**3GPP TSG-RAN WG1 Meeting #104-e *R1-200xxxx***

**e-Meeting, January 25th – February 5th, 2021**

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| *CR-Form-v12.0* |
| **Draft CHANGE REQUEST** |
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|  | **38.214** | **CR** | **-** | **rev** | **-** | **Current version:** | **16.4.0** |  |
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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>*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Editorial corrections for 38.214 |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** |  |
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| ***Work item code:*** | NR\_newRAT-Core  |  | ***Date:*** | 2021-02-03 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-16 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | In section 5.1.6.5, based on email discussion [104-e-NR-Pos-02] small editorial fixes due to innacurate text.For several occasions in section 5.2.1.5.1, 5.2.1.5.1a, removed the -r16 from *enableBeamSwitchTiming-r16*, to better align with the higher layer parameter names.For one change in section 5.2.1.5.1a, based on email discussion [104-e-NR\_UE\_Pow\_Sav-01], as summarized in R1-2102129, removed the postfix ‘-r16’ of parameter minimumSchedulingOffsetK0.For several occasions in section 5.2.2.5, based on email discussion [104-e-NR\_UE\_Pow\_Sav-01], as summarized in R1-2102129, added the “in DRX-Config” clarification.For one change in section 6.1.2.1, based on email discussion [104-e-NR\_UE\_Pow\_Sav-01], as summarized in R1-2102129, clarified ‘The minimum scheduling restriction’ to minimum scheduling offset restriction’.In section 6.1.2.1, based on email discussion [104-e-NR-NRU-03], as summarized in R1-2101992, resource allocation in time domain for two to eight contiguous PUSCHs refers to an incorrect RRC parameter in pusch-Config.In section 6.2.1, based on email discussion [104-e-NR-Pos-02] small editorial fixes on SRS resource set and other Positioning-related higher layer parameters. |
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| ***Summary of change:*** | In section 5.1.6.5., based on email discussion [104-e-NR-Pos-02] small editorial fixes. For several occasions in section 5.2.1.5.1, 5.2.1.5.1a, removed the -r16 from *enableBeamSwitchTiming-r16*, to better align with the higher layer parameter names.For one change in section 5.2.1.5.1a, based on email discussion [104-e-NR\_UE\_Pow\_Sav-01] removed the postfix ‘-r16’ of parameter minimumSchedulingOffsetK0.For several occasions in section 5.2.2.5, based on email discussion [104-e-NR\_UE\_Pow\_Sav-01] added the “in DRX-Config” clarification.For one change in section 6.1.2.1, based on email discussion [104-e-NR\_UE\_Pow\_Sav-01], clarified ‘The minimum scheduling restriction’ to minimum scheduling offset restriction’.For several occasions in section 6.1.2.1, based on email discussion [104-e-NR-NRU-03], replaced *pusch-TimeDomainAllocationList* with *pusch-TimeDomainAllocationListForMultiPUSCH.*In section 6.2.1, based on email discussion [104-e-NR-Pos-02] small editorial fixes on SRS resource set and other Positioning-related higher layer parameters.. |
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| ***Consequences if not approved:*** | Unclear specification. For the two higher layer parameter names changes in 6.1.2.1, the UE cannot be scheduled with two to eight contiguous PUSCHs when only the RRC parameter pusch-TimeDomainAllocationList is provided, because this parameter cannot provide a row indicating resource allocation for two to eight contiguous PUSCHs. |
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| ***Clauses affected:*** | 5.1.6.5, 5.2.1.5.1, 5.2.1.5.1a, 5.2.2.5, 6.1.2.1, 6.2.1 |
|  |  |
|  | **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:*** |  |

<omitted text>

#### 5.1.6.5 PRS reception procedure

The UE can be configured with one or more DL PRS resource set configuration(s) as indicated by the higher layer parameters *NR-DL-PRS-ResourceSet* and *NR-DL-PRS-Resource* as defined by Clause 6.4.3 [17, TS 37.355]. Each DL PRS resource set consists of K≥1 DL PRS resource(s) where each has an associated spatial transmission filter. The UE can be configured with one or more DL PRS positioning frequency layer configuration(s) as indicated by the higher layer parameter *NR-DL-PRS-PositioningFrequencyLayer.* A DL PRS positioning frequency layer is defined as a collection of DL PRS resource sets which have common parameters configured by *NR-DL-PRS-PositioningFrequencyLayer*.

The UE assumes that the following parameters for each DL PRS resource(s) are configured via higher layer parameters *NR-DL-PRS-PositioningFrequencyLayer, NR-DL-PRS-ResourceSet* and *NR-DL-PRS-Resource*.

A positioning frequency layer is configured by *NR-DL-PRS-PositioningFrequencyLayer,* consists of one or more DL PRS resource sets and it is defined by:

*- dl-PRS-SubcarrierSpacing* defines the subcarrier spacing for the DL PRS resource. All DL PRS resources and DL PRS resource sets in the same DL PRS positioning frequency layer have the same value of *dl-PRS-SubcarrierSpacing*. The supported values of *dl-PRS-SubcarrierSpacing* are given in Table 4.2-1 of [4, TS38.211].

*- dl-PRS-CyclicPrefix* defines the cyclic prefix for the DL PRS resource. All DL PRS Resources and DL PRS Resource sets in the same DL PRS positioning frequency layer have the same value of *dl-PRS-CyclicPrefix.* The supported values of *dl-PRS-CyclicPrefix* are given in Table 4.2-1 of [4, TS38.211].

*- dl-PRS-PointA* defines the absolute frequency of the reference resource block. Its lowest subcarrier is also known as Point A. All DL PRS resources belonging to the same DL PRS resource set have common Point A and all DL PRS resources sets belonging to the same DL PRS positioning frequency layer have a common Point A.

The UE expects that it will be configured with *dl-PRS-ID* each of which is defined such that it is associated with multiple DL PRS resource sets from the same cell. The UE expects that one of these *dl-PRS-ID* along with a *nr-DL-PRS-ResourceSetID* and a *nr-DL-PRS-ResourceID-r16* can be used to uniquely identify a DL PRS resource.

A DL PRS resource set is configured by *NR-DL-PRS-ResourceSet*, consists of one or more DL PRS resources and it is defined by:

*- nr-DL-PRS-ResourceSetID* defines the identity of the DL PRS resource set configuration.

*- dl-PRS-Periodicity-and-ResourceSetSlotOffset* defines the DL PRS resource periodicity and takes values $T\_{per}^{PRS}\in 2^{μ}\left\{4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120, 10240\right\} $slots, where $μ=0, 1, 2, 3 $for *dl-PRS-SubcarrierSpacing*=15, 30, 60 and 120 kHz respectively and the slot offset for DL PRS resource set with respect to SFN0 slot 0. All the DL PRS resources within one DL PRS resource set are configured with the same DL PRS resource periodicity.

*- dl-PRS-ResourceRepetitionFactor* defines how many times each DL-PRS resource is repeated for a single instance of the DL-PRS resource set and takes values $T\_{rep}^{PRS}\in \left\{1,2,4,6,8,16,32\right\}$. All the DL PRS resources within one resource set have the same resource repetition factor.

*- dl-PRS-ResourceTimeGap* defines the offset in number of slots between two repeated instances of a DL PRS resource with the same *nr-DL-PRS-ResourceSetId* within a single instance of the DL PRS resource set. The UE only expects to be configured with *dl-PRS-ResourceTimeGap* if *dl-PRS-ResourceRepetitionFactor* is configured with value greater than 1. The time duration spanned by one instance of a *nr-DL-PRS-ResourceSet* is not expected to exceed the configured value of DL PRS periodicity. All the DL PRS resources within one resource set have the same value of *dl-PRS-ResourceTimeGap.*

*- dl-PRS-MutingOption1* and *dl-PRS-MutingOption2* define the time locations where the DL PRS resource is expected to not be transmitted for a DL PRS resource set. If *dl-PRS-MutingOption1* is configured, each bit in the bitmap of *dl-PRS-MutingOption1* corresponds to a configurable number provided by higher layer parameter *dl-prs-MutingBitRepetitionFactor* of consecutive instances of a DL PRS resource set where all the DL PRS resources within the set are muted for the instance that is indicated to be muted. The length of the bitmap can be {2, 4, 6, 8, 16, 32} bits. If *dl-PRS-MutingOption2* is configured each bit in the bitmap of *dl-PRS-MutingOption2* corresponds to a single repetition index for each of the DL PRS resources within each instance of a *nr-DL-PRS-ResourceSet* and the length of the bitmap is equal to the values of *dl-PRS-ResourceRepetitionFactor*. Both *dl-PRS-MutingOption1* and *dl-PRS-MutingOption2* may be configured at the same time in which case the logical AND operation is applied to the bit maps as described in Clause 7.4.1.7.4 of [4, TS 38.211].

*- NR-DL-PRS-SFN0-Offset* defines the time offset of the SFN0 slot 0 for the transmitting cell with respect to SFN0 slot 0 of reference cell.

*- dl-PRS-ResourceList* determines the DL PRS resources that are contained within one DL PRS resource set.

*- dl-PRS-CombSizeN* defines the comb size of a DL PRS resource where the allowable values are given in Clause 7.4.1.7.3 of [TS38.211]. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-CombSizeN*.

*- dl-PRS-ResourceBandwidth* defines the number of resource blocks configured for DL PRS transmission. The parameter has a granularity of 4 PRBs with a minimum of 24 PRBs and a maximum of 272 PRBs. All DL PRS resources sets within a positioning frequency layer have the same value of *dl-PRS-ResourceBandwidth*.

*- dl-PRS-StartPRB* defines the starting PRB index of the DL PRS resource with respect to reference Point A, where reference Point A is given by the higher-layer parameter *dl-PRS-PointA*. The starting PRB index has a granularity of one PRB with a minimum value of 0 and a maximum value of 2176 PRBs. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-StartPRB*.

*- dl-PRS-NumSymbols* defines the number of symbols of the DL PRS resource within a slot where the allowable values are given in Clause 7.4.1.7.3 of [4, TS38.211].

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

For CSI-RS resource sets associated with Resource Settings configured with the higher layer parameter *resourceType* set to 'aperiodic', 'periodic', or 'semi-persistent', trigger states for Reporting Setting(s) (configured with the higher layer parameter *reportConfigType* set to 'aperiodic') and/or Resource Setting for channel and/or interference measurement on one or more component carriers are configured using the higher layer parameter *CSI-AperiodicTriggerStateList*. For aperiodic CSI report triggering, a single set of CSI triggering states are higher layer configured, wherein the CSI triggering states can be associated with any candidate DL BWP. A UE is not expected to receive more than one DCI with non-zero CSI request per slot. A UE is not expected to be configured with different *TCI-StateId*'s for the same aperiodic CSI-RS resource ID configured in multiple aperiodic CSI-RS resource sets with the same triggering offset in the same aperiodic trigger state. A UE is not expected to receive more than one aperiodic CSI report request for transmission in a given slot. If a UE does not indicate its capability of *CSItriggerStateContainingNonactiveBWP* the UE is not expected to be triggered with a CSI report for a non-active DL BWP. Otherwise, when a UE is triggered with a CSI report for a DL BWP that is non-active when expecting to receive the most recent occasion, no later than the CSI reference resource, of the associated NZP CSI-RS, the UE is not expected to report the CSI for the non-active DL BWP and the CSI report associated with that BWP is omitted. When a UE is triggered with aperiodic NZP CSI-RS in a DL BWP that is non-active when expecting to receive the NZP CSI-RS, the UE is not expected to measure the aperiodic CSI-RS. In the carrier of the serving cell expecting to receive that associated NZP CSI-RS, if the active DL BWP when receiving the NZP CSI-RS is different from the active DL BWP when receiving the triggering DCI,

- the last symbol of the PDCCH span of the DCI carrying the BWP switching shall be no later than the last symbol of the PDCCH span of the DCI carrying the CSI trigger, irrespective of whether they are in the same carrier of a serving cell or not and irrespective of whether they are in the same SCS or not;

- the UE is not expected to have any other BWP switching in that carrier after the last symbol of the PDCCH span covering the DCI carrying the CSI trigger and before the first symbol of the triggered NZP CSI-RS or CSI-IM.

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 $n+3N\_{slot}^{subframe,µ}$ where ** is the SCS configuration for the PUCCH.

- 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} and *enableBeamSwitchTiming* is not provided, or is smaller than 48 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 *enableDefaultTCIStatePerCoresetPoolIndex* 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} 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 when the reported value of *beamSwitchTiming-r16* is one of the values {224, 336} 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 *enableTwoDefaultTCIStates* 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} and *enableBeamSwitchTiming* is not provided, aperiodic CSI-RS scheduled with offset larger than or equal to 48 when the reported value of *beamSwitchTiming-r16* is one of the values {224, 336} 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 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], 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 if at least one CORESET is configured for the BWP in which the aperiodic CSI-RS is received, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption used for the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored;

- else if the UE is configured with *enableDefaultBeamForCCS* and when receiving the aperiodic CSI-RS, the UE applies the QCL assumption of the lowest-ID activated TCI state applicable to the PDSCH within the active BWP of the cell in which the CSI-RS is to be received.

- 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* is equal to or greater than the UE reported threshold *beamSwitchTiming* when the reported value is one of the values of {14,28,48} and *enableBeamSwitchTiming* is not provided and the *NZP-CSI-RS-ResourceSet* is not configured with higher layer parameter *trs-Info*, or is equal to or greater than the UE reported threshold *beamSwitchTiming* when the reported value is one of the values of {14,28,48} and the *NZP-CSI-RS-ResourceSet* is configured with higher layer parameter *trs-Info*, or is equal to or greater than 48 when the UE provides *beamSwitchTiming-r16* and *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 parameters *repetition* and *trs-Info*, or is equal to or greater 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', the UE is expected to apply the QCL assumptions in the indicated TCI states for the aperiodic CSI-RS resources in the CSI triggering state indicated by the CSI trigger field in DCI.

- The UE is not expected to receive aperiodic CSI-RS and PDSCH/aperiodic CSI-RS associated with different values of *coresetPoolIndex* in overlapped symbol(s). The UE is not expected to receive aperiodic CSI-RS and semi-persistent/periodic CSI-RS with different 'QCL-type D' in overlapped symbol(s).

- A non-zero codepoint of the CSI request field in the DCI is mapped to a CSI triggering state according to the order of the associated positions of the up to $2^{N\_{TS}}-1$ trigger states in *CSI-AperiodicTriggerStateList* with codepoint '1' mapped to the triggering state in the first position.

For a UE configured with the higher layer parameter *CSI-AperiodicTriggerStateList*, if a Resource Setting linked to a *CSI-ReportConfig* has multiple aperiodic resource sets, only one of the aperiodic CSI-RS resource sets from the Resource Setting is associated with the trigger state, and the UE is higher layer configured per trigger state per Resource Setting to select the one CSI-IM/NZP CSI-RS resource set from the Resource Setting.

When aperiodic CSI-RS is used with aperiodic reporting, the CSI-RS offset is configured per resource set by the higher layer parameter *aperiodicTriggeringOffset* or *aperiodicTriggeringOffset-r16*. The CSI-RS triggering offset has the values of {0, 1, 2, 3, 4, 5, 6, …, 15, 16, 24} slots. If the UE is not configured with *minimumSchedulingOffsetK0* for any DL BWP or *minimumSchedulingOffsetK2* for any UL BWP and if all the associated trigger states do not have the higher layer parameter *qcl-Type* set to 'typeD' in the corresponding TCI states, the CSI-RS triggering offset is fixed to zero. The aperiodic triggering offset of the CSI-IM follows offset of the associated NZP CSI-RS for channel measurement. The aperiodic CSI-RS is transmitted in a slot , , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, and in slot , otherwise, and where

*- n* is the slot containing the triggering DCI, *X* is the CSI-RS triggering offset according to the higher layer parameter *aperiodicTriggeringOffset* or *aperiodicTriggeringOffset-r16*,

*-* $N\_{slot, offset, PDCCH}^{CA} $is the$ N\_{slot, offset}^{CA}$ which is determined by higher-layer configured *ca-SlotOffset* for the cell receiving the PDCCH, $N\_{slot, offset, CSIRS}^{CA} $is the$ N\_{slot, offset}^{CA}$ which is determined by higher-layer configured *ca-SlotOffset* for the cell transmitting the CSI-RS respectively, as defined in [4, TS 38.211] clause 4.5.

The UE does not expect that aperiodic CSI-RS is transmitted before the OFDM symbol(s) carrying its triggering DCI. When the minimum scheduling offset restriction is applied, UE is not expected to be triggered by CSI triggering state indicated by the CSI request field in DCI in which CSI-RS triggering offset is smaller than the currently applicable minimum scheduling offset restriction *K*0min.

If interference measurement is performed on aperiodic NZP CSI-RS, a UE is not expected to be configured with a different aperiodic triggering offset of the NZP CSI-RS for interference measurement from the associated NZP CSI-RS for channel measurement.

If the UE is configured with a single carrier for uplink, the UE is not expected to transmit more than one aperiodic CSI report triggered by different DCIs on overlapping OFDM symbols.

##### 5.2.1.5.1a Aperiodic CSI Reporting/Aperiodic CSI-RS when the triggering PDCCH and the CSI-RS have different numerologies

When the triggering PDCCH and the triggered aperiodic CSI-RS are of different numerologies, the behavior defined in 5.2.1.5.1 for the case where the numerologies are the same applies with the following exceptions:

Beam switch timing:

- 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* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols*,* as defined in [13, TS 38.306], when the reported value is one of the values of {14, 28, 48} and *enableBeamSwitchTiming* is not provided, or is smaller than 48+ $d∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbolswhen the UE provides *beamSwitchTiming-r16* and *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 +* $d∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols*,* when *enableBeamSwitchTiming* is provided and the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *repetition* set to 'on', where if the µPDCCH < µCSIRS, the beam switching timing delay *d* is defined in Table 5.2.1.5.1a-1, else *d* is zero

- if one of the associated trigger states has the higher layer parameter *qcl-Type* set to 'typeD',

- 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], periodic CSI-RS, semi-persistent CSI-RS, aperiodic CSI-RS scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols 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+ $d∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols 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' and scheduled with offset larger than or equal to the UE reported threshold *beamSwitchTiming-r16* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$in CSI-RS symbols when *enableBeamSwitchTiming* is provided;

- else,

- if at least one CORESET is configured for the BWP in which the aperiodic CSI-RS is to be received, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption used for the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored.

- else if the UE is configured with *enableDefaultBeamForCCS*, when receiving the aperiodic CSI-RS, the UE applies the QCL assumption of the lowest-ID activated TCI state applicable to the PDSCH within the active BWP of the cell in which the CSI-RS is to be received.

- 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* is equal to or greater than the UE reported threshold *beamSwitchTiming* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols, when the reported value is one of the values of {14,28,48} and *enableBeamSwitchTiming* is not provided and the *NZP-CSI-RS-ResourceSet* is not configured with higher layer parameter *trs-Info*, or is equal to or greater than the UE reported threshold *beamSwitchTiming* + *d* $∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols when the reported value is one of the values of {14,28,48} and the *NZP-CSI-RS-ResourceSet* is configured with higher layer parameter *trs-Info*, or is equal to or greater than 48+$d∙2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$ in CSI-RS symbols when the UE provides *beamSwitchTiming-r16* and *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 parameters *repetition* and *trs-Info*, or is equal to or greater than the UE reported threshold *beamSwitchTiming-r16* + *d* $2^{μ\_{CSIRS}}/2^{μ\_{PDCCH}}$in CSI-RS symbolswhen *enableBeamSwitchTiming* is provided and the *NZP-CSI-RS-ResourceSet* is configured with the higher layer parameter *repetition* set to 'on', where if the µPDCCH < µCSIRS, the beam switching timing delay *d* is defined in Table 5.2.1.5.1a-1, else *d* is zero, the UE is expected to apply the QCL assumptions in the indicated TCI states for the aperiodic CSI-RS resources in the CSI triggering state indicated by the CSI trigger field in DCI.

Table 5.2.1.5.1a-1: Additional beam switching timing delay *d*

|  |  |
| --- | --- |
| ***µPDCCH*** | ***d* [PDCCH symbols]** |
| 0 | 8 |
| 1 | 8 |
| 2 | 14 |

Aperiodic CSI-RS timing:

- When the aperiodic CSI-RS is used with aperiodic CSI reporting, the CSI-RS triggering offset *X* is configured per resource set by the higher layer parameter *aperiodicTriggeringOffset* or *aperiodicTriggeringOffset-r16,* including the case that the UE is not configured with *minimumSchedulingOffsetK0* for any DL BWP or *minimumSchedulingOffsetK2* for any UL BWP and all the associated trigger states do not have the higher layer parameter *qcl-Type* set to 'typeD' in the corresponding TCI states. The CSI-RS triggering offset has the values of {0, 1, …, 31} slots when the µPDCCH < µCSIRS and {0, 1, 2, 3, 4, 5, 6, …, 15, 16, 24} when the µPDCCH > µCSIRS.. The aperiodic CSI-RS is transmitted in a slot , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, and *Ks* = , otherwise, and where

*- n* is the slot containing the triggering DCI, *X* is the CSI-RS triggering offset in the numerology of CSI-RS according to the higher layer parameter *aperiodicTriggeringOffset* or *aperiodicTriggeringOffset-r16*,

- $μ\_{CSIRS}$ and $μ\_{PDCCH}$ are the subcarrier spacing configurations for CSI-RS and PDCCH, respectively,

- $N\_{slot, offset, PDCCH}^{CA}$ and $μ\_{offset,PDCCH}$are the$ N\_{slot, offset}^{CA}$ and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH respectively, $N\_{slot, offset, CSIRS}^{CA} $and  $μ\_{offset,CSIRS}$ are the$ N\_{slot, offset}^{CA}$ and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the CSI-RS respectively, as defined in [4, TS 38.211] clause 4.5

- If the µPDCCH < µCSIRS, the UE is expected to be able to measure the aperiodic CSI RS, if the CSI-RS starts no earlier than the first symbol of the CSI-RS carrier's slot that starts at least *Ncsirs* PDCCH symbols after the end of the PDCCH triggering the aperiodic CSI-RS.

- If the µPDCCH > µCSIRS, the UE is expected to be able to measure the aperiodic CSI RS, if the CSI-RS starts no earlier than at least *Ncsirs* PDCCH symbols after the end of the PDCCH triggering the aperiodic CSI-RS.

Table 5.2.1.5.1a: *Ncsirs* as a function of the subcarrier spacing of the triggering PDCCH

|  |  |
| --- | --- |
| ***µPDCCH*** | ***Ncsirs* [symbols]** |
| 0 | 4 |
| 1 | 5 |
| 2 | 10 |
| 3 | [14] |

<omitted text>

#### 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 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' and 'ssb-Index-RSRP' 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' or 'ssb-Index-RSRP' 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' 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.

<omitted text>

#### 6.1.2.1 Resource allocation in time domain

<omitted text>

If *pusch-TimeDomainAllocationListForMultiPUSCH* in *pusch-Config* contains row indicating resource allocation for two to eight contiguous PUSCHs, *K2* indicates the slot where UE shall transmit the first PUSCH of the multiple PUSCHs. Each PUSCH has a separate SLIV and mapping type. The number of scheduled PUSCHs is signalled by the number of indicated valid SLIVs in the row of the *pusch-TimeDomainAllocationListForMultiPUSCH* signalled in DCI format 0\_1.

When the UE is configured with *minimumSchedulingOffsetK2* in an active UL BWP it applies a minimum scheduling offset restriction indicated by the '*Minimum applicable scheduling offset indicator*' field in DCI format 0\_1 or DCI format 1\_1 if the same field is available. When the UE configured with *minimumSchedulingOffsetK2* in an active UL BWP and it has not received '*Minimum applicable scheduling offset indicator*' field in DCI format 0\_1 or 1\_1, the UE shall apply a minimum scheduling offset restriction indicated based on '*Minimum applicable scheduling offset indicator*' value '0'. When the minimum scheduling offset restriction is applied the UE is not expected to be scheduled with a DCI in slot *n* to transmit a PUSCH scheduled with C-RNTI, CS-RNTI, MCS-C-RNTI or SP-CSI-RNTI with *K*2 smaller than$\left⌈K\_{2min}⋅\frac{2^{μ^{'}}}{2^{μ}}\right⌉$, where *K*2min and $μ$ are the applied minimum scheduling offset restriction and the numerology of the active UL BWP of the scheduled cell when receiving the DCI in slot *n*, respectively, and $μ^{'}$ is the numerology of the new active UL BWP in case of active UL BWP change in the scheduled cell and is equal to $μ$, otherwise. The minimum scheduling offset restriction is not applied when PUSCH transmission is scheduled by RAR UL grant or fallbackRAR UL grant for RACH procedure, or when PUSCH is scheduled with TC-RNTI. The application delay of the change of the minimum scheduling offset restriction is determined in Clause 5.3.1.

<omitted text>

### 6.2.1 UE sounding procedure

The UE may be configured with one or more Sounding Reference Signal (SRS) resource sets as configured by the higher layer parameter *SRS-ResourceSet* or *SRS-PosResourceSet*. For each SRS resource set configured by *SRS-ResourceSet*, a UE may be configured with SRS resources (higher layer parameter *SRS-Resource*), where the maximum value of K is indicated by UE capability[13, 38.306]. When SRS resource set is configured with the higher layer parameter *SRS-PosResourceSet,* a UE may be configured with *K* ≥1 SRS resources (higher layer parameter *SRS-PosResource*), where the maximum value of K is 16. The SRS resource set applicability is configured by the higher layer parameter *usage* in *SRS-ResourceSet.* When the higher layer parameter *usage* is set to 'beamManagement'*,* only one SRS resource in each of multiple SRS resource sets may be transmitted at a given time instant, but the SRS resources in different SRS resource sets with the same time domain behaviour in the same BWP may be transmitted simultaneously.

For aperiodic SRS at least one state of the DCI field is used to select at least one out of the configured SRS resource set(s).

The following SRS parameters are semi-statically configurable by higher layer parameter *SRS-Resource* or *SRS-PosResource*.

- *srs-ResourceId* or *SRS-PosResourceId* determines SRS resource configuration identity.

- Number of SRS ports, as defined by the higher layer parameter *nrofSRS-Ports* and described in Clause 6.4.1.4 of [4, TS 38.211]. If not configured, *nrofSRS-Ports* is 1.

*-* Time domain behaviour of SRS resource configuration as indicated by the higher layer parameter *resourceType*, which may be periodic, semi-persistent, aperiodic SRS transmission as defined in Clause 6.4.1.4 of [4, TS 38.211].

- Slot level periodicity and slot level offset as defined by the higher layer parameters *periodicityAndOffset-p* or *periodicityAndOffset-sp* for an SRS resource of type periodic or semi-persistent. The UE is not expected to be configured with SRS resources in the same SRS resource set *SRS-ResourceSet* or *SRS-PosResourceSet* with different slot level periodicities. For an *SRS-ResourceSet* configured with higher layer parameter *resourceType* set to 'aperiodic', a slot level offset is defined by the higher layer parameter *slotOffset.* For an *SRS-PosResourceSet* configured with higher layer parameter r*esourceType* set to 'aperiodic', the slot level offset is defined by the higher layer parameter *slotOffset* for each SRS resource.

- Number of OFDM symbols in the SRS resource, starting OFDM symbol of the SRS resource within a slot including repetition factor R as defined by the higher layer parameter *resourceMapping* and described in Clause 6.4.1.4 of [4, TS 38.211]. If *R* is not configured, then *R* is equal to the number of OFDM symbols in the SRS resource.

- SRS bandwidth and , as defined by the higher layer parameter *freqHopping* and described in Clause 6.4.1.4 of [4, TS 38.211]. If not configured, then= 0.

- Frequency hopping bandwidth , as defined by the higher layer parameter *freqHopping* and described in Clause 6.4.1.4 of [4, TS 38.211]. If not configured, then = 0.

- Defining frequency domain position and configurable shift, as defined by the higher layer parameters *freqDomainPosition* and *freqDomainShift*, respectively, and described in Clause 6.4.1.4 of [4, TS 38.211]. If *freqDomainPosition* is not configured, *freqDomainPosition* is zero.

- Cyclic shift, as defined by the higher layer parameter *cyclicShift-n2,* *cyclicShift-n4, or cyclicShift-n8* for transmission comb value 2, 4 or 8, and described in Clause 6.4.1.4 of [4, TS 38.211].

- Transmission comb value, as defined by the higher layer parameter *transmissionComb* described in Clause 6.4.1.4 of [4, TS 38.211].

- Transmission comb offset, as defined by the higher layer parameter *combOffset-n2,* *combOffset-n4,* and *combOffset-n8* for transmission comb value 2, 4, or 8, and described in Clause 6.4.1.4 of [4, TS 38.211].

- SRS sequence ID, as defined by the higher layer parameter *sequenceId* in Clause 6.4.1.4 of [4].

- The configuration of the spatial relation between a reference RS and the target SRS, where the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos*, if configured, contains the ID of the reference RS. The reference RS may be an SS/PBCH block, CSI-RS configured on serving cell indicated by higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise, or an SRS configured on uplink BWP indicated by the higher layer parameter *uplinkBWP*, and serving cell indicated by the higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise. When the target SRS is configured by the higher layer parameter *SRS-PosResourceSet*, the reference RS may also be a DL PRS configured on a serving cell or a non-serving cell indicated by the higher layer parameter *dl-PRS*, or an SS/PBCH block of a non-serving cell indicated by the higher layer parameter *ssb-Ncell*.

The UE may be configured by the higher layer parameter *resourceMapping* in *SRS-Resource* with an SRS resource occupying  adjacent OFDM symbols within the last 6 symbols of the slot, or at any symbol location within the slot if *resourceMapping-r16* is provided subject to UE capability, where all antenna ports of the SRS resources are mapped to each symbol of the resource. When the SRS is configured with the higher layer parameter *SRS-PosResourceSet* the higher layer parameter *resourceMapping-r16* in *SRS-PosResourceSet* with an SRS resource occupying $N\_{S}\in \left\{1,2,4,8,12\right\}$ adjacent symbols anywhere within the slot.

If a PUSCH with a priority index 0 and SRS configured by *SRS-Resource* are transmitted in the same slot on a serving cell, the UE may only be configured to transmit SRS after the transmission of the PUSCH and the corresponding DM-RS.

If a PUSCH transmission with a priority index 1 or a PUCCH transmission with a priority index 1 would overlap in time with an SRS transmission on a serving cell, the UE does not transmit the SRS in the overlapping symbol(s).

For a UE configured with one or more SRS resource configuration(s), and when the higher layer parameter *resourceType* in *SRS-Resource* or *SRS-PosResource* is set to 'periodic':

- if the UE is configured with the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* containing the ID of a reference'ssb-Index', 'ssb-IndexServing', or 'ssb-IndexNcell', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference SS/PBCH block, if the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* contains the ID of a reference 'csi-RS-Index' or 'csi-RS-IndexServing', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference periodic CSI-RS or of the reference semi-persistent CSI-RS, if the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* containing the ID of a reference 'srs' or 'srs-spatialRelation', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the transmission of the reference periodic SRS. When the SRS is configured by the higher layer parameter *SRS-PosResource* and if the higher layer parameter *spatialRelationInfoPos* contains the ID of a reference 'dl-PRS-ResourceId', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference DL PRS.

For a UE configured with one or more SRS resource configuration(s), and when the higher layer parameter *resourceType* in *SRS-Resource* or *SRS-PosResource* is set to 'semi-persistent':

- when a UE receives an activation command, as described in clause 6.1.3.17 or 6.1.3.36 of [10, TS 38.321], for an SRS resource, and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command is transmitted in slot *n*, the corresponding actions in [10, TS 38.321] and the UE assumptions on SRS transmission corresponding to the configured SRS resource set shall be applied starting from the first slot that is after slot $n+3N\_{slot}^{subframe,µ}$ where ** is the SCS configuration for the PUCCH. The activation command also contains spatial relation assumptions provided by a list of references to reference signal IDs, one per element of the activated SRS resource set. When the SRS is configured with the higher layer parameter *SRS-ResourceSet*, each ID in the list refers to a reference SS/PBCH block, NZP CSI-RS resource configured on serving cell indicated by *Resource Serving Cell ID* field in the activation command if present, same serving cell as the SRS resource set otherwise, or SRS resource configured on serving cell and uplink bandwidth part indicated by Resource *Serving Cell ID* field and *Resource BWP ID* field in the activation command if present, same serving cell and bandwidth part as the SRS resource set otherwise. When the SRS is configured with the higher layer parameter *SRS-PosResourceSet*, each ID in the list of reference signal IDs may refer to a reference SS/PBCH block on a serving or non-serving cell indicated by *PCI* field in the activation command, NZP CSI-RS resource configured on serving cell indicated by *Resource Serving Cell ID* field in the activation command if present, same serving cell as the SRS resource set otherwise, or SRS resource configured on serving cell and uplink bandwidth part indicated by Resource *Serving Cell ID* field and *Resource BWP ID* field in the activation command if present, same serving cell and bandwidth part as the SRS resource set otherwise, or DL PRS of a serving or non-serving cell indicated by a higher layer parameter.

- if an SRS resource in the activated resource set is configured with the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos*, the UE shall assume that the ID of the reference signal in the activation command overrides the one configured in *spatialRelationInfo* or *spatialRelationInfoPos.*

- when a UE receives a deactivation command [10, TS 38.321] for an activated SRS resource set, and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the deactivation command, the corresponding actions in [10, TS 38.321] and UE assumption on cessation of SRS transmission corresponding to the deactivated SRS resource set shall apply starting from the first slot that is after slot $n+3N\_{slot}^{subframe,µ}$ where ** is the SCS configuration for the PUCCH.

- if the UE is configured with the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* containing the ID of a reference 'ssb-Index', 'ssb-IndexServing', or 'ssb-IndexNcell' the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference SS/PBCH block, if the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* contains the ID of a reference 'csi-RS-Index' or 'csi-RS-IndexServing', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference periodic CSI-RS or of the reference semi-persistent CSI-RS, if the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* contains the ID of a reference 'srs' or 'srs-SpatialRelation', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the transmission of the reference periodic SRS or of the reference semi-persistent SRS. When the SRS is configured by the higher layer parameter *SRS-PosResourceSet* and if the higher layer parameter *spatialRelationInfoPos* contains the ID of a reference 'dl-PRS-ResourceId', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference DL PRS.

If the UE has an active semi-persistent SRS resource configuration and has not received a deactivation command, the semi-persistent SRS configuration is considered to be active in the UL BWP which is active, otherwise it is considered suspended.

For a UE configured with one or more SRS resource configuration(s), and when the higher layer parameter *resourceType* in *SRS-Resource* or *SRS-PosResource* is set to 'aperiodic':

- the UE receives a configuration of SRS resource sets,

- the UE receives a downlink DCI, a group common DCI, or an uplink DCI based command where a codepoint of the DCI may trigger one or more SRS resource set(s). For SRS in a resource set with usage set to 'codebook' or 'antennaSwitching', the minimal time interval between the last symbol of the PDCCH triggering the aperiodic SRS transmission and the first symbol of SRS resource is *N2*  symbols and an additional time duration *Tswitch*. Otherwise, the minimal time interval between the last symbol of the PDCCH triggering the aperiodic SRS transmission and the first symbol of SRS resource is *N2* +14 symbols and an additional time duration *Tswitch*. The minimal time interval unit of OFDM symbol is counted based on the minimum subcarrier spacing given by min(*µPDCCH, µUL*) where *µUL* is given by min(*µUL,carrier1, µUL,carrier2, µSRS*) when the UE is configured with the higher layer parameter *uplinkTxSwitchingOption* set to 'dualUL' for uplink carrier aggregation, and by *µSRS*otherwise. *µSRS* and *µPDCCH*are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively.

- *Tswitch*, *µUL,carrier1* and *µUL,carrier2* are defined in clause 6.4.

- If the UE receives the DCI triggering aperiodic SRS in slot *n* and except when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits aperiodic SRS in each of the triggered SRS resource set(s) in slot , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, *Ks* =, otherwise, and where

*- k* is configured via higher layer parameter *slotOffset* for each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively;

- $N\_{slot, offset, PDCCH}^{CA}$ and $μ\_{offset,PDCCH} $are the $ N\_{slot, offset}^{CA}$ and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH, $N\_{slot,offset,SRS}^{CA}$ and $μ\_{offset,SRS}$ are the  and the , respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the SRS, as defined in [4, TS 38.211] clause 4.5.

- If the UE receives the DCI triggering aperiodic SRS in slot *n* and when SRS is configured with the higher layer parameter *SRS-PosResource*, the UE transmits every aperiodic SRS resource in each of the triggered SRS resource set(s) in slot , if UE is configured with ca-SlotOffset for at least one of the triggered and triggering cell, *Ks* =, otherwise, and where

*- k* is configured via higher layer parameter *slotOffset* for each aperiodic SRS resource in each triggered SRS resources set and is based on the subcarrier spacing of the triggered SRS transmission, *µSRS* and *µPDCCH* are the subcarrier spacing configurations for triggered SRS and PDCCH carrying the triggering command respectively;

- $N\_{slot, offset, PDCCH}^{CA}$ and $μ\_{offset,PDCCH} $are the $ N\_{slot, offset}^{CA}$ and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDCCH, $N\_{slot,offset,SRS}^{CA}$ and $μ\_{offset,SRS}$ are the  and the , respectively, which are determined by higher-layer configured ca-SlotOffset for the cell transmitting the SRS, as defined in [4, TS 38.211] clause 4.5.

- if the UE is configured with the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* containing the ID of a reference 'ssb-Index', 'ssb-IndexServing' or 'ssb-IndexNcell', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference SS/PBCH block, if the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* contains the ID of a reference 'csi-RS-Index' or 'csi-RS-IndexServing', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference periodic CSI-RS or of the reference semi-persistent CSI-RS, or of the latest reference aperiodic CSI-RS. If the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos* contains the ID of a reference 'srs' or 'srs-SpatialRelation', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the transmission of the reference periodic SRS or of the reference semi-persistent SRS or of the reference aperiodic SRS. When the SRS is configured by the higher layer parameter *SRS-PosResourceSet* and if the higher layer parameter *spatialRelationInfoPos* contains the ID of a reference 'dl-PRS', the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the reference DL PRS.

- when a UE receives an spatial relation update command, as described in clause 6.1.3.26 of [10, TS 38.321], for an SRS resource configured with the higher layer parameter *SRS-Resource*, and when the HARQ-ACK corresponding to the PDSCH carrying the update command is transmitted in slot *n*, the corresponding actions in [10, TS 38.321] and the UE assumptions on updating spatial relation for the SRS resource shall be applied for SRS transmission starting from the first slot that is after slot $n+3N\_{slot}^{subframe,µ}. $The update command contains spatial relation assumptions provided by a list of references to reference signal IDs, one per element of the updated SRS resource set. Each ID in the list refers to a reference SS/PBCH block, NZP CSI-RS resource configured on serving cell indicated by *Resource Serving Cell ID* field in the update command if present, same serving cell as the SRS resource set otherwise, or SRS resource configured on serving cell and uplink bandwidth part indicated by *Resource* *Serving Cell ID* field and *Resource BWP ID* field in the update command if present, same serving cell and bandwidth part as the SRS resource set otherwise. When the UE is configured with the higher layer parameter *usage* in *SRS-ResourceSet* set to 'antennaSwitching', the UE shall not expect to be configured with different spatial relations for SRS resources in the same SRS resource set.

<omitted text>