**3GPP TSG-RAN WG1 Meeting #117 R1-24xxxxx**

**Fukuoka, Japan, May 20 – 24, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.211** | **CR** | **xxxx** | **rev** | **-** | **Current version:** | **18.2.0** |  |
|  | | | | | | | | |
| *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:*** | Corrections to positioning enhancements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2-Core | | | | |  | ***Date:*** | | | 2024-05-27 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | * Correction to description associated with the AGC symbol of a SL PRS transmission in a dedicated SL PRS resource pool since a “SL PRS transmission” is defined to include the transmission of the AGC symbol. * The parameter names between TS 38.211 and TS 38.331 are not aligned for some of the parameters in SRS for positioning. * Parameter *sl-CombSize* and *sl-PRS-comb-offset* can only be used in dedicated resource pool. *sl-PRS-CombSizeN-AndReOffset* should be used in shared resource pool. * Parameter *mNumberOfSymbols* can only be used in shared resource pool*. sl-NumberOfSymbols* should be used a dedicated resource pool. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Correction of the AGC symbols definition. * Alignment of parameter names (R1-2405404) * Correcting the parameter names for dedicated and shared resoruce pools (R1-2405404) | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | * Capturing the OFDM symbol immediately preceding an SL PRS transmission in a dedicated SL PRS resource pool as an AGC symbol would be inconsistent with the definition of “SL PRS transmission”. * Misaligned and inconssitent specifications. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4.1.4.1, 6.4.1.4.2, 6.4.1.4.3, 8.2.1, 8.4.1.6.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

##### 6.4.1.4.1 SRS resource

An SRS resource is configured by the *SRS-Resource* IE or the *SRS-PosResource* IE and consists of

- antenna ports , where the number of antenna ports is given by the higher layer parameter *nrofSRS-Ports* or *nrofSRS-Ports-n8* if configured, otherwise , and when the SRS resource is in a SRS resource set with higher-layer parameter *usage* in *SRS-ResourceSet* not set to 'nonCodebook', or determined according to [6, TS 38.214] when the SRS resource is in a SRS resource set with higher-layer parameter *usage* in *SRS-ResourceSet* set to 'nonCodebook'.

- , the number of hops for SRS Tx hopping for an SRS resource configured by *SRS-PosResource* given by the higher layer parameter *numberOfHops* if configured, otherwise .

- consecutive OFDM symbols given by the field *nrofSymbols* contained in the higher layer parameter *resourceMapping*. If ,is the number of consecutive OFDM symbol per hop.

- , the starting position in the time domain given by  where the offset counts symbols backwards from the end of the slot and is given by the field *startPosition* contained in the higher layer parameter *resourceMapping* and . If is the starting position of each hop in the time domain, determined by the field *startPosition* for each SRS transmission hop.

- , the frequency-domain starting position of the sounding reference signal.

##### 6.4.1.4.2 Sequence generation

The sounding reference signal sequence for an SRS resource, or if *numberOfHops* for *SRS-PosResource* is provided, for a given hop within an SRS resource, shall be generated according to

where is given by clause 6.4.1.4.3, is given by clause 5.2.2 with and the transmission comb number is contained in the higher-layer parameter *transmissionComb*. The quantity is the OFDM symbol number within the SRS resource.

The quantity is given by

- if the higher-layer parameter *nrofSRS-Ports-n8* equals *ports8tdm*

- otherwise

The cyclic shift for antenna port is given as

where

where is contained in the higher layer parameter *transmissionComb*. The maximum number of cyclic shifts is given by Table 6.4.1.4.2-1.

The quantities and  are given by

- if the higher-layer parameter *nrofSRS-Ports-n8* equals *ports8tdm*

- otherwise

The quantity is given by

- if the higher-layer parameter *cyclicShiftHopping* is not configured:

- if the higher-layer parameter *cyclicShiftHopping* is configured:

where and is the th entry and the cardinality of the set

respectively, where is given by the higher-layer parameter *hoppingSubset* inthe *cyclicShiftHopping* IE if configured, otherwise . The higher-layer parameter *hoppingSubset* inthe *cyclicShiftHopping* IE includes a bitmap of bits with non-zero bits, where if the th non-zero bit is the :th bit in the bitmap, then .

The pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame for which , where the cyclic-shift hopping identity is contained in the higher-layer parameter *cyclicShiftHopping*.

If the higher-layer parameter *hoppingFinerGranularity* is configured, , otherwise .

The sequence group and the sequence number in clause 5.2.2 depends on the higher-layer parameter *groupOrSequenceHopping* in the *SRS-Resource* IE or the *SRS-PosResource* IE*.* The SRS sequence identity is given by the higher layer parameter *sequenceId* in the *SRS-Resource* IE, in which case , or the *SRS-PosResource-r16* IE, in which case .

- if *groupOrSequenceHopping* equals 'neither', neither group, nor sequence hopping shall be used and



- if *groupOrSequenceHopping* equals 'groupHopping', group hopping but not sequence hopping shall be used and



where the pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame.

- if *groupOrSequenceHopping* equals 'sequenceHopping', sequence hopping but not group hopping shall be used and



where the pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame.

Table 6.4.1.4.2-1: Maximum number of cyclic shifts as a function of .

|  |  |
| --- | --- |
|  |  |
| 2 | 8 |
| 4 | 12 |
| 8 | 6 |

##### 6.4.1.4.3 Mapping to physical resources

Throughout this clause, when the higher layer parameter *numberOfHops* is provided for *SRS-PosResource*, the sounding reference signal sequence definitions applies to a given hop.

When SRS is transmitted on a given SRS resource, the sequence for each OFDM symbol and for each of the antenna ports of the SRS resource shall be multiplied with the amplitude scaling factor  in order to conform to the transmit power specified in [5, 38.213] and mapped in sequence starting with  to resource elements  in a slot for each of the antenna ports  according to

The length of the sounding reference signal sequence is given by

where is given by a selected row of Table 6.4.1.4.3-1 with  where  is given by the field *b-SRS* contained in the higher-layer parameter *freqHopping* if configured, otherwise . The row of the table is selected according to the index  given by the field *c-SRS* contained in the higher-layer parameter *freqHopping*. The quantity is given by the higher-layer parameter *FreqScalingFactor* if configured, otherwise . When *FreqScalingFactor* is configured, the UE expects the length of the SRS sequence to be a multiple of 6.

The frequency-domain starting position is defined by

where

and

and

- is given by the higher-layer parameter *StartRBIndex* if configured, otherwise ;

- is given by Table 6.4.1.4.3-3 with

if the higher-layer parameter *EnableStartRBHopping* is configured, otherwise .

- is given by the higher-layer parameter *overlapValue* in *TxHoppingConfig*.

- is the hop transmission counter in the time domain, which corresponds to the order of the higher-layer parameter *SlotOffsetForRemainingHops* in *slotOffsetForRemainingHopsList*.

- is the initial hop index.

The quantity is given by

- if the higher-layer parameter *combOffsetHopping* is not configured:

- if the higher-layer parameter *combOffsetHopping* is configured:

where and is the th entry and the cardinality of the set

respectively, where is given by the higher-layer parameter *hoppingSubset* inthe *combOffsetHopping* IE if configured, otherwise . The higher-layer parameter *hoppingSubset* inthe *combOffsetHopping* IE includes a bitmap of bits with non-zero bits, where if the th non-zero bit is the :th bit in the bitmap, then .

The pseudo-random sequence is defined by clause 5.2.1 and shall be initialized with at the beginning of each radio frame for which , where the comb offset hopping identity  is contained in the higher-layer parameter *combOffsetHopping*.

If the higher-layer parameter *hoppingWithRepetition* is set to *Repetition*, , otherwise .

If *numberOfHops* is configured:

- The reference point for is the lowest subcarrier of the configured bandwidth for SRS with Tx hopping configured by the parameter *bwp* in *SRS-PosTx-Hopping*.

otherwise:

- If  the reference point for is subcarrier 0 in common resource block 0, otherwise the reference point is the lowest subcarrier of the BWP.

If the SRS is configured by the IE *SRS-PosResource*, the quantity is given by Table 6.4.1.4.3-2, otherwise .

The frequency domain shift value adjusts the SRS allocation with respect to the reference point grid and is contained in the higher-layer parameter *freqDomainShift* in the *SRS-Resource* IE or the *SRS-PosResource* IE. The transmission comb offset is contained in the higher-layer parameter *transmissionComb* in the *SRS-Resource* IE or the *SRS-PosResource* IE and is a frequency position index.

Frequency hopping of the sounding reference signal is configured by the parameter , given by the field *b-hop* contained in the higher-layer parameter *freqHopping* if configured, otherwise .

If , frequency hopping is disabled and the frequency position index remains constant (unless re-configured) and is defined by



for all OFDM symbols of the SRS resource. The quantity  is given by the higher-layer parameter *freqDomainPosition* if configured, otherwise , and the values of and for are given by the selected row of Table 6.4.1.4.3-1 corresponding to the configured value of .

If , frequency hopping is enabled and the frequency position indices are defined by

where is given by Table 6.4.1.4.3-1,



and where regardless of the value of . The quantity counts the number of SRS transmissions. For the case of an SRS resource configured as aperiodic by the higher-layer parameter *resourceType*, it is given by within the slot in which the symbol SRS resource is transmitted. The quantity is given by if the higher-layer parameter *nrofSRS-Ports-n8* equals ‘ports8tdm’, otherwise . The quantity is the repetition factor given by the field *repetitionFactor* if configured, otherwise .

For the case of an SRS resource configured as periodic or semi-persistent by the higher-layer parameter *resourceType*, the SRS counter is given by

for slots that satisfy . The periodicity  in slots and slot offset  are given in clause 6.4.1.4.4.

Table 6.4.1.4.3-1: SRS bandwidth configuration.

|  |  | |  | |  | |  | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| 0 | 4 | 1 | 4 | 1 | 4 | 1 | 4 | 1 |
| 1 | 8 | 1 | 4 | 2 | 4 | 1 | 4 | 1 |
| 2 | 12 | 1 | 4 | 3 | 4 | 1 | 4 | 1 |
| 3 | 16 | 1 | 4 | 4 | 4 | 1 | 4 | 1 |
| 4 | 16 | 1 | 8 | 2 | 4 | 2 | 4 | 1 |
| 5 | 20 | 1 | 4 | 5 | 4 | 1 | 4 | 1 |
| 6 | 24 | 1 | 4 | 6 | 4 | 1 | 4 | 1 |
| 7 | 24 | 1 | 12 | 2 | 4 | 3 | 4 | 1 |
| 8 | 28 | 1 | 4 | 7 | 4 | 1 | 4 | 1 |
| 9 | 32 | 1 | 16 | 2 | 8 | 2 | 4 | 2 |
| 10 | 36 | 1 | 12 | 3 | 4 | 3 | 4 | 1 |
| 11 | 40 | 1 | 20 | 2 | 4 | 5 | 4 | 1 |
| 12 | 48 | 1 | 16 | 3 | 8 | 2 | 4 | 2 |
| 13 | 48 | 1 | 24 | 2 | 12 | 2 | 4 | 3 |
| 14 | 52 | 1 | 4 | 13 | 4 | 1 | 4 | 1 |
| 15 | 56 | 1 | 28 | 2 | 4 | 7 | 4 | 1 |
| 16 | 60 | 1 | 20 | 3 | 4 | 5 | 4 | 1 |
| 17 | 64 | 1 | 32 | 2 | 16 | 2 | 4 | 4 |
| 18 | 72 | 1 | 24 | 3 | 12 | 2 | 4 | 3 |
| 19 | 72 | 1 | 36 | 2 | 12 | 3 | 4 | 3 |
| 20 | 76 | 1 | 4 | 19 | 4 | 1 | 4 | 1 |
| 21 | 80 | 1 | 40 | 2 | 20 | 2 | 4 | 5 |
| 22 | 88 | 1 | 44 | 2 | 4 | 11 | 4 | 1 |
| 23 | 96 | 1 | 32 | 3 | 16 | 2 | 4 | 4 |
| 24 | 96 | 1 | 48 | 2 | 24 | 2 | 4 | 6 |
| 25 | 104 | 1 | 52 | 2 | 4 | 13 | 4 | 1 |
| 26 | 112 | 1 | 56 | 2 | 28 | 2 | 4 | 7 |
| 27 | 120 | 1 | 60 | 2 | 20 | 3 | 4 | 5 |
| 28 | 120 | 1 | 40 | 3 | 8 | 5 | 4 | 2 |
| 29 | 120 | 1 | 24 | 5 | 12 | 2 | 4 | 3 |
| 30 | 128 | 1 | 64 | 2 | 32 | 2 | 4 | 8 |
| 31 | 128 | 1 | 64 | 2 | 16 | 4 | 4 | 4 |
| 32 | 128 | 1 | 16 | 8 | 8 | 2 | 4 | 2 |
| 33 | 132 | 1 | 44 | 3 | 4 | 11 | 4 | 1 |
| 34 | 136 | 1 | 68 | 2 | 4 | 17 | 4 | 1 |
| 35 | 144 | 1 | 72 | 2 | 36 | 2 | 4 | 9 |
| 36 | 144 | 1 | 48 | 3 | 24 | 2 | 12 | 2 |
| 37 | 144 | 1 | 48 | 3 | 16 | 3 | 4 | 4 |
| 38 | 144 | 1 | 16 | 9 | 8 | 2 | 4 | 2 |
| 39 | 152 | 1 | 76 | 2 | 4 | 19 | 4 | 1 |
| 40 | 160 | 1 | 80 | 2 | 40 | 2 | 4 | 10 |
| 41 | 160 | 1 | 80 | 2 | 20 | 4 | 4 | 5 |
| 42 | 160 | 1 | 32 | 5 | 16 | 2 | 4 | 4 |
| 43 | 168 | 1 | 84 | 2 | 28 | 3 | 4 | 7 |
| 44 | 176 | 1 | 88 | 2 | 44 | 2 | 4 | 11 |
| 45 | 184 | 1 | 92 | 2 | 4 | 23 | 4 | 1 |
| 46 | 192 | 1 | 96 | 2 | 48 | 2 | 4 | 12 |
| 47 | 192 | 1 | 96 | 2 | 24 | 4 | 4 | 6 |
| 48 | 192 | 1 | 64 | 3 | 16 | 4 | 4 | 4 |
| 49 | 192 | 1 | 24 | 8 | 8 | 3 | 4 | 2 |
| 50 | 208 | 1 | 104 | 2 | 52 | 2 | 4 | 13 |
| 51 | 216 | 1 | 108 | 2 | 36 | 3 | 4 | 9 |
| 52 | 224 | 1 | 112 | 2 | 56 | 2 | 4 | 14 |
| 53 | 240 | 1 | 120 | 2 | 60 | 2 | 4 | 15 |
| 54 | 240 | 1 | 80 | 3 | 20 | 4 | 4 | 5 |
| 55 | 240 | 1 | 48 | 5 | 16 | 3 | 8 | 2 |
| 56 | 240 | 1 | 24 | 10 | 12 | 2 | 4 | 3 |
| 57 | 256 | 1 | 128 | 2 | 64 | 2 | 4 | 16 |
| 58 | 256 | 1 | 128 | 2 | 32 | 4 | 4 | 8 |
| 59 | 256 | 1 | 16 | 16 | 8 | 2 | 4 | 2 |
| 60 | 264 | 1 | 132 | 2 | 44 | 3 | 4 | 11 |
| 61 | 272 | 1 | 136 | 2 | 68 | 2 | 4 | 17 |
| 62 | 272 | 1 | 68 | 4 | 4 | 17 | 4 | 1 |
| 63 | 272 | 1 | 16 | 17 | 8 | 2 | 4 | 2 |

Table 6.4.1.4.3-2: The offset for SRS as a function of and .

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | | | | |
|  |  |  |  |  |
| 2 | 0 | 0,1 | 0,1,0,1 | - | - |
| 4 | - | 0, 2 | 0, 2, 1, 3 | 0, 2, 1, 3, 0, 2, 1, 3 | 0, 2, 1, 3, 0, 2, 1, 3, 0, 2, 1, 3 |
| 8 | - | - | 0, 4, 2, 6 | 0, 4, 2, 6, 1, 5, 3, 7 | 0, 4, 2, 6, 1, 5, 3, 7, 0, 4, 2, 6 |

Table 6.4.1.4.3-3: The quantity as a function of .

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | | |
|  |  |  |  |
| 0 | 0 | 0 | 0 |
| 1 | - | 1 | 2 |
| 2 | - | - | 1 |
| 3 | - | - | 3 |

### 8.2.1 General

In a shared SL PRS resource pool, the OFDM symbol immediately preceding the symbols which are configured for use by PSFCH if PSFCH is configured in this slot, and the last symbol configured for sidelink in a slot, serve as guard symbol(s). In a dedicated SL PRS resource pool, the last symbol configured for sidelink in a slot serves as a guard symbol. Otherwise, the OFDM symbol immediately following the last symbol used for PSSCH, PSFCH, or S-SSB serves as a guard symbol.

The first OFDM symbol of a PSSCH and its associated PSCCH is duplicated as described in clauses 8.3.1.5 and 8.3.2.3. The first OFDM symbol of a PSFCH is duplicated as described in clause 8.3.4.2.2.

The OFDM symbol immediately preceding an SL PRS resource in a dedicated SL PRS resource pool is generated as described in clause 8.4.1.6.3.

##### 8.4.1.6.3 Mapping to physical resources

The sequence shall be multiplied with the amplitude scaling factor in order to conform to the transmit power specified in [5, TS 38.213] and mapped to resources elements according to

when the following conditions are fulfilled:

- the resource element is within the common resource blocks occupied by the SL PRS resource

and where

- the comb size is provided by the higher layer parameter *sl-PRS-CombSizeN-AndReOffset* for a shared SL PRS resource pool and by the higher layer parameter *sl-CombSize* for a dedicated SL PRS resource pool

- the resource-element offset

- the frequency offset is given by Table 8.4.1.6.3-1

- the starting symbol is provided by the higher-layer parameter *sl-PRS-starting-symbol* for a dedicated SL PRS resource pool, or is determined such that the symbols {} are mapped to the last consecutive symbols in the slot that can be used for SL PRS for a shared SL PRS resource pool as described in clause 8.2.4.1.1 in [6, TS38.214]

- the number of symbols is provided by the higher-layer parameter *mNumberOfSymbols* for a shared resource pool and by the higher layer parameter *sl-NumberOfSymbols* for a dedicated resource pooland limited to combinations fulfilling

- in a dedicated SL PRS resource pool: {1, 2}, {2, 2}, {2, 4}, {4, 4}, {6, 6}, and combinations with and where

- in a shared SL PRS resource pool: {1, 1}, {1, 2}, {2, 1}, {2, 2}, {2, 4}, {4, 1}, {4, 2}, {4, 4}

- the antenna port

The reference point for is subcarrier 0 in common resource block 0.

For transmission of an SL PRS in a dedicated SL PRS resource pool, the content of the OFDM symbol immediately preceding the SL PRS resource shall be generated based on 8.4.1.6.2 and mapped to resource elements with

- the time-domain index

- the set of frequency-domain indices shall be identical to those of the last OFDM symbol in the SL PRS resource

- the amplitude scaling factor shall be same as the amplitude scaling factor of the SL PRS resource.

Table 8.4.1.6.3-1: The frequency offset as a function of .

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Symbol number within the sidelink PRS resource** | | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 4 | 0 | 2 | 1 | 3 | 0 | 2 | 1 | 3 | 0 |
| 6 | 0 | 3 | 1 | 4 | 2 | 5 | 0 | 3 | 1 |