**3GPP TSG-RAN WG2 Meeting 109bis-e *R2-2003985***

Online, 20 – 24 Apr, 2020

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **37.355** | **CR** | DraftCR | **rev** | **-** | **Current version:** | **16.0.0** |  |
|  |
| *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:***  | Correction on SSB configuration in LPP spec |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_pos-Core |  | ***Date:*** | 2020-04-20 |
|  |  |  |  |  |
| ***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 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:*** | Before RAN2#109bis-e, we have the following email discussion:* [Post109e#31][NR/Pos] Details of spatial relation for positioning (Huawei)

Scope: Continue the discussion from R2-2001936 and resolve open issues. Intended outcome: Summary for next meetingduring which, we have agreed that the SSB configuration for the SSB serving as the source reference signal for DL-PRS is configured in LPP message. Update at 109bis-eDuring the meeting, the following agreements have been made on the above discussion:Agreements:Spatial relation of SRS is recommended by the LMF and decided by the gNB. It is up to gNB implementation whether to follow the LMF recommendation. The gNB informs the LMF of its decision.UE does not report RSRP of DL-PRS in RRC procedures for SRS configuration. Keep the current SSB configuration for the DL-only positioning in the LPP message. Keep the current configuration of SSB in RRC for UL-only positioning. This means that the RRC configuration can carry the full SSB configuration or SSB index and PCI.For the assistance information in NRPPa for SSB configuration for UL-only positioning, it should include both TF configuration and SSB index in the NRPPa message.Looking at the current spec, based on the above agreement, we need to clarify in the QCL configuration of DL-PRS that the UE obtains the QCL of DL-PRS by referencing the SSB configuration in the LPP message by PCI |
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| ***Summary of change:*** | 1/ Add field description for ssb-index2/ Add field description for pci |
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| ***Consequences if not approved:*** |  |
|  |  |
| ***Clauses affected:*** |  |
|  |  |
|  | **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:*** |  |

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| --- | --- |
| ***This CR's revision history:*** | R2-2003055 |

====================================FIRST CHANGE==================================

#### *– NR-DL-PRS-Config*

The IE *NR-DL-PRS-Config* defines downlink PRS configuration.

-- ASN1START

NR-DL-PRS-Config-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceSetList-r16 SEQUENCE (SIZE (1..nrMaxSetsPerTRP)) NR-DL-PRS-ResourceSet-r16,

 nr-DL-PRS-SFN0-Offset-r16 SEQUENCE {

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

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

 } OPTIONAL,

 ...

}

NR-DL-PRS-ResourceSet-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16,

 dl-PRS-Periodicity-and-ResourceSetSlotOffset-r16-r16 NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16,

 dl-PRS-ResourceRepetitionFactor-r16 ENUMERATED {n1, n2, n4, n6, n8, n16, n32, ...},

 dl-PRS-ResourceTimeGap-r16 ENUMERATED {s1, s2, s4, s8, s16, s32, ...},

 dl-PRS-ResourceList-r16 SEQUENCE (SIZE (1..nrMaxResourcesPerSet)) OF NR-DL-PRS-Resource-r16,

 dl-PRS-NumSymbols-r16 ENUMERATED {n2, n4, n6, n12, ...},

 dl-PRS-MutingPatternList-r16 SEQUENCE {

 mutingOption1-r16 SEQUENCE {

 mutingPattern-r16 MutingPattern-r16,

 dl-PRS-MutingBitRepetitionFactor-r16 ENUMERATED {n1, n2, n4, n8, ...} OPTIONAL --Need OR

 },

 mutingOption2-r16 SEQUENCE {

 mutingPattern-r16 MutingPattern-r16

 }

 },

 dl-PRS-ResourcePower-r16 INTEGER (-60..50),

 ...

}

NR-DL-PRS-Resource-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceId-r16 NR-DL-PRS-ResourceID-r16,

 dl-PRS-SequenceId-r16 INTEGER {0.. 4095},

 dl-PRS-ReOffset-r16 CHOICE {

 n2-r16 INTEGER (0..1),

 n4-r16 INTEGER (0..3),

 n6-r16 INTEGER (0..5),

 n12-r16 INTEGER (0..11)

 },

 dl-PRS-ResourceSlotOffset-r16 INTEGER (0..nrMaxResourceOffsetValue-1),

 dl-PRS-ResourceSymbolOffset-r16 INTEGER (0..12),

 dl-PRS-QCL-Info-r16 DL-PRS-QCL-Info-r16 OPTIONAL,

 ...

}

MutingPattern-r16 ::= CHOICE {

 po2-r16 BIT STRING (SIZE(2)),

 po4-r16 BIT STRING (SIZE(4)),

 po6-r16 BIT STRING (SIZE(6)),

 po8-r16 BIT STRING (SIZE(8)),

 po16-r16 BIT STRING (SIZE(16)),

 po32-r16 BIT STRING (SIZE(32)),

 ...

}

DL-PRS-QCL-Info-r16 ::= CHOICE {

 ssb-r16 SEQUENCE {

 pci-r16 NR-PhysCellId-r16,

 ssb-Index-r16 INTEGER (0..63),

 rs-Type-r16 ENUMERATED {typeC, typeD, typeC-plus-typeD}

 },

 dl-PRS-r16 SEQUENCE {

 qcl-dl-PRS-ResourceId-r16 NR-DL-PRS-ResourceID,

 qcl-dl-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16

 }

}

NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16 ::= CHOICE {

 scs15-r16 CHOICE {

 n4-r16 INTEGER (0..3),

 n5-r16 INTEGER (0..4),

 n8-r16 INTEGER (0..7),

 n10-r16 INTEGER (0..9),

 n16-r16 INTEGER (0..15),

 n20-r16 INTEGER (0..19),

 n32-r16 INTEGER (0..31),

 n40-r16 INTEGER (0..39),

 n64-r16 INTEGER (0..63),

 n80-r16 INTEGER (0..79),

 n160-r16 INTEGER (0..159),

 n320-r16 INTEGER (0..319),

 n640-r16 INTEGER (0..639),

 n1280-r16 INTEGER (0..1279),

 n2560-r16 INTEGER (0..2559),

 n5120-r16 INTEGER (0..5119),

 n10240-r16 INTEGER (0..10239),

 ...},

 scs30-r16 CHOICE {

 n8-r16 INTEGER (0..7),

 n10-r16 INTEGER (0..9),

 n16-r16 INTEGER (0..15),

 n20-r16 INTEGER (0..19),

 n32-r16 INTEGER (0..31),

 n40-r16 INTEGER (0..39),

 n64-r16 INTEGER (0..63),

 n80-r16 INTEGER (0..79),

 n128-r16 INTEGER (0..127),

 n160-r16 INTEGER (0..159),

 n320-r16 INTEGER (0..319),

 n640-r16 INTEGER (0..639),

 n1280-r16 INTEGER (0..1279),

 n2560-r16 INTEGER (0..2559),

 n5120-r16 INTEGER (0..5119),

 n10240-r16 INTEGER (0..10239),

 n20480-r16 INTEGER (0..20479),

 ...},

 scs60-r16 CHOICE {

 n16-r16 INTEGER (0..15),

 n20-r16 INTEGER (0..19),

 n32-r16 INTEGER (0..31),

 n40-r16 INTEGER (0..39),

 n64-r16 INTEGER (0..63),

 n80-r16 INTEGER (0..79),

 n128-r16 INTEGER (0..127),

 n160-r16 INTEGER (0..159),

 n256-r16 INTEGER (0..255),

 n320-r16 INTEGER (0..319),

 n640-r16 INTEGER (0..639),

 n1280-r16 INTEGER (0..1279),

 n2560-r16 INTEGER (0..2559),

 n5120-r16 INTEGER (0..5119),

 n10240-r16 INTEGER (0..10239),

 n20480-r16 INTEGER (0..20479),

 n40960-r16 INTEGER (0..40959),

 ...},

 scs120-r16 CHOICE {

 n32-r16 INTEGER (0..31),

 n40-r16 INTEGER (0..39),

 n64-r16 INTEGER (0..63),

 n80-r16 INTEGER (0..79),

 n128-r16 INTEGER (0..127),

 n160-r16 INTEGER (0..159),

 n256-r16 INTEGER (0..255),

 n320-r16 INTEGER (0..319),

 n512-r16 INTEGER (0..511),

 n640-r16 INTEGER (0..639),

 n1280-r16 INTEGER (0..1279),

 n2560-r16 INTEGER (0..2559),

 n5120-r16 INTEGER (0..5119),

 n10240-r16 INTEGER (0..10239),

 n20480-r16 INTEGER (0..20479),

 n40960-r16 INTEGER (0..40959),

 n81920-r16 INTEGER (0..81919),

 ...},

 ...

}

NR-DL-PRS-ResourceID-r16 ::= INTEGER (0.. nrMaxNumDL-PRS-ResourcesPerSet-1)

NR-DL-PRS-ResourceSetID-r16 ::= INTEGER (0.. nrMaxNumDL-PRS-ResourceSetsPerTRP-1)

nrMaxNumDL-PRS-ResourcesPerSet-1 INTEGER ::= 63

nrMaxNumDL-PRS-ResourceSetsPerTRP-1 INTEGER ::= 7

nrMaxResourceOffsetValue-1 INTEGER ::= 511

nrMaxResourcesPerSet INTEGER ::= 64 -- Maximum resources can be configured for one set

nrMaxSetsPerTrp INTEGER ::= 2 -- Maximum resources set can be configured for one TRP

-- ASN1STOP

| *NR-DL-PRS-Config* field descriptions |
| --- |
| ***dl-PRS-Periodicity-and-ResourceSetSlotOffset*** This field specifies the Periodicity of DL PRS allocation in slots configured per DL PRS Resource Set and the slot offset with respect to SFN slot 0 for a TRP where DL PRS Resource Set is configured (i.e. slot where the first DL PRS Resource of DL PRS Resource Set occurs). |
| ***dl-PRS-ResourceRepetitionFactor***This parameter controls how many times each DL-PRS Resource is repeated for a single instance of the DL-PRS Resource Set. It is applied to all resources of DL PRS Resource Set. |
| ***dl-PRS-ResourceTimeGap***This parameter indicates offset in units of slots between two repeated instances of a DL PRS Resource corresponding to the same DL-PRS Resource ID within a single instance of the DL PRS Resource Set. DL-PRS-ResourceTimeGap is provided only if DL-PRS-ResourceRepetitionFactor is configured and is greater than 1. The time duration spanned by one DL PRS Resource set containing repeated DL PRS Resources should not exceed DL-PRS-Periodicity. |
| ***dl-PRS-MutingPatternList***List of dl-PRS-MutingPattern, first entry is for Option 1 and second entry is for Option 2. The following options are supported for the applicability of the bitmap.• Option 1: Each bit in the bitmap corresponds to a configurable number of consecutive instances (in a periodic transmission of DL-PRS resource sets) of a DL-PRS Resource seto All DL-PRS Resources within a DL-PRS Resource Set instance are muted for a DL-PRS Resource Set instance that is indicated to be muted by the bitmap• Option 2: Each bit in the bitmap corresponds to a single repetition index for each of the DL-PRS Resources within an instance of a DL-PRS Resource Set (The length of the bitmap is equal to DL-PRS-ResourceRepetitionFactor)o The above applies to all instances of the DL-PRS Resource Set that the above DL-PRS Resources are part of.• Bitmap size values: 2, 4, 6, 8, 16, 32 bitsBit value “0” indicates a muted DL PRS transmission, and the value “1” indicates DL PRS transmissionUE can be configured with any of the following combinations of DL PRS muting options:Option 1 onlyOption 2 onlyOption 1 and Option 2 |
| ***dl-PRS-MutingBitRepetitionFactor***This parameter indicates the configurable number of consecutive instances (in a periodic transmission of DL-PRS resource sets) of a DL-PRS Resource Set applicable to single bit of Option 1 Muting bitmap. |
| ***dl-PRS-CombSizeN***This parameter indicates Resource element (RE) spacing in each symbol of DL PRS Resource. All DL PRS Resource Sets belonging to the same Positioning Frequency Layer have the same value of combSize. |
| ***dl-PRS-ReOffset***This parameter indicates Resource element offset in frequency domain for the first symbol in a DL PRS Resource. The relative RE offsets of following symbols are defined relative to the RE Offset in frequency domain of the first symbol in the DL PRS resource. |
| ***dl-PRS-ResourceSlotOffset***This parameters indicates points to starting slot of DL PRS Resource with respect to corresponding DL-PRS-ResourceSetSlotOffset***.*** |
| ***dl-PRS-QCL-Info***This parameter provides QCL information to assist the UE in performing DL PRS receive beamforming. It contains the QCL relation of DL-PRS with other DL reference signals (SSB or PRS) for serving and neighboring cells. QCL relation between two DL-PRS Resources can only be provided for DL-PRS Resources of the same TRP. |
| ***pci***This field specifies the physical cell ID of the cell with the SSB that is configured as the source reference signal for the DL-PRS. The UE obtains the the SSB configuration for the SSB configured as source reference signal for the DL-PRS by indexing to the field *nr-SSB-Config* with this physical cell identity. |
| ***ssb-Index***This field indicates the index for the SSB configured as the source reference signal for the DL-PRS.  |
| ***dl-PRS-SubcarrierSpacing***This parameter indicates Subcarrier Spacing for DL PRS Resource. 15, 30, 60 kHz for FR1; 60, 120 kHz for FR2. |
| ***dl-PRS-ResourceBandwidth***This parameter indicates the number of PRBs allocated for DL PRS Resource (allocated DL PRS bandwidth). All DL PRS Resources of the DL PRS Resource Set have the same bandwidth. All DL PRS Resource Sets belonging to the same Positioning Frequency Layer have the same value of DL PRS Bandwidth and Start PRB.Value 1 equals 24, value 2 equals to 28, value 3 equals to 32 and so on. |
| ***dl-PRS-StartPRB***This parameter indicates start PRB index defined as offset with respect to reference DL PRS Point A configured for positioning frequency layer.  |
| ***dl-PRS-PointA***This parameter indicates absolute frequency of the reference resource block for DL PRS. Its lowest subcarrier is also known as DL PRS Point A. A single Point A for DL PRS resource allocation is provided per positioning frequency layer. All DL PRS Resources belonging to the same DL PRS Resource Set have common Point A. |
| ***dl-PRS-CyclicPrefix***This parameter indicates Cyclic Prefix Type for DL PRS Resource. |
| ***dl-PRS-NumSymbol***This parameter indicates the number of symbols per DL PRS Resource within a slot. |
| ***dl-PRS-SequenceId***This parameter indicates the sequence Id used to initialize cinit value used in pseudo random generator TS38.211 [x2, 5.2.1] for generation of DL PRS sequence for transmission on a given DL PRS Resource. |
| ***nr-DL-PRS-SFN0-Offset***Defines time offset of the SFN0 slot 0 for given TRP with respect to SFN0 slot 0 of reference TRP. |
| ***sfn-Offset***This field specifies the SFN offset at the TRP antenna location between the reference TRP and this neighbour TRP. The offset corresponds to the number of full radio frames counted from the beginning of a radio frame #0 of the reference TRP to the beginning of the closest subsequent radio frame #0 of this neighbour TRP. |
| ***integerSubframeOffset***This field specifies the frame boundary offset at the TRP antenna location between the reference TRP and this neighbour TRP counted in full subframes. The offset is counted from the beginning of a subframe #0 of the reference TRP to the beginning of the closest subsequent subframe #0 of this neighbour TRP, rounded down to multiples of subframes.  |

====================================END OF CHANGES==================================