**3GPP TSG RAN WG1 #112bis-e R1-230xxxx**

**e-Meeting, April 17th – April 26th, 2023**

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| *CR-Form-v12.1* |
| **Draft CHANGE REQUEST** |
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|  | **38.214** | **CR** |  | **rev** |  | **Current version:** | **17.5.0** |  |
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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:***  | Correction on default beam for HST-SFN |
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| ***Source to WG:*** | Intel Corporation |
| ***Source to TSG:*** | R1 |
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| ***Work item code:*** | NR\_FeMIMO-Core |  | ***Date:*** | 2023-04-21 |
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| ***Category:*** | **F** |  | ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In RAN1#106(e), we had the following agreement for default beam of AP CSI-RS when SFN PDCCH is enabled and there is no DL signal. However, current SPEC wording does not capture the agreement correctly. Current wording seems to suggest that two TCI states are always indicated for the CORESET with the lowest CORESET ID in the latest slot. However, the CORESET with the lowest CORESET ID could be activated with only one TCI state. Hence, current wording is not accurate.

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| **Agreement**If enhanced SFN PDCCH transmission scheme (scheme 1 or if TRP-based pre-compensation is supported in FR2) is configured and CORESET is indicated with two TCI states, and scheduling offset for AP CSI-RS is less than the threshold and *enableTwoDefaultTCIStates* is not configured* If there is no other DL signal on the same symbol, use one of two TCI states as default beam for aperiodic CSI-RS reception, i.e.
	+ using one TCI state of the CORESET with the lowest CORESET ID in the latest slot as default beam for aperiodic CSI-RS reception. If there are two activated TCI states for the CORESET with the lowest CORESET ID, one of two TCI states will be selected, i.e. always selects the first TCI state if the CORESET has two TCI states
* If there is other DL signal on the same symbol, reuse Rel-15/16 mechanism
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| ***Summary of change:*** | Modify specification wording to reflect existing agreement.  |
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| ***Consequences if not approved:*** | Existing agreement is not correctly captured.  |
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| ***Clauses affected:*** | 5.1, 5.2.1.5.1 |
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|  | **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 ...  |
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| ***Other comments:*** | Isolated impact analysisThis CR captures existing agreement, hence, no new UE or network behavior is defined in this CR, and there is no inter-operability issue.  |
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| ***This CR's revision history:*** |  |

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

< Unchanged parts are omitted >

##### 5.2.1.5.1 Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have the same numerology

< Unchanged parts are omitted >

A trigger state is initiated using the *CSI request* field in DCI.

- When all the bits of *CSI request* field in DCI are set to zero, no CSI is requested.

- When the number of configured CSI triggering states in *CSI-AperiodicTriggerStateList* is greater than , where  is the number of bits in the DCI *CSI request* field, the UE receives a subselection indication, as described in clause 6.1.3.13 of [10, TS 38.321], used to map up to  trigger states to the codepoints of the *CSI request* field in DCI.  is configured by the higher layer parameter *reportTriggerSize* where . When the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the subselection indication, the corresponding action in [10, TS 38.321] and UE assumption on the mapping of the selected CSI trigger state(s) to the codepoint(s) of DCI CSI request field shall be applied starting from the first slot that is after slot $n+3N\_{slot}^{subframe,µ}+\frac{2^{μ}}{2^{μ\_{K\_{mac}}}}∙k\_{mac}$ where ** is the SCS configuration for the PUCCH and $μ\_{K\_{mac}} $is the subcarrier spacing configuration for $k\_{mac}$ with a value of 0 for frequency range 1, and $k\_{mac}$ is provided by *K-Mac* or $k\_{mac}=0$ if *K-Mac* is not provided..

- When the number of CSI triggering states in *CSI-AperiodicTriggerStateList* is less than or equal to , the *CSI request* field in DCI directly indicates the triggering state.

- For each aperiodic CSI-RS resource in a CSI-RS resource set associated with each CSI triggering state, the UE is indicated the quasi co-location configuration of quasi co-location RS source(s) and quasi co-location type(s), as described in clause 5.1.5, through higher layer signaling of *qcl-info* which contains a list of references to *TCI-State's* for the aperiodic CSI-RS resources associated with the CSI triggering state. If a *State* referred toin the list is configured with a reference to an RS configured with *qcl-Type* set to 'typeD', that RS may be an SS/PBCH block located in the same or different CC/DL BWP or a CSI-RS resource configured as periodic or semi-persistent located in the same or different CC/DL BWP.

- If the scheduling offset between the last symbol of the PDCCH carrying the triggering DCI and the first symbol of the aperiodic CSI-RS resources in a *NZP-CSI-RS-ResourceSet* configured without higher layer parameter *trs-Info* is smaller than the UE reported threshold *beamSwitchTiming,* as defined in [13, TS 38.306], when the reported value is one of the values of {14, 28, 48}$∙2^{max(0, μ\_{CSIRS}-3)}$ and *enableBeamSwitchTiming* is not provided, or is smaller than 48$∙2^{max(0, μ\_{CSIRS}-3)}$ when the UE provides *beamSwitchTiming-r16*, *enableBeamSwitchTiming* is provided and the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *repetition* set to 'off' or configured without the higher layer parameter *repetition,* or is smaller than the UE reported threshold *beamSwitchTiming-r16,* when *enableBeamSwitchTiming* is provided and the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *repetition* set to 'on'.

- If a UE is configured with *enableDefaultTCI-StatePerCoresetPoolIndex* and the UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet*

- if there is any other DL signal with an indicated TCI state in the same symbols as the CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the aperiodic CSI-RS. The other DL signal refers to PDSCH scheduled by a PDCCH associated with the same *coresetPoolIndex* as the PDCCH triggering the aperiodic CSI-RS and scheduled with offset larger than or equal to the threshold *timeDurationForQCL,* as defined in [13, TS 38.306], aperiodic CSI-RS triggered by a PDCCH associated with the same *coresetPoolIndex* as the PDCCH triggering the aperiodic CSI-RS and scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming* when the reported value is one of the values {14,28,48}$∙2^{max(0, μ\_{CSIRS}-3)}$ and *enableBeamSwitchTiming* is not provided, aperiodic CSI-RS triggered by a PDCCH associated with the same *coresetPoolIndex* as the PDCCH triggering the aperiodic CSI-RS and scheduled with offset larger than or equal to 48$∙2^{max(0, μ\_{CSIRS}-3)}$ when the reported value of *beamSwitchTiming-r16* is one of the values {224, 336}$∙2^{max(0, μ\_{CSIRS}-3)}$ and *enableBeamSwitchTiming* is provided, periodic CSI-RS, semi-persistent CSI-RS;

- else, the UE applies the QCL parameter(s) of the CORESET associated with a monitored search space with the lowest *controlResourceSetId* among CORESETs, which are configured with the same value of *coresetPoolIndex* as the PDCCH triggering that aperiodic CSI-RS, in the latest slot in which one or more CORESETs are associated with the same value of *coresetPoolIndex* as the PDCCH triggering that aperiodic CSI-RS

- else if a UE is configured with *enableTwoDefaultTCI-States* and at least one TCI codepoint is mapped to two TCI states

- if there is any other DL signal with an indicated TCI state in the same symbols as the CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the aperiodic CSI-RS. The other DL signal refers to PDSCH scheduled with offset larger than or equal to the threshold *timeDurationForQCL,* as defined in [13, TS 38.306], aperiodic CSI-RS scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming* when the reported value is one of the values {14,28,48}$∙2^{max(0, μ\_{CSIRS}-3)}$ and *enableBeamSwitchTiming* is not provided, aperiodic CSI-RS scheduled with offset larger than or equal to 48$∙2^{max(0, μ\_{CSIRS}-3)}$ when the reported value of *beamSwitchTiming-r16* is one of the values {224, 336}$∙2^{max(0, μ\_{CSIRS}-3)}$ and *enableBeamSwitchTiming* is provided, periodic CSI-RS, semi-persistent CSI-RS. If there is a PDSCH indicated with two TCI states in the same symbols as the CSI-RS, the UE applies the first TCI state of the two TCI states when receiving the aperiodic CSI-RS.

- else, the UE applies the first one of two TCI states corresponding to the lowest TCI codepoint among those mapped to two TCI states and applicable to the PDSCH within the active BWP of the cell in which the CSI-RS is to be received when receiving the aperiodic CSI-RS.

- else if a UE is configured with *sfnSchemePdcch* set to *'*sfnSchemeA', it is not configured with *enableTwoDefaultTCI-States,* and the two TCI states are activated for the CORESET by the activation command as described in clause 6.1.3.x of [10, TS 38.321]

- if there is any other DL signal with an indicated TCI state in the same symbols as the CSI-RS, the UE applies the QCL assumption of the other DL signal also when receiving the aperiodic CSI-RS. The other DL signal refers to PDSCH scheduled with an offset larger than or equal to the threshold *timeDurationForQCL,* as defined in [13, TS 38.306], periodic CSI-RS, semi-persistent CSI-RS, aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming* when the reported value is one of the values {14,28,48} and when *enableBeamSwitchTiming* is not provided or the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *trs-Info* , aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* configuredwith the higher layer parameter *repetition* set to 'off' or configured without the higher layer parameters *repetition* and *trs-Info* scheduled with offset larger than or equal to 48 when the UE provides *beamSwitchTiming-r16* and *enableBeamSwitchTiming* is provided, aperiodic CSI-RS in a *NZP-CSI-RS-ResourceSet* configuredwith the higher layer parameter *repetition* set to 'on' scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming-r16* and *enableBeamSwitchTiming* is provided;

- else, the UE applies the first one of TCI states indicated for the CORESET with the lowest CORESET ID in the latest slot within the active BWP of the cell in which the CSI-RS is to be received when receiving the aperiodic CSI-RS, if two TCI states are activated for the CORESET. Otherwise, the UE applies the single activated TCI state of the CORESET with the lowest CORESET ID in the latest slot within the active BWP of the cell in which the CSI-RS is to be received, when receiving the aperiodic CSI-RS

< Unchanged parts are omitted >