one set and aperiodic CSI-RS resources in a second set, with the aperiodic CSI-RS and periodic CSI-RS resource having the same bandwidth (with same RB location) and the aperiodic CSI-RS being configured with *qcl-Type* set to 'typeA' and 'typeD', where applicable, with the periodic CSI-RS resources. For frequency range 2, the UE does not expect that the scheduling offset between the last symbol of the PDCCH carrying the triggering DCI and the first symbol of the aperiodic CSI-RS resources is smaller than *beamSwitchTiming* + *d* in CSI-RS symbols*,* where *beamSwitchTiming* is UE reported value defined in [13, TS 38.306], the reported value is one of the values of {14, 28, 48}, and the beam switching timing delay *d* is defined in Table 5.2.1.5.1a-1 if µPDCCH < µCSIRS , else *d* is zero. The UE shall expect that the periodic CSI-RS resource set and aperiodic CSI-RS resource set are configured with the same number of CSI-RS resources and with the same number of CSI-RS resources in a slot. For the aperiodic CSI-RS resource set if triggered, and if the associated periodic CSI-RS resource set is configured with four periodic CSI-RS resources with two consecutive slots with two periodic CSI-RS resources in each slot, the higher layer parameter *aperiodicTriggeringOffset* indicates the triggering offset for the first slot for the first two CSI-RS resources in the set.

A UE does not expect to be configured with a *CSI-ReportConfig* that is linked to a *CSI-ResourceConfig* containing an *NZP-CSI-RS-ResourceSet* configured with *trs-Info* and with the *CSI-ReportConfig* configured with the higher layer parameter *timeRestrictionForChannelMeasurements* set to 'configured'.

A UE does not expect to be configured with a *CSI-ReportConfig* with the higher layer parameter *reportQuantity* set to other than 'none' for aperiodic NZP CSI-RS resource set configured with *trs-Info.*

A UE does not expect to be configured with a *CSI-ReportConfig* for periodic NZP CSI-RS resource set configured with *trs-Info*.

A UE does not expect to be configured with a *NZP-CSI-RS-ResourceSet* configured both with *trs-Info* and *repetition*.

Each CSI-RS resource, defined in Clause 7.4.1.5.3 of [4, TS 38.211], is configured by the higher layer parameter *NZP-CSI-RS-Resource* with the following restrictions:

- the time-domain locations of the two CSI-RS resources in a slot, or of the four CSI-RS resources in two consecutive slots (which are the same across two consecutive slots), as defined by higher layer parameter *CSI-RS-resourceMapping*, is given by one of

- , , or for frequency range 1 and frequency range 2,

- , , , , ,  or  for frequency range 2.

- a single port CSI-RS resource with density  given by Table 7.4.1.5.3-1 from [4, TS 38.211] and higher layer parameter *density* configured by *CSI-RS-ResourceMapping.*

- if carrier , , and the carrier is configured in paired spectrum, the bandwidth of the CSI-RS resource, as given by the higher layer parameter *freqBand* configured by *CSI-RS-ResourceMapping*, is *X* resource blocks, where resources if the UE indicates *trs-AddBW-Set1* for the *trs-AdditionalBandwidth* capability and if the UE indicates *trs-AddBW-Set2* for the *AdditionalBandwidth* capability; in these cases, if the UE is configured with CSI-RS comprising X<52 resource blocks, the UE does not expect that the total number of PRBs allocated for DL transmissions but not overlapped with the PRBs carrying CSI-RS for tracking is more than 4, where all CSI-RS resource configurations shall span the same set of resource blocks; otherwise, the bandwidth of the CSI-RS resource, as given by the higher layer parameter *freqBand* configured by *CSI-RS-ResourceMapping*, is the minimum of 52 and resource blocks, or is equal to resource blocks. For operation with shared spectrum channel access, *freqBand* configured by *CSI-RS-ResourceMapping*, is the minimum of 48 and resource blocks, or is equal to resource blocks.

- the UE is not expected to be configured with the periodicity of  slots if the bandwidth of CSI-RS resource is larger than 52 resource blocks.

- the periodicity and slot offset for periodic NZP CSI-RS resources, as given by the higher layer parameter *periodicityAndOffset* configured b*y NZP-CSI-RS-Resource*, is one of slots where 10, 20, 40, or 80 and where µ is defined in Clause 4.3 of [4, TS 38.211].

- same *powerControlOffset* and *powerControlOffsetSS* given by*NZP-CSI-RS-Resource* value across all resources.

A UE in RRC\_IDLE or RRC\_INACTIVE can receive a higher layer configuration of TRS occasions via a [*TRS-ResourceSetConfig*].

- For frequency range 1, the UE may be configured with one or more TRS resource set(s), where each TRS resource set configured by a [*TRS-ResourceSet*] consists of four periodic NZP CSI-RS resources in two consecutive slots with two periodic NZP CSI-RS resources in each slot.

- For frequency range 2 the UE may be configured with one or more TRS resource set(s), where each TRS resource set configured by a [*TRS-ResourceSet*] consists of two periodic NZP CSI-RS resources in one slot or by a [*TRS-ResourceSet*] of four periodic NZP CSI-RS resources in two consecutive slots with two periodic NZP CSI-RS resources in each slot.

Each NZP CSI-RS resource, defined in Clause 7.4.1.5.3 of [4, TS 38.211], is configured by the higher layer parameter [*TRS-Resource*] in a [*TRS-REsourceSet*] with the following restrictions for a UE in RRC\_IDLE or RRC\_INACTIVE:

- the time-domain locations of the two CSI-RS resources in a slot, or of the four CSI-RS resources in two consecutive slots (which are the same across two consecutive slots), is one of

- , , or for frequency range 1 and frequency range 2,

- , , , , ,  or  for frequency range 2.

- where the first symbol location in a slot is indicated by *firstOFDMSymbolInTimeDomain* in the [*TRS-ResourceSet*] and the second symbol location in a slot is *firstOFDMSymbolInTimeDomain +* 4

- a single port CSI-RS resource with density  given by Table 7.4.1.5.3-1 from [4, TS 38.211]*.*

- the bandwidth and the frequency location of the NZP CSI-RS resource, is given by the higher layer parameter [*nrofRBs*], [*startingRB*] and [*frequencyDomainAllocation*] in a [*TRS-ResourceSet*] and applies to all resources in a [*TRS-ResourceSet*]. The [frequencyDomainAllocation] configuration is not restricted by initial DL BWP.

- [UE is not expected to receive TRS occasions outside the initial DL BWP.]

- the periodicity and slot offset for periodic NZP CSI-RS resources, is given by the higher layer parameter *periodicityAndOffset* configured b*y* a [*TRS-ResourceSet*], is one of slots where 10, 20, 40, or 80 and where µ is defined in Clause 4.3 of [4, TS 38.211], applies to all resources in a [*TRS-ResourceSet*].

- the UE does not expect the [*TRS-ResourceSet*] to be configured with the periodicity of  slots if the bandwidth of NZP CSI-RS resource is larger than 52 resource blocks.

- the UE may assume the sub-carrier spacing of the NZP CSI-RS resources configured by [*TRS-ResourceSet*] to be same as the sub-carrier spacing of the initial DL BWP.

- *powerControlOffsetSS* given bya [*TRS-ResourceSet*] applies to all resources in a [*TRS-ResourceSet*].

- the QCL information for periodic NZP CSI-RS resources, is given by the higher layer parameter *ssb-Index* configured by a [*TRS-ResourceSet*], is a SS/PBCH block, applies to all resources in a [*TRS-ResourceSet*].

- the UE may assume the following quasi co-location type(s):

- 'typeC' with an SS/PBCH block and, when applicable, 'typeD' with the same SS/PBCH block.

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