**3GPP TSG-RAN2 Meeting #126 *R2-240***

**Fukuoka, Japan, 20th - 24th May., 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.331** | **CR** | 4791 | **rev** | 1 | **Current version:** | **16.16.0** |  |
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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 to Positioning SRS Configuration | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos-Core | | | | |  | ***Date:*** | | | 2024-05-20 |
|  |  | | | |  | |  | | |  |
| ***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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | For legacy SRS, the range of slotOffset for aperiodic SRS in SRS-ResourceSet is 1..32. In the field description, it explains that value 0 is supported with the absence of the field, which means no offset. From our understanding, the same value range should apply to positoning SRS.  However, in current RRC, for posisitioning SRS, there is no correspondig description when the field slotOffset is absent. In this way, value 0 is not supported for slotOffset for aperiodic positoning SRS in SRS-PosResource due to incomplete field description. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add field description to SRS-PosResource that the absence of slotOffset for aperiodic positoning SRS represents no offset. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | It is not clear what is the offset if the field slotOffset is absent with the need code of the field indicated as Need S. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.3.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

=================================================== CHANGE BEGIN ============================================================

– *SRS-Config*

The IE *SRS-Config* is used to configure sounding reference signal transmissions. The configuration defines a list of SRS-Resources, a list of SRS-PosResources, a list of SRS-PosResourceSets and a list of SRS-ResourceSets. Each resource set defines a set of SRS-Resources or SRS-PosResources. The network triggers the transmission of the set of SRS-Resources or SRS-PosResources using a configured aperiodicSRS-ResourceTrigger (L1 DCI).

***SRS-Config* information element**

-- ASN1START

-- TAG-SRS-CONFIG-START

SRS-Config ::= SEQUENCE {

srs-ResourceSetToReleaseList SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSetId OPTIONAL, -- Need N

srs-ResourceSetToAddModList SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet OPTIONAL, -- Need N

srs-ResourceToReleaseList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SRS-ResourceId OPTIONAL, -- Need N

srs-ResourceToAddModList SEQUENCE (SIZE(1..maxNrofSRS-Resources)) OF SRS-Resource OPTIONAL, -- Need N

tpc-Accumulation ENUMERATED {disabled} OPTIONAL, -- Need S

...,

[[

srs-RequestDCI-1-2-r16 INTEGER (1..2) OPTIONAL, -- Need S

srs-RequestDCI-0-2-r16 INTEGER (1..2) OPTIONAL, -- Need S

srs-ResourceSetToAddModListDCI-0-2-r16 SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSet OPTIONAL, -- Need N

srs-ResourceSetToReleaseListDCI-0-2-r16 SEQUENCE (SIZE(1..maxNrofSRS-ResourceSets)) OF SRS-ResourceSetId OPTIONAL, -- Need N

srs-PosResourceSetToReleaseList-r16 SEQUENCE (SIZE(1..maxNrofSRS-PosResourceSets-r16)) OF SRS-PosResourceSetId-r16

OPTIONAL, -- Need N

srs-PosResourceSetToAddModList-r16 SEQUENCE (SIZE(1..maxNrofSRS-PosResourceSets-r16)) OF SRS-PosResourceSet-r16 OPTIONAL,-- Need N

srs-PosResourceToReleaseList-r16 SEQUENCE (SIZE(1..maxNrofSRS-PosResources-r16)) OF SRS-PosResourceId-r16 OPTIONAL,-- Need N

srs-PosResourceToAddModList-r16 SEQUENCE (SIZE(1..maxNrofSRS-PosResources-r16)) OF SRS-PosResource-r16 OPTIONAL -- Need N

]]

}

SRS-ResourceSet ::= SEQUENCE {

srs-ResourceSetId SRS-ResourceSetId,

srs-ResourceIdList SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-ResourceId OPTIONAL, -- Cond Setup

resourceType CHOICE {

aperiodic SEQUENCE {

aperiodicSRS-ResourceTrigger INTEGER (1..maxNrofSRS-TriggerStates-1),

csi-RS NZP-CSI-RS-ResourceId OPTIONAL, -- Cond NonCodebook

slotOffset INTEGER (1..32) OPTIONAL, -- Need S

...,

[[

aperiodicSRS-ResourceTriggerList SEQUENCE (SIZE(1..maxNrofSRS-TriggerStates-2))

OF INTEGER (1..maxNrofSRS-TriggerStates-1) OPTIONAL -- Need M

]]

},

semi-persistent SEQUENCE {

associatedCSI-RS NZP-CSI-RS-ResourceId OPTIONAL, -- Cond NonCodebook

...

},

periodic SEQUENCE {

associatedCSI-RS NZP-CSI-RS-ResourceId OPTIONAL, -- Cond NonCodebook

...

}

},

usage ENUMERATED {beamManagement, codebook, nonCodebook, antennaSwitching},

alpha Alpha OPTIONAL, -- Need S

p0 INTEGER (-202..24) OPTIONAL, -- Cond Setup

pathlossReferenceRS PathlossReferenceRS-Config OPTIONAL, -- Need M

srs-PowerControlAdjustmentStates ENUMERATED { sameAsFci2, separateClosedLoop} OPTIONAL, -- Need S

...,

[[

pathlossReferenceRSList-r16 SetupRelease { PathlossReferenceRSList-r16} OPTIONAL -- Need M

]]

}

PathlossReferenceRS-Config ::= CHOICE {

ssb-Index SSB-Index,

csi-RS-Index NZP-CSI-RS-ResourceId

}

PathlossReferenceRSList-r16 ::= SEQUENCE (SIZE (1..maxNrofSRS-PathlossReferenceRS-r16)) OF PathlossReferenceRS-r16

PathlossReferenceRS-r16 ::= SEQUENCE {

srs-PathlossReferenceRS-Id-r16 SRS-PathlossReferenceRS-Id-r16,

pathlossReferenceRS-r16 PathlossReferenceRS-Config

}

SRS-PathlossReferenceRS-Id-r16 ::= INTEGER (0..maxNrofSRS-PathlossReferenceRS-1-r16)

SRS-PosResourceSet-r16 ::= SEQUENCE {

srs-PosResourceSetId-r16 SRS-PosResourceSetId-r16,

srs-PosResourceIdList-r16 SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-PosResourceId-r16

OPTIONAL, -- Cond Setup

resourceType-r16 CHOICE {

aperiodic-r16 SEQUENCE {

aperiodicSRS-ResourceTriggerList-r16 SEQUENCE (SIZE(1..maxNrofSRS-TriggerStates-1))

OF INTEGER (1..maxNrofSRS-TriggerStates-1) OPTIONAL, -- Need M

...

},

semi-persistent-r16 SEQUENCE {

...

},

periodic-r16 SEQUENCE {

...

}

},

alpha-r16 Alpha OPTIONAL, -- Need S

p0-r16 INTEGER (-202..24) OPTIONAL, -- Cond Setup

pathlossReferenceRS-Pos-r16 CHOICE {

ssb-IndexServing-r16 SSB-Index,

ssb-Ncell-r16 SSB-InfoNcell-r16,

dl-PRS-r16 DL-PRS-Info-r16

} OPTIONAL, -- Need M

...

}

SRS-ResourceSetId ::= INTEGER (0..maxNrofSRS-ResourceSets-1)

SRS-PosResourceSetId-r16 ::= INTEGER (0..maxNrofSRS-PosResourceSets-1-r16)

SRS-Resource ::= SEQUENCE {

srs-ResourceId SRS-ResourceId,

nrofSRS-Ports ENUMERATED {port1, ports2, ports4},

ptrs-PortIndex ENUMERATED {n0, n1 } OPTIONAL, -- Need R

transmissionComb CHOICE {

n2 SEQUENCE {

combOffset-n2 INTEGER (0..1),

cyclicShift-n2 INTEGER (0..7)

},

n4 SEQUENCE {

combOffset-n4 INTEGER (0..3),

cyclicShift-n4 INTEGER (0..11)

}

},

resourceMapping SEQUENCE {

startPosition INTEGER (0..5),

nrofSymbols ENUMERATED {n1, n2, n4},

repetitionFactor ENUMERATED {n1, n2, n4}

},

freqDomainPosition INTEGER (0..67),

freqDomainShift INTEGER (0..268),

freqHopping SEQUENCE {

c-SRS INTEGER (0..63),

b-SRS INTEGER (0..3),

b-hop INTEGER (0..3)

},

groupOrSequenceHopping ENUMERATED { neither, groupHopping, sequenceHopping },

resourceType CHOICE {

aperiodic SEQUENCE {

...

},

semi-persistent SEQUENCE {

periodicityAndOffset-sp SRS-PeriodicityAndOffset,

...

},

periodic SEQUENCE {

periodicityAndOffset-p SRS-PeriodicityAndOffset,

...

}

},

sequenceId INTEGER (0..1023),

spatialRelationInfo SRS-SpatialRelationInfo OPTIONAL, -- Need R

...,

[[

resourceMapping-r16 SEQUENCE {

startPosition-r16 INTEGER (0..13),

nrofSymbols-r16 ENUMERATED {n1, n2, n4},

repetitionFactor-r16 ENUMERATED {n1, n2, n4}

} OPTIONAL -- Need R

]]

}

SRS-PosResource-r16::= SEQUENCE {

srs-PosResourceId-r16 SRS-PosResourceId-r16,

transmissionComb-r16 CHOICE {

n2-r16 SEQUENCE {

combOffset-n2-r16 INTEGER (0..1),

cyclicShift-n2-r16 INTEGER (0..7)

},

n4-r16 SEQUENCE {

combOffset-n4-r16 INTEGER (0..3),

cyclicShift-n4-r16 INTEGER (0..11)

},

n8-r16 SEQUENCE {

combOffset-n8-r16 INTEGER (0..7),

cyclicShift-n8-r16 INTEGER (0..5)

},

...

},

resourceMapping-r16 SEQUENCE {

startPosition-r16 INTEGER (0..13),

nrofSymbols-r16 ENUMERATED {n1, n2, n4, n8, n12}

},

freqDomainShift-r16 INTEGER (0..268),

freqHopping-r16 SEQUENCE {

c-SRS-r16 INTEGER (0..63),

...

},

groupOrSequenceHopping-r16 ENUMERATED { neither, groupHopping, sequenceHopping },

resourceType-r16 CHOICE {

aperiodic-r16 SEQUENCE {

slotOffset-r16 INTEGER (1..32) OPTIONAL, -- Need S

...

},

semi-persistent-r16 SEQUENCE {

periodicityAndOffset-sp-r16 SRS-PeriodicityAndOffset-r16,

...,

[[

periodicityAndOffset-sp-Ext-r16 SRS-PeriodicityAndOffsetExt-r16 OPTIONAL -- Need R

]]

},

periodic-r16 SEQUENCE {

periodicityAndOffset-p-r16 SRS-PeriodicityAndOffset-r16,

...,

[[

periodicityAndOffset-p-Ext-r16 SRS-PeriodicityAndOffsetExt-r16 OPTIONAL -- Need R

]]

}

},

sequenceId-r16 INTEGER (0..65535),

spatialRelationInfoPos-r16 SRS-SpatialRelationInfoPos-r16 OPTIONAL, -- Need R

...

}

SRS-SpatialRelationInfo ::= SEQUENCE {

servingCellId ServCellIndex OPTIONAL, -- Need S

referenceSignal CHOICE {

ssb-Index SSB-Index,

csi-RS-Index NZP-CSI-RS-ResourceId,

srs SEQUENCE {

resourceId SRS-ResourceId,

uplinkBWP BWP-Id

}

}

}

SRS-SpatialRelationInfoPos-r16 ::= CHOICE {

servingRS-r16 SEQUENCE {

servingCellId ServCellIndex OPTIONAL, -- Need S

referenceSignal-r16 CHOICE {

ssb-IndexServing-r16 SSB-Index,

csi-RS-IndexServing-r16 NZP-CSI-RS-ResourceId,

srs-SpatialRelation-r16 SEQUENCE {

resourceSelection-r16 CHOICE {

srs-ResourceId-r16 SRS-ResourceId,

srs-PosResourceId-r16 SRS-PosResourceId-r16

},

uplinkBWP-r16 BWP-Id

}

}

},

ssb-Ncell-r16 SSB-InfoNcell-r16,

dl-PRS-r16 DL-PRS-Info-r16

}

SSB-Configuration-r16 ::= SEQUENCE {

ssb-Freq-r16 ARFCN-ValueNR,

halfFrameIndex-r16 ENUMERATED {zero, one},

ssbSubcarrierSpacing-r16 SubcarrierSpacing,

ssb-Periodicity-r16 ENUMERATED { ms5, ms10, ms20, ms40, ms80, ms160, spare2,spare1 } OPTIONAL, -- Need S

sfn0-Offset-r16 SEQUENCE {

sfn-Offset-r16 INTEGER (0..1023),

integerSubframeOffset-r16 INTEGER (0..9) OPTIONAL -- Need R

} OPTIONAL, -- Need R

sfn-SSB-Offset-r16 INTEGER (0..15),

ss-PBCH-BlockPower-r16 INTEGER (-60..50) OPTIONAL -- Cond Pathloss

}

SSB-InfoNcell-r16 ::= SEQUENCE {

physicalCellId-r16 PhysCellId,

ssb-IndexNcell-r16 SSB-Index OPTIONAL, -- Need S

ssb-Configuration-r16 SSB-Configuration-r16 OPTIONAL -- Need S

}

DL-PRS-Info-r16 ::= SEQUENCE {

dl-PRS-ID-r16 INTEGER (0..255),

dl-PRS-ResourceSetId-r16 INTEGER (0..7),

dl-PRS-ResourceId-r16 INTEGER (0..63) OPTIONAL -- Need S

}

SRS-ResourceId ::= INTEGER (0..maxNrofSRS-Resources-1)

SRS-PosResourceId-r16 ::= INTEGER (0..maxNrofSRS-PosResources-1-r16)

SRS-PeriodicityAndOffset ::= CHOICE {

sl1 NULL,

sl2 INTEGER(0..1),

sl4 INTEGER(0..3),

sl5 INTEGER(0..4),

sl8 INTEGER(0..7),

sl10 INTEGER(0..9),

sl16 INTEGER(0..15),

sl20 INTEGER(0..19),

sl32 INTEGER(0..31),

sl40 INTEGER(0..39),

sl64 INTEGER(0..63),

sl80 INTEGER(0..79),

sl160 INTEGER(0..159),

sl320 INTEGER(0..319),

sl640 INTEGER(0..639),

sl1280 INTEGER(0..1279),

sl2560 INTEGER(0..2559)

}

SRS-PeriodicityAndOffset-r16 ::= CHOICE {

sl1 NULL,

sl2 INTEGER(0..1),

sl4 INTEGER(0..3),

sl5 INTEGER(0..4),

sl8 INTEGER(0..7),

sl10 INTEGER(0..9),

sl16 INTEGER(0..15),

sl20 INTEGER(0..19),

sl32 INTEGER(0..31),

sl40 INTEGER(0..39),

sl64 INTEGER(0..63),

sl80 INTEGER(0..79),

sl160 INTEGER(0..159),

sl320 INTEGER(0..319),

sl640 INTEGER(0..639),

sl1280 INTEGER(0..1279),

sl2560 INTEGER(0..2559),

sl5120 INTEGER(0..5119),

sl10240 INTEGER(0..10239),

sl40960 INTEGER(0..40959),

sl81920 INTEGER(0..81919),

...

}

SRS-PeriodicityAndOffsetExt-r16 ::= CHOICE {

sl128 INTEGER(0..127),

sl256 INTEGER(0..255),

sl512 INTEGER(0..511),

sl20480 INTEGER(0..20479)

}

-- TAG-SRS-CONFIG-STOP

-- ASN1STOP

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| --- |
| ***SRS-Config* field descriptions** |
| ***tpc-Accumulation***  If the field is absent, UE applies TPC commands via accumulation. If disabled, UE applies the TPC command without accumulation (this applies to SRS when a separate closed loop is configured for SRS) (see TS 38.213 [13], clause 7.3). |

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| ***SRS-Resource, SRS-PosResource* field descriptions** |
| ***cyclicShift-n2***  Cyclic shift configuration (see TS 38.214 [19], clause 6.2.1). |
| ***cyclicShift-n4***  Cyclic shift configuration (see TS 38.214 [19], clause 6.2.1). |
| ***cyclicShift-n8***  Cyclic shift configuration (see TS 38.214 [19], clause 6.2.1). |
| ***freqHopping***  Includes parameters capturing SRS frequency hopping (see TS 38.214 [19], clause 6.2.1). For CLI SRS-RSRP measurement, the network always configures this field such that *b-hop* > *b-SRS*. |
| ***groupOrSequenceHopping***  Parameter(s) for configuring group or sequence hopping (see TS 38.211 [16], clause 6.4.1.4.2). For CLI SRS-RSRP measurement, the network always configures this parameter to 'neither'. |
| ***nrofSRS-Ports***  Number of ports. For CLI SRS-RSRP measurement, the network always configures this parameter to 'port1'. |
| ***periodicityAndOffset-p, periodicityAndOffset-p-Ext***  Periodicity and slot offset for this SRS resource. All values are in "number of slots". Value *sl1* corresponds to a periodicity of 1 slot, value *sl2* corresponds to a periodicity of 2 slots, and so on. For each periodicity the corresponding offset is given in number of slots. For periodicity *sl1* the offset is 0 slots (see TS 38.214 [19], clause 6.2.1). For CLI SRS-RSRP measurement, *sl1280* and *sl2560* cannot be configured. For *SRS-PosResource*, *sl20480*, *sl40960* and *sl81920* cannot be configured for SCS=15kHz, *sl40960* and *sl81920* cannot be configured for SCS=30kHz, and *sl81920* cannot be configured for SCS=60kHz.  When the field *periodicityAndOffset-p-Ext* is present, the field *periodicityAndOffset-p* shall be ignored by the UE. |
| ***periodicityAndOffset-sp, periodicityAndOffset-sp-Ext***  Periodicity and slot offset for this SRS resource. All values are in "number of slots". Value *sl1* corresponds to a periodicity of 1 slot, value *sl2* corresponds to a periodicity of 2 slots, and so on. For each periodicity the corresponding offset is given in number of slots. For periodicity *sl1* the offset is 0 slots (see TS 38.214 [19], clause 6.2.1). For *SRS-PosResource*, *sl20480*, *sl40960* and *sl81920* cannot be configured for SCS=15kHz, *sl40960* and *sl81920* cannot be configured for SCS=30kHz, and *sl81920* cannot be configured for SCS=60kHz.s  When the field *periodicityAndOffset-sp-Ext* is present, the field *periodicityAndOffset-sp* shall be ignored by the UE. |
| ***ptrs-PortIndex***  The PTRS port index for this SRS resource for non-codebook based UL MIMO. This is only applicable when the corresponding *PTRS-UplinkConfig* is set to CP-OFDM. The *ptrs-PortIndex* configured here must be smaller than the *maxNrofPorts* configured in the *PTRS-UplinkConfig* (see TS 38.214 [19], clause 6.2.3.1). This parameter is not applicable to CLI SRS-RSRP measurement. |
| ***resourceMapping***  OFDM symbol location of the SRS resource within a slot including *nrofSymbols* (number of OFDM symbols), *startPosition* (value 0 refers to the last symbol, value 1 refers to the second last symbol, and so on) and *repetitionFactor* (see TS 38.214 [19], clause 6.2.1 and TS 38.211 [16], clause 6.4.1.4). The configured SRS resource does not exceed the slot boundary. If *resourceMapping-r16* is signalled, UE shall ignore the *resourceMapping* (without suffix). For CLI SRS-RSRP measurement, the network always configures *nrofSymbols* and *repetitionFactor* to 'n1'. |
| ***resourceType***  Periodicity and offset for semi-persistent and periodic SRS resource, or slot offset for aperiodic SRS resource for positioning (see TS 38.214 [19], clause 6.2.1). For CLI SRS-RSRP measurement, only 'periodic' is applicable for *resourceType*. |
| ***slotOffset***  An offset in number of slots between the triggering DCI and the actual transmission of this *SRS-PosResource*. If the field is absent the UE applies no offset (value 0). |
| ***sequenceId***  Sequence ID used to initialize pseudo random group and sequence hopping (see TS 38.214 [19], clause 6.2.1). |
| ***spatialRelationInfo***  Configuration of the spatial relation between a reference RS and the target SRS. Reference RS can be SSB/CSI-RS/SRS (see TS 38.214 [19], clause 6.2.1). This parameter is not applicable to CLI SRS-RSRP measurement. |
| ***spatialRelationInfoPos***  Configuration of the spatial relation between a reference RS and the target SRS. Reference RS can be SSB/CSI-RS/SRS/DL-PRS (see TS 38.214 [19], clause 6.2.1).  If the IE *srs-ResourceId-Ext* is present, the IE *srs-ResourceId* in *spatialRelationInfoPos* represents the index from 0 to 63. Otherwise the IE *srs-ResourceId* in *spatialRelationInfoPos* represents the index from 0 to 31. |
| ***srs-RequestDCI-0-2***  Indicate the number of bits for "SRS request"in DCI format 0\_2. When the field is absent, then the value of 0 bit for "SRS request" in DCI format 0\_2 is applied. If the parameter *srs-RequestDCI-0-2* is configured to value 1, 1 bit is used to indicate one of the first two rows of Table 7.3.1.1.2-24 in TS 38.212 [17] for triggered aperiodic SRS resource set. If the value 2 is configured, 2 bits are used to indicate one of the rows of Table 7.3.1.1.2-24 in TS 38.212 [17]. When UE is configured with *supplementaryUplink*, an extra bit (the first bit of the SRS request field) is used for the non-SUL/SUL indication. |
| ***srs-RequestDCI-1-2***  Indicate the number of bits for "SRS request" in DCI format 1\_2. When the field is absent, then the value of 0 bit for "SRS request" in DCI format 1\_2 is applied. When the UE is configured with *supplementaryUplink*, an extra bit (the first bit of the SRS request field) is used for the non-SUL/SUL indication (see TS 38.214 [19], clause 6.1.1.2). |
| ***srs-ResourceSetToAddModListDCI-0-2***  List of SRS resource set to be added or modified for DCI format 0\_2 (see TS 38.212 [17], clause 7.3.1). |
| ***srs-ResourceSetToReleaseListDCI-0-2***  List of SRS resource set to be released for DCI format 0\_2 (see TS 38.212 [17], clause 7.3.1). |
| ***transmissionComb***  Comb value (2 or 4 or 8) and comb offset (0..combValue-1) (see TS 38.214 [19], clause 6.2.1). |

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| ***SRS-ResourceSet, SRS-PosResourceSet* field descriptions** |
| ***alpha***  alpha value for SRS power control (see TS 38.213 [13], clause 7.3). When the field is absent the UE applies the value 1. |
| ***aperiodicSRS-ResourceTriggerList***  An additional list of DCI "code points" upon which the UE shall transmit SRS according to this SRS resource set configuration (see TS 38.214 [19], clause 6). When the field is not included during a reconfiguration of *SRS-ResourceSet* of *resourceType* set to *aperiodic*, UE maintains this value based on the Need M; that is, this list is not considered as an extension of *aperiodicSRS-ResourceTrigger* for purpose of applying the general rule for extended list in clause 6.1.3. |
| ***aperiodicSRS-ResourceTrigger***  The DCI "code point" upon which the UE shall transmit SRS according to this SRS resource set configuration (see TS 38.214 [19], clause 6). |
| ***associatedCSI-RS***  ID of CSI-RS resource associated with this SRS resource set in non-codebook based operation (see TS 38.214 [19], clause 6.1.1.2). |
| ***csi-RS***  ID of CSI-RS resource associated with this SRS resource set. (see TS 38.214 [19], clause 6.1.1.2). |
| ***dl-PRS***  This field indicates a PRS configuration. |
| ***p0***  P0 value for SRS power control. The value is in dBm. Only even values (step size 2) are allowed (see TS 38.213 [13], clause 7.3). |
| ***pathlossReferenceRS***  A reference signal (e.g. a CSI-RS config or a SS block) to be used for SRS path loss estimation (see TS 38.213 [13], clause 7.3). |
| ***pathlossReferenceRS-Pos***  A reference signal (e.g. a SS block or a DL-PRS config) to be used for SRS path loss estimation (see TS 38.213 [13], clause 7.3). |
| ***pathlossReferenceRSList***  Multiple candidate pathloss reference RS(s) for SRS power control, where one candidate RS can be mapped to SRS Resource Set via MAC CE (clause 6.1.3.27 in TS 38.321 [3]). The network can only configure this field if *pathlossReferenceRS* is not configured in the same *SRS-ResourceSet*. |
| ***resourceType***  Time domain behavior of SRS resource configuration, see TS 38.214 [19], clause 6.2.1. The network configures SRS resources in the same resource set with the same time domain behavior on periodic, aperiodic and semi-persistent SRS. |
| ***slotOffset***  An offset in number of slots between the triggering DCI and the actual transmission of this *SRS-ResourceSet*. If the field is absent the UE applies no offset (value 0). |
| ***srs-PowerControlAdjustmentStates***  Indicates whether hsrs,c(i) = fc(i,1) or hsrs,c(i) = fc(i,2) (if twoPUSCH-PC-AdjustmentStates are configured) or separate close loop is configured for SRS. This parameter is applicable only for Uls on which UE also transmits PUSCH. If absent or release, the UE applies the value sameAs-Fci1 (see TS 38.213 [13], clause 7.3). |
| ***srs-ResourceIdList, srs-PosResourceIdList***  The IDs of the SRS-Resources/SRS-PosResource used in this *SRS-ResourceSet/SRS-PosResourceSet*. If this *SRS-ResourceSet* is configured with usage set to codebook, the *srs-ResourceIdList* contains at most 2 entries. If this *SRS-ResourceSet* is configured with *usage* set to *nonCodebook*, the *srs-ResourceIdList* contains at most 4 entries. |
| ***srs-ResourceSetId, srs-PosResourceSetId***  The ID of this resource set. It is unique in the context of the BWP in which the parent *SRS-Config* is defined. |
| ***ssb-IndexServing***  Indicates SSB index belonging to a serving cell where the SRS is configured. |
| ***ssb-Ncell***  This field indicates a SSB configuration from neighboring cell. |
| ***usage***  Indicates if the SRS resource set is used for beam management, codebook based or non-codebook based transmission or antenna switching. See TS 38.214 [19], clause 6.2.1. Reconfiguration between codebook based and non-codebook based transmission is not supported. |

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| ***SRS-SpatialRelationInfoPos* field descriptions** |
| ***csi-RS-IndexServing***  Indicates CSI-RS index belonging to a serving cell. |
| ***dl-PRS***  This field indicates a PRS configuration. |
| ***resourceSelection***  Indicates whether the configured SRS spatial relation resource is a *SRS-Resource* or *SRS-PosResource*. |
| ***servingCellId***  The serving Cell ID of the source SSB, CSI-RS, or SRS for the spatial relation of the target SRS resource. If this field is absent the SSB, the CSI-RS, or the SRS is from the same serving cell where the SRS is configured. |
| ***ssb-IndexServing***  Indicates SSB index belonging to a serving cell. |
| ***ssb-Ncell***  This field indicates a SSB configuration from neighboring cell. |

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| ***SSB-InfoNCell* field descriptions** |
| ***physicalCellId***  This field specifies the physical cell ID of the neighbour cell for which SSB configuration is provided. |
| ***ssb-IndexNcell***  This field specifies the index of the SSB for a neighbour cell. See TS 38.213 [13]. If this field is absent, the UE determines the *ssb-IndexNcell* of the *physicalCellId*  based on its SSB measurement from the cell. |
| ***ssb-Configuration***  This field specifies the full configuration of the SSB. If this field is absent, the UE obtains the configuration for the SSB from *nr-SSB-Config* received as part of DL-PRS assistance data in LPP*,* see TS 37.355 [49], by looking up the corresponding SSB configuration using the field *physicalCellId*. |

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| ***DL-PRS-Info* field descriptions** |
| ***dl-PRS-ID***  This field specifies the UE specific TRP ID (see TS 37.355 [49]) for which PRS configuration is provided. |
| ***dl-PRS-ResourceSetId***  This field specifies the PRS-ResourceSet ID of a PRS resourceSet. |
| ***dl-PRS-ResourceId***  This field specifies the PRS-Resource ID of a PRS resource. If this field is absent, the UE determines the *dl-PRS-ResourceID* based on its PRS measurement from the TRP (see TS 37.355 [49]) and DL-PRS Resource Set. |

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| ***SSB-Configuration* field descriptions** |
| ***halfFrameIndex***  Indicates whether SSB is in the first half or the second half of the frame.Value zero indicates the first half and value 1 indicates the second half. |
| ***integerSubframeOffset***  Indicates the subframe boundary offset of the cell in which SSB is transmited. |
| ***sfn0-Offset***  Indiactes the time offset of the SFN0 slot 0 for the cell with respect to SFN0 slot 0 of serving cell. |
| ***sfn-Offset***  Specifies the SFN offset between the cell in which SSB is transmited and serving cell. The offset corresponds to the number of full radio frames counted from the beginning of a radio frame #0 of serving cell to the beginning of the closest subsequent radio frame #0 of the cell in which SSB is transmitted. |
| ***sfn-SSB-Offset***  Indicates the SFN offset of the transmitted SSB relative to the start of the SSB period. Value 0 indicates that the SSB is transmitted in the first system frame, value 1 indicates that SSB is transmitted in the second system frame and so on. The network configures this field according to the field *ssb-Periodicity* such that the indicated system frame does not exceed the configured SSB periodicity. |
| ***ss-PBCH-BlockPower***  Average EPRE of the resources elements that carry secondary synchronization signals in dBm that the NW used for SSB transmission, see TS 38.213 [13], clause 7. |
| ***ssb-Freq***  Indicates the frequency of the SSB. |
| ***ssb-Periodicity***  Indicates the periodicity of the SSB. If the field is absent, the UE applies the value ms5. (see TS 38.213 [13], clause 4.1) |
| ***ssbSubcarrierSpacing***  Subcarrier spacing of SSB. Only the values 15 kHz or 30 kHz (FR1), and 120 kHz or 240 kHz (FR2) are applicable. |

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| **Conditional Presence** | **Explanation** |
| *Setup* | This field is mandatory present upon configuration of *SRS-ResourceSet* or *SRS-Resource* and optionally present, Need M, otherwise. |
| *NonCodebook* | This field is optionally present, Need M, in case of non-codebook based transmission, otherwise the field is absent. |
| *Pathloss* | The field is mandatory present if the IE *SSB-InfoNcell* is included in *pathlossReferenceRS-Pos*; otherwise it is optionally present, Need R |

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