**3GPP TSG-RAN WG2 Meeting #117-e *R2-22xxxxx***

**Electronic, 21st Feb – 3rd Mar 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.331** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **16.7.0** |  |
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| *For* [***HELP***](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 |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Miscellaneous non-controversial corrections Set XIII | | | | | | | | | |
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| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core, TEI16 | | | | |  | ***Date:*** | | | 2022-03-03 |
|  |  | | | |  | |  | | |  |
| ***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 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 of miscellaneous non-controversial errors (typos etc) | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Miscellaneous non-controversial errors are corrrected.  Draft CRs agreed to me merged at RAN2#117e:   1. R2-2203499 Clarification on servingCellMO (R16)   Clarified that servingCellMO is always configured for a serving cell if the UE is expected to measure the serving cell. Corrected the editorial mistake in CSI-RS-Resource-Mobility.   1. R2-2203328 Correction on Full configuration(R16)   Deleted the words “(i.e., SpCell change)” since full configuration is applicable to all cases of reconfiguration with sync.   1. R2-2202232 Correction to the reference of DCI format 2\_6 field descriptions   Corrected the references in the field description of dci-Format2-6 and sizeDCI-2-6.   1. R2-2203442 Correction on Non-numerical K1 Value   For the IE PUCCH-Config, the terminology “non-numerical value” is changed as “inapplicable value”, which is specified in 38.213 spec.  Corrected also some other typos.  **Impact Analysis**  Impacted 5G architecture options: NR SA, (NG)EN-DC, NE-DC, NR-DC  Impacted functionality: Miscellaneous  Inter-operability:  1. If the network is implemented according to the CR and the UE is not, no inter-operability issues are expected.  2. If the UE is implemented according to the CR and the network is not, no inter-operability issues are expected. | | | | | | | | |
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| ***Consequences if not approved:*** | | Miscellaneous non-controversial errors will remain in the specification. | | | | | | | | |
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| ***Clauses affected:*** | | 5.3.5.11 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*START OF CHANGE*

#### 5.3.5.11 Full configuration

The UE shall:

1> release/ clear all current dedicated radio configurations except for the following:

- the MCG C-RNTI;

- the AS security configurations associated with the master key;

- the SRB1/SRB2 configurations and DRB configurations as configured by *radioBearerConfig* or *radioBearerConfig2*.

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like *MeasConfig*. Radio configuration also includes the RLC bearer configurations as configured by *RLC-BearerConfig*. In case NR-DC or NE-DC is configured, this also includes the entire NR or E-UTRA SCG configuration which are released according to the MR-DC release procedure as specified in 5.3.5.10.

NOTE 1a: For NR sidelink communication, the radio configuration includes the sidelink RRC configuration received from the network, but does not include the sidelink RRC reconfiguration and sidelink UE capability received from other UEs via PC5-RRC. In addition, the UE considers the new NR sidelink configurations as full configuration, in case of state transition and change of system information used for NR sidelink communication.

NOTE 1b: To establish the RLC bearer of SRB(s) after release due to *fullConfig*, the network can include the *srb-Identity* within *srb-ToAddModList* (i.e. the UE applies RLC default configuration) and/or provide *rlc-BearerToAddModList* of concerned SRB(s) explicitly.

- the logged measurement configuration;

1> if the *spCellConfig* in the *masterCellGroup* includes the *reconfigurationWithSync*:

2> release/ clear all current common radio configurations;

2> use the default values specified in 9.2.3 for timers T310, T311 and constants N310, N311;

1> else (full configuration after re-establishment or during RRC resume):

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;

1> else (full configuration after re-establishment or during RRC resume):

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;

1> apply the default L1 parameter values as specified in corresponding physical layer specifications except for the following:

- parameters for which values are provided in *SIB1*;

1> apply the default MAC Cell Group configuration as specified in 9.2.2;

1> for each *srb-Identity* value included in the *srb-ToAddModList* (SRB reconfiguration):

2> establish an RLC entity for the corresponding SRB;

2> apply the default SRB configuration defined in 9.2.1 for the corresponding SRB;

NOTE 2: This is to get the SRBs (SRB1 and SRB2 for reconfiguration with sync and SRB2 for resume and reconfiguration after re-establishment) to a known state from which the reconfiguration message can do further configuration.

1> for each *pdu-Session* that is part of the current UE configuration:

2> release the SDAP entity (clause 5.1.2 in TS 37.324 [24]);

2> release each DRB associated to the *pdu-Session* as specified in 5.3.5.6.4;

NOTE 3: This will retain the *pdu-Session* but remove the DRBs including *drb-identity* of these bearers from the current UE configuration. Setup of the DRBs within the AS is described in clause 5.3.5.6.5 using the new configuration. The *pdu-Session* acts as the anchor for associating the released and re-setup DRB. In the AS the DRB re-setup is equivalent with a new DRB setup (including new PDCP and logical channel configurations).

1> for each *pdu-Session* that is part of the current UE configuration but not added with same *pdu-Session* in the *drb-ToAddModList*:

2> if the procedure was triggered due to reconfiguration with sync:

3> indicate the release of the user plane resources for the *pdu-Session* to upper layers after successful reconfiguration with sync;

2> else:

3> indicate the release of the user plane resources for the *pdu-Session* to upper layers immediately;

*END OF CHANGE*

### 6.3.2 Radio resource control information elements

<CUT>

– *CSI-RS-ResourceConfigMobility*

The IE *CSI-RS-ResourceConfigMobility* is used to configure CSI-RS based RRM measurements.

***CSI-RS-ResourceConfigMobility* information element**

-- ASN1START

-- TAG-CSI-RS-RESOURCECONFIGMOBILITY-START

CSI-RS-ResourceConfigMobility ::= SEQUENCE {

subcarrierSpacing SubcarrierSpacing,

csi-RS-CellList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-CellsRRM)) OF CSI-RS-CellMobility,

...,

[[

refServCellIndex ServCellIndex OPTIONAL -- Need S

]]

}

CSI-RS-CellMobility ::= SEQUENCE {

cellId PhysCellId,

csi-rs-MeasurementBW SEQUENCE {

nrofPRBs ENUMERATED { size24, size48, size96, size192, size264},

startPRB INTEGER(0..2169)

},

density ENUMERATED {d1,d3} OPTIONAL, -- Need R

csi-rs-ResourceList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-ResourcesRRM)) OF CSI-RS-Resource-Mobility

}

CSI-RS-Resource-Mobility ::= SEQUENCE {

csi-RS-Index CSI-RS-Index,

slotConfig CHOICE {

ms4 INTEGER (0..31),

ms5 INTEGER (0..39),

ms10 INTEGER (0..79),

ms20 INTEGER (0..159),

ms40 INTEGER (0..319)

},

associatedSSB SEQUENCE {

ssb-Index SSB-Index,

isQuasiColocated BOOLEAN

} OPTIONAL, -- Need R

frequencyDomainAllocation CHOICE {

row1 BIT STRING (SIZE (4)),

row2 BIT STRING (SIZE (12))

},

firstOFDMSymbolInTimeDomain INTEGER (0..13),

sequenceGenerationConfig INTEGER (0..1023),

...

}

CSI-RS-Index ::= INTEGER (0..maxNrofCSI-RS-ResourcesRRM-1)

-- TAG-CSI-RS-RESOURCECONFIGMOBILITY-STOP

-- ASN1STOP

|  |
| --- |
| ***CSI-RS-CellMobility* field descriptions** |
| ***csi-rs-ResourceList-Mobility***  List of CSI-RS resources for mobility. The maximum number of CSI-RS resources that can be configured per *measObjectNR* depends on the configuration of *associatedSSB* and the support of *increasedNumberofCSIRSPerMO* capability (see TS 38.214 [19], clause 5.1.6.1.3). |
| ***density***  Frequency domain density for the 1-port CSI-RS for L3 mobility. See TS 38.211 [16], clause 7.4.1. |
| ***nrofPRBs***  Allowed size of the measurement BW in PRBs. See TS 38.211 [16], clause 7.4.1. |
| ***startPRB***  Starting PRB index of the measurement bandwidth. See TS 38.211 [16], clause 7.4.1. |

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| ***CSI-RS-ResourceConfigMobility* field descriptions** |
| ***csi-RS-CellList-Mobility***  List of cells for CSI-RS based RRM measurements. |
| ***refServCellIndex***  Indicates the serving cell providing the timing reference for CSI-RS resources without *associatedSSB*. The field may be present only if there is at least one CSI-RS resource configured without *associatedSSB*. If this field is absent, the UE shall use the timing of the PCell for measurements on the CSI-RS resources without *associatedSSB*. The CSI-RS resources and the serving cell indicated by *refServCellIndex* for timing reference should be located in the same band. |
| ***subcarrierSpacing***  Subcarrier spacing of CSI-RS. Only the values 15, 30 kHz or 60 kHz (FR1), and 60 or 120 kHz (FR2) are applicable. |

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| ***CSI-RS-Resource-Mobility* field descriptions** |
| ***associatedSSB***  If this field is present, the UE may base the timing of the CSI-RS resource indicated in *CSI-RS-Resource-Mobility* on the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility*. In this case, the UE is not required to monitor that CSI-RS resource if the UE cannot detect the SS/PBCH block indicated by this *associatedSSB* and *cellId*. If this field is absent, the UE shall base the timing of the CSI-RS resource indicated in *CSI-RS-Resource-Mobility* on the timing of the serving cell indicated by *refServCellIndex*. In this case, the UE is required to measure the CSI-RS resource even if SS/PBCH block(s) with *cellId* in the *CSI-RS-CellMobility* are not detected.  CSI-RS resources with and without *associatedSSB* may be configured in accordance with the rules in TS 38.214 [19], clause 5.1.6.1.3. |
| ***csi-RS-Index***  CSI-RS resource index associated to the CSI-RS resource to be measured (and used for reporting). |
| ***firstOFDMSymbolInTimeDomain***  Time domain allocation within a physical resource block. The field indicates the first OFDM symbol in the PRB used for CSI-RS, see TS 38.211 [16], clause 7.4.1.5.3. Value 2 is supported only when *dmrs-TypeA-Position* equals *pos3*. |
| ***frequencyDomainAllocation***  Frequency domain allocation within a physical resource block in accordance with TS 38.211 [16], clause 7.4.1.5.3 including table 7.4.1.5.2-1. The number of bits that may be set to one depend on the chosen row in that table. |
| ***isQuasiColocated***  Indicates that the CSI-RS resource is quasi co-located with the associated SS/PBCH block, see TS 38.214 [19], clause 5.1.6.1.3. |
| ***sequenceGenerationConfig***  Scrambling ID for CSI-RS (see TS 38.211 [16], clause 7.4.1.5.2). |
| ***slotConfig***  Indicates the CSI-RS periodicity (in milliseconds) and for each periodicity the offset (in number of slots). When *subcarrierSpacing* is set to *kHz15*, the maximum offset values for periodicities *ms4/ms5/ms10/ms20/ms40* are 3/4/9/19/39 slots. When *subcarrierSpacing* is set to *kHz30*, the maximum offset values for periodicities *ms4/ms5/ms10/ms20/ms40* are 7/9/19/39/79 slots. When *subcarrierSpacing* is set to *kHz60*, the maximum offset values for periodicities *ms4/ms5/ms10/ms20/ms40* are 15/19/39/79/159 slots. When *subcarrierSpacing* is set *kHz120*, the maximum offset values for periodicities *ms4/ms5/ms10/ms20/ms40* are 31/39/79/159/319 slots. |

#### – *PhysicalCellGroupConfig*

The IE *PhysicalCellGroupConfig* is used to configure cell-group specific L1 parameters.

*PhysicalCellGroupConfig* information element

-- ASN1START

-- TAG-PHYSICALCELLGROUPCONFIG-START

PhysicalCellGroupConfig ::= SEQUENCE {

harq-ACK-SpatialBundlingPUCCH ENUMERATED {true} OPTIONAL, -- Need S

harq-ACK-SpatialBundlingPUSCH ENUMERATED {true} OPTIONAL, -- Need S

p-NR-FR1 P-Max OPTIONAL, -- Need R

pdsch-HARQ-ACK-Codebook ENUMERATED {semiStatic, dynamic},

tpc-SRS-RNTI RNTI-Value OPTIONAL, -- Need R

tpc-PUCCH-RNTI RNTI-Value OPTIONAL, -- Need R

tpc-PUSCH-RNTI RNTI-Value OPTIONAL, -- Need R

sp-CSI-RNTI RNTI-Value OPTIONAL, -- Need R

cs-RNTI SetupRelease { RNTI-Value } OPTIONAL, -- Need M

...,

[[

mcs-C-RNTI RNTI-Value OPTIONAL, -- Need R

p-UE-FR1 P-Max OPTIONAL -- Cond MCG-Only

]],

[[

xScale ENUMERATED {dB0, dB6, spare2, spare1} OPTIONAL -- Cond SCG-Only

]],

[[

pdcch-BlindDetection SetupRelease { PDCCH-BlindDetection } OPTIONAL -- Need M

]],

[[

dcp-Config-r16 SetupRelease { DCP-Config-r16 } OPTIONAL, -- Need M

harq-ACK-SpatialBundlingPUCCH-secondaryPUCCHgroup-r16 ENUMERATED {enabled, disabled} OPTIONAL, -- Cond twoPUCCHgroup

harq-ACK-SpatialBundlingPUSCH-secondaryPUCCHgroup-r16 ENUMERATED {enabled, disabled} OPTIONAL, -- Cond twoPUCCHgroup

pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup-r16 ENUMERATED {semiStatic, dynamic} OPTIONAL, -- Cond twoPUCCHgroup

p-NR-FR2-r16 P-Max OPTIONAL, -- Need R

p-UE-FR2-r16 P-Max OPTIONAL, -- Cond MCG-Only

nrdc-PCmode-FR1-r16 ENUMERATED {semi-static-mode1, semi-static-mode2, dynamic} OPTIONAL, -- Cond MCG-Only

nrdc-PCmode-FR2-r16 ENUMERATED {semi-static-mode1, semi-static-mode2, dynamic} OPTIONAL, -- Cond MCG-Only

pdsch-HARQ-ACK-Codebook-r16 ENUMERATED {enhancedDynamic} OPTIONAL, -- Need R

nfi-TotalDAI-Included-r16 ENUMERATED {true} OPTIONAL, -- Need R

ul-TotalDAI-Included-r16 ENUMERATED {true} OPTIONAL, -- Need R

pdsch-HARQ-ACK-OneShotFeedback-r16 ENUMERATED {true} OPTIONAL, -- Need R

pdsch-HARQ-ACK-OneShotFeedbackNDI-r16 ENUMERATED {true} OPTIONAL, -- Need R

pdsch-HARQ-ACK-OneShotFeedbackCBG-r16 ENUMERATED {true} OPTIONAL, -- Need R

downlinkAssignmentIndexDCI-0-2-r16 ENUMERATED { enabled } OPTIONAL, -- Need S

downlinkAssignmentIndexDCI-1-2-r16 ENUMERATED {n1, n2, n4} OPTIONAL, -- Need S

pdsch-HARQ-ACK-CodebookList-r16 SetupRelease {PDSCH-HARQ-ACK-CodebookList-r16} OPTIONAL, -- Need M

ackNackFeedbackMode-r16 ENUMERATED {joint, separate} OPTIONAL, -- Need R

pdcch-BlindDetectionCA-CombIndicator-r16 SetupRelease { PDCCH-BlindDetectionCA-CombIndicator-r16 } OPTIONAL, -- Need M

pdcch-BlindDetection2-r16 SetupRelease { PDCCH-BlindDetection2-r16 } OPTIONAL, -- Need M

pdcch-BlindDetection3-r16 SetupRelease { PDCCH-BlindDetection3-r16 } OPTIONAL, -- Need M

bdFactorR-r16 ENUMERATED {n1} OPTIONAL -- Need R

]]

}

PDCCH-BlindDetection ::= INTEGER (1..15)

DCP-Config-r16 ::= SEQUENCE {

ps-RNTI-r16 RNTI-Value,

ps-Offset-r16 INTEGER (1..120),

sizeDCI-2-6-r16 INTEGER (1..maxDCI-2-6-Size-r16),

ps-PositionDCI-2-6-r16 INTEGER (0..maxDCI-2-6-Size-1-r16),

ps-WakeUp-r16 ENUMERATED {true} OPTIONAL, -- Need S

ps-TransmitPeriodicL1-RSRP-r16 ENUMERATED {true} OPTIONAL, -- Need S

ps-TransmitOtherPeriodicCSI-r16 ENUMERATED {true} OPTIONAL -- Need S

}

PDSCH-HARQ-ACK-CodebookList-r16 ::= SEQUENCE (SIZE (1..2)) OF ENUMERATED {semiStatic, dynamic}

PDCCH-BlindDetectionCA-CombIndicator-r16 ::= SEQUENCE {

pdcch-BlindDetectionCA1-r16 INTEGER (1..15),

pdcch-BlindDetectionCA2-r16 INTEGER (1..15)

}

PDCCH-BlindDetection2-r16 ::= INTEGER (1..15)

PDCCH-BlindDetection3-r16 ::= INTEGER (1..15)

-- TAG-PHYSICALCELLGROUPCONFIG-STOP

-- ASN1STOP

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| *PhysicalCellGroupConfig* field descriptions |
| ***ackNackFeedbackMode***  Indicates which among the joint and separate ACK/NACK feedback modes to use within a slot as specified in TS 38.213 [13] (clause 9). |
| ***bdFactorR***  Parameter for determining and distributing the maximum numbers of BD/CCE for mPDCCH based mPDSCH transmission as specified in TS 38.213 [13] Clause 10.1. |
| ***cs-RNTI***  RNTI value for downlink SPS (see *SPS-Config*) and uplink configured grant (see *ConfiguredGrantConfig*). |
| ***downlinkAssignmentIndexDCI-0-2***  Indicates if "Downlink assignment index" is present or absent in DCI format 0\_2. If the field "*downlinkAssignmentIndexDCI-0-2*" is absent, then 0 bit for "Downlink assignment index" in DCI format 0\_2. If the field "*downlinkAssignmentIndexDCI-0-2*" is present, then the bitwidth of "Downlink assignment index" in DCI format 0\_2 is defined in the same was as that in DCI format 0\_1 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 9.1). |
| ***downlinkAssignmentIndexDCI-1-2***  Configures the number of bits for "Downlink assignment index" in DCI format 1\_2. If the field is absent, then 0 bit for "Downlink assignment index" in DCI format 1\_2. Note that 1 bit and 2 bits are applied if only one serving cell is configured in the DL and the higher layer parameter pdsch-HARQ-ACK-Codebook=dynamic. 4 bits is applied if more than one serving cell are configured in the DL and the higher layer parameter *pdsch-HARQ-ACK-Codebook* is set to *dynamic* (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 9.1). |
| ***harq-ACK-SpatialBundlingPUCCH***  Enables spatial bundling of HARQ ACKs. It is configured per cell group (i.e. for all the cells within the cell group) for PUCCH reporting of HARQ-ACK. It is only applicable when more than 4 layers are possible to schedule. When the field is absent, the spatial bundling of PUCCH HARQ ACKs for the primary PUCCH group is disabled (see TS 38.213 [13], clause 9.1.2.1). If the field *harq-ACK SpatialBundlingPUCCH-secondaryPUCCHgroup* is present, *harq-ACK-SpatialBundlingPUCCH* is only applied to primary PUCCH group. Network does not configure for a UE both spatial bundling of HARQ ACKs and *codeBlockGroupTransmission* within the same cell group. |
| ***harq-ACK-SpatialBundlingPUCCH-secondaryPUCCHgroup***  Indicates whether spatial bundling of PUCCH HARQ ACKs for the secondary PUCCH group is enabled or disabled. The field is only applicable when more than 4 layers are possible to schedule (see TS 38.213 [13], clause 9.1.2.1). When the field is absent, the use of spatial bundling of PUCCH HARQ ACKs for the secondary PUCCH group is indicated by *harq-ACK-SpatialBundlingPUCCH*. See TS 38.213 [13], clause 9.1.2.1. Network does not configure for a UE both spatial bundling of HARQ ACKs and *codeBlockGroupTransmission* within the same cell group. |
| ***harq-ACK-SpatialBundlingPUSCH***  Enables spatial bundling of HARQ ACKs. It is configured per cell group (i.e. for all the cells within the cell group) for PUSCH reporting of HARQ-ACK. It is only applicable when more than 4 layers are possible to schedule. When the field is absent, the spatial bundling of PUSCH HARQ ACKs for the primary PUCCH group is disabled (see TS 38.213 [13], clauses 9.1.2.2 and 9.1.3.2). If the field *harq-ACK SpatialBundlingPUSCH-secondaryPUCCHgroup* is present, *harq-ACK-SpatialBundlingPUSCH* is only applied to primary PUCCH group. Network does not configure for a UE both spatial bundling of HARQ ACKs and *codeBlockGroupTransmission* within the same cell group. |
| ***harq-ACK-SpatialBundlingPUSCH-secondaryPUCCHgroup***  Indicates whether spatial bundling of PUSCH HARQ ACKs for the secondary PUCCH group is enabled or disabled. The field is only applicable when more than 4 layers are possible to schedule (see TS 38.213 [13], clauses 9.1.2.2 and 9.1.3.2). When the field is absent, the use of spatial bundling of PUSCH HARQ ACKs for the secondary PUCCH group is indicated by *harq-ACK-SpatialBundlingPUSCH*. See TS 38.213 [13], clauses 9.1.2.2 and 9.1.3.2. Network does not configure for a UE both spatial bundling of HARQ ACKs and *codeBlockGroupTransmission* within the same cell group. |
| ***mcs-C-RNTI***  RNTI to indicate use of *qam64LowSE* for grant-based transmissions. When the *mcs*-*C-RNT*I is configured, RNTI scrambling of DCI CRC is used to choose the corresponding MCS table. |
| ***nfi-TotalDAI-Included***  Indicates whether the NFI and total DAI fields of the non-scheduled PDSCH group is included in the non-fallback DL grant DCI (see TS 38.212 [17], clause 7.3.1). The network configures this only when enhanced dynamic codebook is configured (*pdsch-HARQ-ACK-Codebook* is set to *enhancedDynamic*). |
| ***nrdc-PCmode-FR1***  Indicates the uplink power sharing mode that the UE uses in NR-DC in frequency range 1 (FR1) (see TS 38.213 [13], clause 7.6). |
| ***nrdc-PCmode-FR2***  Indicates the uplink power sharing mode that the UE uses in NR-DC in frequency range 2 (FR2) (see TS 38.213 [13], clause 7.6). |
| ***pdcch-BlindDetection, pdcch-BlindDetection2, pdcch-BlindDetection3***  Indicates the reference number of cells for PDCCH blind detection for the CG. Network configures the field for each CG when the UE is in NR DC and sets the value in accordance with the constraints specified in TS 38.213 [13]. The network configures *pdcch-BlindDetection* only if the UE is in NR-DC. The network configures *pdcch-BlindDetection2* only if the UE is in NR-DC with at least one downlink cell using Rel-16 PDCCH monitoring capability. The network configures *pdcch-BlindDetection3* only if the UE is in NR-DC with at least one downlink cell using Rel-15 PDCCH monitoring capability. |
| ***pdcch-BlindDetectionCA-CombIndicator***  Configure one combination of pdcch-BlindDetectionCA1 (for R15) and pdcch-BlindDetectionCA2 (for R16) for UE to use for scaling PDCCH monitoring capability if the number of serving cells configured to a UE is larger than the reported capability, and if UE reports more than one combination of pdcch-BlindDetectionCA1 and pdcch-BlindDetectionCA2 as UE capability. The combination of pdcch-BlindDetectionCA1 and pdcch-BlindDetectionCA2) configured by pdcch-BlindDetectionCACombIndicator is from the more than one combination of pdcch-BlindDetectionCA1 and pdcch-BlindDetectionCA2 reported by UE (see TS 38.213 [13], clause 10). |
| ***p-NR-FR1***  The maximum total transmit power to be used by the UE in this NR cell group across all serving cells in frequency range 1 (FR1). The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-UE-FR1* (configured total for all serving cells operating on FR1). |
| ***p-NR-FR2***  The maximum total transmit power to be used by the UE in this NR cell group across all serving cells in frequency range 2 (FR2). The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-UE-FR2* (configured total for all serving cells operating on FR2). This field is only used in NR-DC. |
| ***ps-RNTI***  RNTI value for scrambling CRC of DCI format 2-6 used for power saving (see TS 38.213 [13], clause 10.1). |
| ***ps-Offset***  The start of the search-time of DCI format 2-6 with CRC scrambled by PS-RNTI relative to the start of the *drx-onDurationTimer* of Long DRX (see TS 38.213 [13], clause 10.3). Value in multiples of 0.125ms (milliseconds). 1 corresponds to 0.125 ms, 2corresponds to 0.25 ms, 3 corresponds to 0.375 ms and so on. |
| ***ps-WakeUp***  Indicates the UE to wake-up if DCI format 2-6 is not detected outside active time (see TS 38.321 [3], clause 5.7). If the field is absent, the UE does not wake-up if DCI format 2-6 is not detected outside active time. |
| ***ps-PositionDCI-2-6***  Starting position of UE wakeup and SCell dormancy indication in DCI format 2-6 (see TS 38.213 [13], clause 10.3). |
| ***ps-TransmitPeriodicL1-RSRP***  Indicates the UE to transmit periodic L1-RSRP report(s) when the *drx-onDurationTimer* does not start (see TS 38.321 [3], clause 5.7). If the field is absent, the UE does not transmit periodic L1-RSRP report(s) when the *drx-onDurationTimer* does not start. |
| ***ps-TransmitOtherPeriodicCSI***  Indicates the UE to transmit periodic CSI report(s) other than L1-RSRP reports when the *drx-onDurationTimer* does not start (see TS 38.321 [3], clause 5.7). If the field is absent, the UE does not transmit periodic CSI report(s) other than L1-RSRP reports when the *drx-onDurationTimer* does not start. |
| ***p-UE-FR1***  The maximum total transmit power to be used by the UE across all serving cells in frequency range 1 (FR1) across all cell groups. The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-NR-FR1* (configured for the cell group). |
| ***p-UE-FR2***  The maximum total transmit power to be used by the UE across all serving cells in frequency range 2 (FR2) across all cell groups. The maximum transmit power that the UE may use may be additionally limited by p-Max (configured in FrequencyInfoUL) and by p-NR-FR2 (configured for the cell group). |
| ***pdsch-HARQ-ACK-Codebook***  The PDSCH HARQ-ACK codebook is either semi-static or dynamic. This is applicable to both CA and none CA operation (see TS 38.213 [13], clauses 9.1.2 and 9.1.3). If *pdsch-HARQ-ACK-Codebook-r16* is signalled, UE shall ignore the *pdsch-HARQ-ACK-Codebook* (without suffix). For the HARQ-ACK for sidelink, if *pdsch-HARQ-ACK-Codebook-r16* is signalled, the UE uses *pdsch-HARQ-ACK-Codebook* (without suffix) and ignores *pdsch-HARQ-ACK-Codebook-r16*. If the field *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup* is present, *pdsch-HARQ-ACK-Codebook* is applied to primary PUCCH group. Otherwise, this field is applied to the cell group (i.e. for all the cells within the cell group). For the HARQ-ACK for sidelink, if the field *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup* is present, *pdsch-HARQ-ACK-Codebook* is applied to primary and secondary PUCCH group and the UE ignores *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup*. |
| ***pdsch-HARQ-ACK-CodebookList***  A list of configurations for one or two HARQ-ACK codebooks. Each configuration in the list is defined in the same way as *pdsch-HARQ-ACK-Codebook* (see TS 38.212 [17], clause 7.3.1.2.2 and TS 38.213 [13], clauses 7.2.1, 9.1.2, 9.1.3 and 9.2.1). If this field is present, the field *pdsch-HARQ-ACK-Codebook* is ignored. If this field is present, the value of this field is applied for primary PUCCH group and for secondary PUCCH group (if configured). For the HARQ-ACK for sidelink, the UE uses *pdsch-HARQ-ACK-Codebook* and ignores *pdsch-HARQ-ACK-CodebookList* if this field is present. |
| ***pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup***  The PDSCH HARQ-ACK codebook is either semi-static or dynamic. This is applicable to CA operation (see TS 38.213 [13], clauses 9.1.2 and 9.1.3). It is configured for secondary PUCCH group*.* |
| ***pdsch-HARQ-ACK-OneShotFeedback***  When configured, the DCI\_format 1\_1 can request the UE to report A/N for all HARQ processes and all CCs configured in the PUCCH group (see TS 38.212 [17], clause 7.3.1). |
| ***pdsch-HARQ-ACK-OneShotFeedbackCBG***  When configured, the DCI\_format 1\_1 can request the UE to include CBG level A/N for each CC with CBG level transmission configured. When not configured, the UE will report TB level A/N even if CBG level transmission is configured for a CC.The network configures this only when *pdsch-HARQ-ACK-OneShotFeedback* is configured. |
| ***pdsch-HARQ-ACK-OneShotFeedbackNDI***  When configured, the DCI\_format 1\_1 can request the UE to include NDI for each A/N reported.The network configures this only when *pdsch-HARQ-ACK-OneShotFeedback* is configured. |
| ***sizeDCI-2-6***  Size of DCI format 2-6 (see TS 38.213 [13], clause 10.3). |
| ***sp-CSI-RNTI***  RNTI for Semi-Persistent CSI reporting on PUSCH (see *CSI-ReportConfig*) (see TS 38.214 [19], clause 5.2.1.5.2). Network always configures the UE with a value for this field when at least one *CSI-ReportConfig* with *reportConfigType* set to *semiPersistentOnPUSCH* is configured. |
| ***tpc-PUCCH-RNTI***  RNTI used for PUCCH TPC commands on DCI (see TS 38.213 [13], clause 10.1). |
| ***tpc-PUSCH-RNTI***  RNTI used for PUSCH TPC commands on DCI (see TS 38.213 [13], clause 10.1). |
| ***tpc-SRS-RNTI***  RNTI used for SRS TPC commands on DCI (see TS 38.213 [13], clause 10.1). |
| ***ul-TotalDAI-Included***  Indicates whether the total DAI fields of the additonal PDSCH group is included in the non-fallback UL grant DCI (see TS 38.212 [17], clause 7.3.1). The network configures this only when enhanced dynamic codebook is configured (*pdsch-HARQ-ACK-Codebook* is set to *enhancedDynamic*). |
| ***xScale***  The UE is allowed to drop NR only if the power scaling applied to NR results in a difference between scaled and unscaled NR UL of more than *xScale* dB (see TS 38.213 [13]). If the value is not configured for dynamic power sharing, the UE assumes default value of 6 dB. |

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| --- | --- |
| Conditional Presence | Explanation |
| *MCG-Only* | This field is optionally present, Need R, in the *PhysicalCellGroupConfig* of the MCG. It is absent otherwise. |
| *SCG-Only* | This field is optionally present, Need S, in the *PhysicalCellGroupConfig* of the SCG in (NG)EN-DC as defined in TS 38.213 [13]. It is absent otherwise. |
| *twoPUCCHgroup* | This field is optionally present, Need R, if secondary PUCCH group is configured. It is absent otherwise. |

#### – *PUCCH-Config*

The IE *PUCCH-Config* is used to configure UE specific PUCCH parameters (per BWP).

*PUCCH-Config* information element

-- ASN1START

-- TAG-PUCCH-CONFIG-START

PUCCH-Config ::= SEQUENCE {

resourceSetToAddModList SEQUENCE (SIZE (1..maxNrofPUCCH-ResourceSets)) OF PUCCH-ResourceSet OPTIONAL, -- Need N

resourceSetToReleaseList SEQUENCE (SIZE (1..maxNrofPUCCH-ResourceSets)) OF PUCCH-ResourceSetId OPTIONAL, -- Need N

resourceToAddModList SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-Resource OPTIONAL, -- Need N

resourceToReleaseList SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-ResourceId OPTIONAL, -- Need N

format1 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M

format2 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M

format3 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M

format4 SetupRelease { PUCCH-FormatConfig } OPTIONAL, -- Need M

schedulingRequestResourceToAddModList SEQUENCE (SIZE (1..maxNrofSR-Resources)) OF SchedulingRequestResourceConfig

OPTIONAL, -- Need N

schedulingRequestResourceToReleaseList SEQUENCE (SIZE (1..maxNrofSR-Resources)) OF SchedulingRequestResourceId

OPTIONAL, -- Need N

multi-CSI-PUCCH-ResourceList SEQUENCE (SIZE (1..2)) OF PUCCH-ResourceId OPTIONAL, -- Need M

dl-DataToUL-ACK SEQUENCE (SIZE (1..8)) OF INTEGER (0..15) OPTIONAL, -- Need M

spatialRelationInfoToAddModList SEQUENCE (SIZE (1..maxNrofSpatialRelationInfos)) OF PUCCH-SpatialRelationInfo

OPTIONAL, -- Need N

spatialRelationInfoToReleaseList SEQUENCE (SIZE (1..maxNrofSpatialRelationInfos)) OF PUCCH-SpatialRelationInfoId

OPTIONAL, -- Need N

pucch-PowerControl PUCCH-PowerControl OPTIONAL, -- Need M

...,

[[

resourceToAddModListExt-v1610 SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-ResourceExt-v1610 OPTIONAL, -- Need N

dl-DataToUL-ACK-r16 SetupRelease { DL-DataToUL-ACK-r16 } OPTIONAL, -- Need M

ul-AccessConfigListDCI-1-1-r16 SetupRelease { UL-AccessConfigListDCI-1-1-r16 } OPTIONAL, -- Need M

subslotLengthForPUCCH-r16 CHOICE {

normalCP-r16 ENUMERATED {n2,n7},

extendedCP-r16 ENUMERATED {n2,n6}

} OPTIONAL, -- Need R

dl-DataToUL-ACK-DCI-1-2-r16 SetupRelease { DL-DataToUL-ACK-DCI-1-2-r16} OPTIONAL, -- Need M

numberOfBitsForPUCCH-ResourceIndicatorDCI-1-2-r16 INTEGER (0..3) OPTIONAL, -- Need R

dmrs-UplinkTransformPrecodingPUCCH-r16 ENUMERATED {enabled} OPTIONAL, -- Cond PI2-BPSK

spatialRelationInfoToAddModListSizeExt-v1610 SEQUENCE (SIZE (1..maxNrofSpatialRelationInfosDiff-r16)) OF PUCCH-SpatialRelationInfo

OPTIONAL, -- Need N

spatialRelationInfoToReleaseListSizeExt-v1610 SEQUENCE (SIZE (1..maxNrofSpatialRelationInfosDiff-r16)) OF PUCCH-SpatialRelationInfoId

OPTIONAL, -- Need N

spatialRelationInfoToAddModListExt-v1610 SEQUENCE (SIZE (1..maxNrofSpatialRelationInfos-r16)) OF PUCCH-SpatialRelationInfoExt-r16

OPTIONAL, -- Need N

spatialRelationInfoToReleaseListExt-v1610 SEQUENCE (SIZE (1..maxNrofSpatialRelationInfos-r16)) OF

PUCCH-SpatialRelationInfoId-r16 OPTIONAL, -- Need N

resourceGroupToAddModList-r16 SEQUENCE (SIZE (1..maxNrofPUCCH-ResourceGroups-r16)) OF PUCCH-ResourceGroup-r16

OPTIONAL, -- Need N

resourceGroupToReleaseList-r16 SEQUENCE (SIZE (1..maxNrofPUCCH-ResourceGroups-r16)) OF PUCCH-ResourceGroupId-r16

OPTIONAL, -- Need N

sps-PUCCH-AN-List-r16 SetupRelease { SPS-PUCCH-AN-List-r16 } OPTIONAL, -- Need M

schedulingRequestResourceToAddModListExt-v1610 SEQUENCE (SIZE (1..maxNrofSR-Resources)) OF SchedulingRequestResourceConfigExt-v1610

OPTIONAL -- Need N

]]

}

PUCCH-FormatConfig ::= SEQUENCE {

interslotFrequencyHopping ENUMERATED {enabled} OPTIONAL, -- Need R

additionalDMRS ENUMERATED {true} OPTIONAL, -- Need R

maxCodeRate PUCCH-MaxCodeRate OPTIONAL, -- Need R

nrofSlots ENUMERATED {n2,n4,n8} OPTIONAL, -- Need S

pi2BPSK ENUMERATED {enabled} OPTIONAL, -- Need R

simultaneousHARQ-ACK-CSI ENUMERATED {true} OPTIONAL -- Need R

}

PUCCH-MaxCodeRate ::= ENUMERATED {zeroDot08, zeroDot15, zeroDot25, zeroDot35, zeroDot45, zeroDot60, zeroDot80}

-- A set with one or more PUCCH resources

PUCCH-ResourceSet ::= SEQUENCE {

pucch-ResourceSetId PUCCH-ResourceSetId,

resourceList SEQUENCE (SIZE (1..maxNrofPUCCH-ResourcesPerSet)) OF PUCCH-ResourceId,

maxPayloadSize INTEGER (4..256) OPTIONAL -- Need R

}

PUCCH-ResourceSetId ::= INTEGER (0..maxNrofPUCCH-ResourceSets-1)

PUCCH-Resource ::= SEQUENCE {

pucch-ResourceId PUCCH-ResourceId,

startingPRB PRB-Id,

intraSlotFrequencyHopping ENUMERATED { enabled } OPTIONAL, -- Need R

secondHopPRB PRB-Id OPTIONAL, -- Need R

format CHOICE {

format0 PUCCH-format0,

format1 PUCCH-format1,

format2 PUCCH-format2,

format3 PUCCH-format3,

format4 PUCCH-format4

}

}

PUCCH-ResourceExt-v1610 ::= SEQUENCE {

interlaceAllocation-r16 SEQUENCE {

rb-SetIndex INTEGER (0..4),

interlace0 CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..4)

}

} OPTIONAL, --Need R

format-v1610 CHOICE {

interlace1-v1610 INTEGER (0..9),

occ-v1610 SEQUENCE {

occ-Length-v1610 ENUMERATED {n2,n4} OPTIONAL, -- Need M

occ-Index-v1610 ENUMERATED {n0,n1,n2,n3} OPTIONAL -- Need M

}

} OPTIONAL, -- Need R

...

}

PUCCH-ResourceId ::= INTEGER (0..maxNrofPUCCH-Resources-1)

PUCCH-format0 ::= SEQUENCE {

initialCyclicShift INTEGER(0..11),

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER(0..13)

}

PUCCH-format1 ::= SEQUENCE {

initialCyclicShift INTEGER(0..11),

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER(0..10),

timeDomainOCC INTEGER(0..6)

}

PUCCH-format2 ::= SEQUENCE {

nrofPRBs INTEGER (1..16),

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER(0..13)

}

PUCCH-format3 ::= SEQUENCE {

nrofPRBs INTEGER (1..16),

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER(0..10)

}

PUCCH-format4 ::= SEQUENCE {

nrofSymbols INTEGER (4..14),

occ-Length ENUMERATED {n2,n4},

occ-Index ENUMERATED {n0,n1,n2,n3},

startingSymbolIndex INTEGER(0..10)

}

PUCCH-ResourceGroup-r16 ::= SEQUENCE {

pucch-ResourceGroupId-r16 PUCCH-ResourceGroupId-r16,

resourcePerGroupList-r16 SEQUENCE (SIZE (1..maxNrofPUCCH-ResourcesPerGroup-r16)) OF PUCCH-ResourceId

}

PUCCH-ResourceGroupId-r16 ::= INTEGER (0..maxNrofPUCCH-ResourceGroups-1-r16)

DL-DataToUL-ACK-r16 ::= SEQUENCE (SIZE (1..8)) OF INTEGER (-1..15)

DL-DataToUL-ACK-DCI-1-2-r16 ::= SEQUENCE (SIZE (1..8)) OF INTEGER (0..15)

UL-AccessConfigListDCI-1-1-r16 ::= SEQUENCE (SIZE (1..16)) OF INTEGER (0..15)

-- TAG-PUCCH-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PUCCH-Config* field descriptions |
| ***dl-DataToUL-ACK, dl-DataToUL-ACK-DCI-1-2***  List of timing for given PDSCH to the DL ACK (see TS 38.213 [13], clause 9.1.2). The field *dl-DataToUL-ACK* applies to DCI format 1\_1 and the field *dl-DataToUL-ACK-DCI-1-2* applies to DCI format 1\_2 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 9.2.3). If *dl-DataToUL-ACK-r16* is signalled, UE shall ignore the *dl-DataToUL-ACK* (without suffix). The value -1 corresponds to "inapplicable value" for the case where the A/N feedback timing is not explicitly included at the time of scheduling PDSCH. |
| ***dmrs-UplinkTransformPrecodingPUCCH***  This field is used for PUCCH formats 3 and 4 according to TS 38.211, Clause 6.4.1.3.3.1. |
| ***format1***  Parameters that are common for all PUCCH resources of format 1. |
| ***format2***  Parameters that are common for all PUCCH resources of format 2. |
| ***format3***  Parameters that are common for all PUCCH resources of format 3. |
| ***format4.***  Parameters that are common for all PUCCH resources of format 4 |
| ***numberOfBitsForPUCCH- ResourceIndicatorDCI-1-2***  Configuration of the number of bits for "PUCCH resource indicator" in DCI format 1\_2 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 9.2.3). |
| ***resourceGroupToAddModList, resourceGroupToReleaseList***  Lists for adding and releasing groups of PUCCH resources that can be updated simultaneously for spatial relations with a MAC CE |
| ***resourceSetToAddModList, resourceSetToReleaseList***  Lists for adding and releasing PUCCH resource sets (see TS 38.213 [13], clause 9.2). |
| ***resourceToAddModList, resourceToAddModListExt, resourceToReleaseList***  Lists for adding and releasing PUCCH resources applicable for the UL BWP and serving cell in which the *PUCCH-Config* is defined. The resources defined herein are referred to from other parts of the configuration to determine which resource the UE shall use for which report. If the network includes of *resourceToAddModListExt*, it includes the same number of entries, and listed in the same order, as in *resourceToAddModList*. |
| ***spatialRelationInfoToAddModList, spatialRelationInfoToAddModListSizeExt , spatialRelationInfoToAddModListExt***  Configuration of the spatial relation between a reference RS and PUCCH. Reference RS can be SSB/CSI-RS/SRS. If the list has more than one element, MAC-CE selects a single element (see TS 38.321 [3], clause 5.18.8 and TS 38.213 [13], clause 9.2.2). The UE shall consider entries in *spatialRelationInfoToAddModList* and in *spatialRelationInfoToAddModListSizeExt* as a single list, i.e. an entry created using *spatialRelationInfoToAddModList* can be modified using *spatialRelationInfoToAddModListSizeExt* (or deleted using *spatialRelationInfoToReleaseListSizeExt*) and vice-versa. If the network includes *spatialRelationInfoToAddModListExt*, it includes the same number of entries, and listed in the same order, as in the concatenation of *spatialRelationInfoToAddModList* and of *spatialRelationInfoToAddModListSizeExt*. |
| ***spatialRelationInfoToReleaseList, spatialRelationInfoToReleaseListSizeExt, spatialRelationInfoToReleaseListExt***  Lists of spatial relation configurations between a reference RS and PUCCH to be released by the UE. |
| ***sps-PUCCH-AN-List***  Indicates a list of PUCCH resources for DL SPS HARQ ACK. The field *maxPayloadSize* is absent for the first and the last *SPS-PUCCH-AN* in the list. If configured, this overrides *n1PUCCH-AN* in *SPS-config.* |
| ***subslotLengthForPUCCH***  Indicate the sub-slot length for sub-slot based PUCCH feedback in number of symbols (see TS 38.213 [13], clause 9). Value *n2* corresponds to 2 symbols, value *n6* corresponding to 6 symbols, value *n7* corresponds to 7 symbols. For normal CP, the value is either *n2* or *n7*. For extended CP, the value is either *n2* or *n6*. |
| ***ul-AccessConfigListDCI-1-1***  List of the combinations of cyclic prefix extension and UL channel access type (See TS 38.212 [17], Clause 7.3.1). |

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| *PUCCH-format3* field descriptions |
| ***nrofPRBs***  The supported values are 1,2,3,4,5,6,8,9,10,12,15 and 16. The UE shall ignore this field when *formatExt* is configured. |

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| *PUCCH-FormatConfig* field descriptions |
| ***additionalDMRS***  If the field is present, the UE enables 2 DMRS symbols per hop of a PUCCH Format 3 or 4 if both hops are more than X symbols when FH is enabled (X=4). And it enables 4 DMRS symbols for a PUCCH Format 3 or 4 with more than 2X+1 symbols when FH is disabled (X=4). The field is not applicable for format 1 and 2. See TS 38.213 [13], clause 9.2.2. |
| ***interslotFrequencyHopping***  If the field is present, the UE enables inter-slot frequency hopping when PUCCH Format 1, 3 or 4 is repeated over multiple slots. For long PUCCH over multiple slots, the intra and inter slot frequency hopping cannot be enabled at the same time for a UE. The field is not applicable for format 2. See TS 38.213 [13], clause 9.2.6. |
| ***maxCodeRate***  Max coding rate to determine how to feedback UCI on PUCCH for format 2, 3 or 4. The field is not applicable for format 1. See TS 38.213 [13], clause 9.2.5. |
| ***nrofSlots***  Number of slots with the same PUCCH F1, F3 or F4. When the field is absent the UE applies the value *n1*. The field is not applicable for format 2. See TS 38.213 [13], clause 9.2.6. |
| ***pi2BPSK***  If the field is present, the UE uses pi/2 BPSK for UCI symbols instead of QPSK for PUCCH. The field is not applicable for format 1 and 2. See TS 38.213 [13], clause 9.2.5. |
| ***rb-SetIndex***  Indicates the RB set where PUCCH resource is allocated. |
| ***simultaneousHARQ-ACK-CSI***  If the field is present, the UE uses simultaneous transmission of CSI and HARQ-ACK feedback with or without SR with PUCCH Format 2, 3 or 4. See TS 38.213 [13], clause 9.2.5. When the field is absent the UE applies the value *off.* The field is not applicable for format 1. |

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| *PUCCH-Resource, PUCCH-ResourceExt* field descriptions |
| ***format,*** ***formatExt***  Selection of the PUCCH format (format 0 – 4) and format-specific parameters, see TS 38.213 [13], clause 9.2. *format0* and *format1* are only allowed for a resource in a first PUCCH resource set. *format2*, *format3* and *format4* are only allowed for a resource in non-first PUCCH resource set. The network can only configure *formatExt* when format is set to *format2* or *format3*. |
| ***interlace0***  This is the only interlace of interlaced PUCCH Format 0 and 1 and the first interlace for interlaced PUCCH Format 2 and 3. |
| ***interlace1***  A second interlace, in addition to interlace 0, as specified in TS 38.213 [13], clause 9.2.1. For 15KHz SCS, values {0..9} are applicable; for 30Khz SCS, values {0..4} are applicable. For 15kHz SCS, the values of *interlace1* shall satisfy *interlace1*=mod(*interlace0*+X,10) where X=1, -1, or 5. |
| ***intraSlotFrequencyHopping***  Enabling intra-slot frequency hopping, applicable for all types of PUCCH formats. For long PUCCH over multiple slots, the intra and inter slot frequency hopping cannot be enabled at the same time for a UE. See TS 38.213 [13], clause 9.2.1. |
| ***occ-Index***  Indicates the orthogonal cover code index (see TS 38.213 [13], clause 9.2.1). This field is Applicable when *useInterlacePUCCH-Dedicated-r16* is configured. |
| ***occ-Length***  Indicates the orthogonal cover code length (see TS 38.213 [13], clause 9.2.1). Applicable when *useInterlacePUCCH-Dedicated-r16* is configured. |
| ***pucch-ResourceId***  Identifier of the PUCCH resource. |
| ***secondHopPRB***  Index of first PRB after frequency hopping of PUCCH. This value is applicable for intra-slot frequency hopping (see TS 38.213 [13], clause 9.2.1) or inter-slot frequency hopping (see TS 38.213 [13], clause 9.2.6). |

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| *PUCCH-ResourceSet* field descriptions |
| ***maxPayloadSize***  Maximum number of UCI information bits that the UE may transmit using this PUCCH resource set (see TS 38.213 [13], clause 9.2.1). In a PUCCH occurrence, the UE chooses the first of its *PUCCH-ResourceSet* which supports the number of bits that the UE wants to transmit. The field is absent in the first set (Set0) and in the last configured set since the UE derives the maximum number of UCI information bits as specified in TS 38.213 [13], clause 9.2.1. This field can take integer values that are multiples of 4. |
| ***resourceList***  PUCCH resources of *format0* and *format1* are only allowed in the first PUCCH resource set, i.e., in a PUCCH-ResourceSet with *pucch-ResourceSetId* = 0. This set may contain between 1 and 32 resources. PUCCH resources of *format2*, *format3* and *format4* are only allowed in a *PUCCH-ResourceSet* with *pucch-ResourceSetId* > 0. If present, these sets contain between 1 and 8 resources each. The UE chooses a *PUCCH-Resource* from this list as specified in TS 38.213 [13], clause 9.2.3. Note that this list contains only a list of resource IDs. The actual resources are configured in *PUCCH-Config*. |

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| Conditional Presence | Explanation |
| *PI2-BPSK* | The field is optionally present, Need R, if *format3* and/or *format4* are configured and *pi2BPSK* is configured in each of them. It is absent, Need R otherwise. |

#### – *SearchSpace*

The IE *SearchSpace* defines how/where to search for PDCCH candidates. Each search space is associated with one *ControlResourceSet*. For a scheduled cell in the case of cross carrier scheduling, except for *nrofCandidates*, all the optional fields are absent (regardless of their presence conditions).

*SearchSpace* information element

-- ASN1START

-- TAG-SEARCHSPACE-START

SearchSpace ::= SEQUENCE {

searchSpaceId SearchSpaceId,

controlResourceSetId ControlResourceSetId OPTIONAL, -- Cond SetupOnly

monitoringSlotPeriodicityAndOffset 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),

sl40 INTEGER (0..39),

sl80 INTEGER (0..79),

sl160 INTEGER (0..159),

sl320 INTEGER (0..319),

sl640 INTEGER (0..639),

sl1280 INTEGER (0..1279),

sl2560 INTEGER (0..2559)

} OPTIONAL, -- Cond Setup

duration INTEGER (2..2559) OPTIONAL, -- Need R

monitoringSymbolsWithinSlot BIT STRING (SIZE (14)) OPTIONAL, -- Cond Setup

nrofCandidates SEQUENCE {

aggregationLevel1 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

aggregationLevel2 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

aggregationLevel4 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

aggregationLevel8 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8},

aggregationLevel16 ENUMERATED {n0, n1, n2, n3, n4, n5, n6, n8}

} OPTIONAL, -- Cond Setup

searchSpaceType CHOICE {

common SEQUENCE {

dci-Format0-0-AndFormat1-0 SEQUENCE {

...

} OPTIONAL, -- Need R

dci-Format2-0 SEQUENCE {

nrofCandidates-SFI SEQUENCE {

aggregationLevel1 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel2 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel4 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel8 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel16 ENUMERATED {n1, n2} OPTIONAL -- Need R

},

...

} OPTIONAL, -- Need R

dci-Format2-1 SEQUENCE {

...

} OPTIONAL, -- Need R

dci-Format2-2 SEQUENCE {

...

} OPTIONAL, -- Need R

dci-Format2-3 SEQUENCE {

dummy1 ENUMERATED {sl1, sl2, sl4, sl5, sl8, sl10, sl16, sl20} OPTIONAL, -- Cond Setup

dummy2 ENUMERATED {n1, n2},

...

} OPTIONAL -- Need R

},

ue-Specific SEQUENCE {

dci-Formats ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1},

...,

[[

dci-Formats-MT-r16 ENUMERATED {formats2-5} OPTIONAL, -- Need R

dci-FormatsSL-r16 ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1, formats3-0, formats3-1,

formats3-0-And-3-1} OPTIONAL, -- Need R

dci-FormatsExt-r16 ENUMERATED {formats0-2-And-1-2, formats0-1-And-1-1And-0-2-And-1-2}

OPTIONAL -- Need R

]]

}

} OPTIONAL -- Cond Setup2

}

SearchSpaceExt-r16 ::= SEQUENCE {

controlResourceSetId-r16 ControlResourceSetId-r16 OPTIONAL, -- Cond SetupOnly2

searchSpaceType-r16 SEQUENCE {

common-r16 SEQUENCE {

dci-Format2-4-r16 SEQUENCE {

nrofCandidates-CI-r16 SEQUENCE {

aggregationLevel1-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel2-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel4-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel8-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel16-r16 ENUMERATED {n1, n2} OPTIONAL -- Need R

},

...

} OPTIONAL, -- Need R

dci-Format2-5-r16 SEQUENCE {

nrofCandidates-IAB-r16 SEQUENCE {

aggregationLevel1-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel2-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel4-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel8-r16 ENUMERATED {n1, n2} OPTIONAL, -- Need R

aggregationLevel16-r16 ENUMERATED {n1, n2} OPTIONAL -- Need R

},

...

} OPTIONAL, -- Need R

dci-Format2-6-r16 SEQUENCE {

...

} OPTIONAL, -- Need R

...

}

} OPTIONAL, -- Cond Setup3

searchSpaceGroupIdList-r16 SEQUENCE (SIZE (1.. 2)) OF INTEGER (0..1) OPTIONAL, -- Need R

freqMonitorLocations-r16 BIT STRING (SIZE (5)) OPTIONAL -- Need R

}

-- TAG-SEARCHSPACE-STOP

-- ASN1STOP

|  |
| --- |
| *SearchSpace* field descriptions |
| ***common***  Configures this search space as common search space (CSS) and DCI formats to monitor. |
| ***controlResourceSetId***  The CORESET applicable for this SearchSpace. Value 0 identifies the common CORESET#0 configured in MIB and in *ServingCellConfigCommon*. Values 1..*maxNrofControlResourceSets-1* identify CORESETs configured in System Information or by dedicated signalling. The CORESETs with *non-zero controlResourceSetId* are configured in the same BWP as this *SearchSpace*. If the field *controlResourceSetId-r16* is present, UE shall ignore the *controlResourceSetId* (without suffix). |
| ***dummy1, dummy2***  This field is not used in the specification. If received it shall be ignored by the UE. |
| ***dci-Format0-0-AndFormat1-0***  If configured, the UE monitors the DCI formats 0\_0 and 1\_0 according to TS 38.213 [13], clause 10.1. |
| ***dci-Format2-0***  If configured, UE monitors the DCI format 2\_0 according to TS 38.213 [13], clause 10.1, 11.1.1. |
| ***dci-Format2-1***  If configured, UE monitors the DCI format 2\_1 according to TS 38.213 [13], clause 10.1, 11.2. |
| ***dci-Format2-2***  If configured, UE monitors the DCI format 2\_2 according to TS 38.213 [13], clause 10.1, 11.3. |
| ***dci-Format2-3***  If configured, UE monitors the DCI format 2\_3 according to TS 38.213 [13], clause 10.1, 11.4 |
| ***dci-Format2-4***  If configured, UE monitors the DCI format 2\_4 according to TS 38.213 [13], clause 11.2A. |
| ***dci-Format2-5***  If configured, IAB-MT monitors the DCI format 2\_5 according to TS 38.213 [13], clause 14. |
| ***dci-Format2-6***  If configured, UE monitors the DCI format 2\_6 according to TS 38.213 [13], clause 10.1, 10.3. DCI format 2\_6 can only be configured on the SpCell. |
| ***dci-Formats***  Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1. |
| ***dci-FormatsExt***  If this field is present, the field *dci-Formats* is ignored and *dci-FormatsExt* is used instead to indicate whether the UE monitors in this USS for DCI format 0\_2 and 1\_2 or formats 0\_1 and 1\_1 and 0\_2 and 1\_2 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 10.1). This field is not configured for operation with shared spectrum channel access in this release*.* |
| ***dci-Formats-MT***  Indicates whether the IAB-MT monitors the DCI formats 2-5 according to TS 38.213 [13], clause 14. |
| ***dci-FormatsSL***  Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1 or for format 3-0 or for format 3-1 or for formats 3-0 and 3-1. If this field is present, the field *dci-Formats* is ignored and *dci-FormatsSL* is used. |
| ***duration***  Number of consecutive slots that a SearchSpace lasts in every occasion, i.e., upon every period as given in the *periodicityAndOffset*. If the field is absent, the UE applies the value 1 slot, except for DCI format 2\_0. The UE ignores this field for DCI format 2\_0. The maximum valid duration is periodicity-1 (periodicity as given in the *monitoringSlotPeriodicityAndOffset*).  For IAB-MT, duration indicates number of consecutive slots that a SearchSpace lasts in every occasion, i.e., upon every period as given in the *periodicityAndOffset*. If the field is absent, the IAB-MT applies the value 1 slot, except for DCI format 2\_0 and DCI format 2\_5. The IAB-MT ignores this field for DCI format 2\_0 and DCI format 2\_5. The maximum valid duration is periodicity-1 (periodicity as given in the *monitoringSlotPeriodicityAndOffset*). |
| ***freqMonitorLocations***  Defines an association of the search space to multiple monitoring locations in the frequency domain and indicates whether the pattern configured in the associated CORESET is replicated to a specific RB set, see TS 38.213, clause 10.1. Each bit in the bitmap corresponds to one RB set, and the leftmost (most significant) bit corresponds to RB set 0 in the BWP. A bit set to 1 indicates that a frequency domain resource allocation replicated from the pattern configured in the associated CORESET is mapped to the RB set. |
| ***monitoringSlotPeriodicityAndOffset***  Slots for PDCCH Monitoring configured as periodicity and offset. If the UE is configured to monitor DCI format 2\_1, only the values 'sl1', 'sl2' or 'sl4' are applicable. If the UE is configured to monitor DCI format 2\_0, only the values ′sl1′, ′sl2′, ′sl4′, ′sl5′, ′sl8′, ′sl10′, ′sl16′, and ′sl20′ are applicable (see TS 38.213 [13], clause 10). If the UE is configured to monitor DCI format 2\_4, only the values 'sl1', 'sl2', 'sl4', 'sl5', 'sl8' and 'sl10' are applicable.  For IAB-MT, If the IAB-MT is configured to monitor DCI format 2\_1, only the values 'sl1', 'sl2' or 'sl4' are applicable. If the IAB-MT is configured to monitor DCI format 2\_0 or DCI format 2\_5, only the values ′sl1′, ′sl2′, ′sl4′, ′sl5′, ′sl8′, ′sl10′, ′sl16′, and ′sl20′ are applicable (see TS 38.213, clause 10). |
| ***monitoringSymbolsWithinSlot***  The first symbol(s) for PDCCH monitoring in the slots configured for PDCCH monitoring (see *monitoringSlotPeriodicityAndOffset* and *duration*). The most significant (left) bit represents the first OFDM in a slot, and the second most significant (left) bit represents the second OFDM symbol in a slot and so on. The bit(s) set to one identify the first OFDM symbol(s) of the control resource set within a slot. If the cyclic prefix of the BWP is set to extended CP, the last two bits within the bit string shall be ignored by the UE or IAB-MT.  For DCI format 2\_0, the first one symbol applies if the *duration* of CORESET (in the IE *ControlResourceSet*) identified by *controlResourceSetId* indicates 3 symbols, the first two symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 2 symbols, and the first three symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 1 symbol.  See TS 38.213 [13], clause 10.  For IAB-MT: For DCI format 2\_0 or DCI format 2\_5, the first one symbol applies if the duration of CORESET (in the IE *ControlResourceSet*) identified by *controlResourceSetId* indicates 3 symbols, the first two symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 2 symbols, and the first three symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 1 symbol.  See TS 38.213 [13], clause 10. |
| ***nrofCandidates-CI***  The number of PDCCH candidates specifically for format 2-4 for the configured aggregation level. If an aggregation level is absent, the UE does not search for any candidates with that aggregation level. The network configures only one aggregationLevel and the corresponding number of candidates (see TS 38.213 [13], clause 10.1). |
| ***nrofCandidates-SFI***  The number of PDCCH candidates specifically for format 2-0 for the configured aggregation level. If an aggregation level is absent, the UE does not search for any candidates with that aggregation level. The network configures only one aggregationLevel and the corresponding number of candidates (see TS 38.213 [13], clause 11.1.1). For a search space configured with *freqMonitorLocations-r16*, only value ′n1′ is valid. |
| ***nrofCandidates***  Number of PDCCH candidates per aggregation level. The number of candidates and aggregation levels configured here applies to all formats unless a particular value is specified or a format-specific value is provided (see inside *searchSpaceType*). If configured in the *SearchSpace* of a cross carrier scheduled cell, this field determines the number of candidates and aggregation levels to be used on the linked scheduling cell (see TS 38.213 [13], clause 10). |
| ***searchSpaceGroupIdList***  List of search space group IDs which the search space is associated with. The network configures at most 2 search space groups per BWP where the group ID is either 0 or 1. |
| ***searchSpaceId***  Identity of the search space. SearchSpaceId = 0 identifies the *searchSpaceZero* configured via PBCH (MIB) or *ServingCellConfigCommon* and may hence not be used in the *SearchSpace* IE. The *searchSpaceId* is unique among the BWPs of a Serving Cell. In case of cross carrier scheduling, search spaces with the same *searchSpaceId* in scheduled cell and scheduling cell are linked to each other. The UE applies the search space for the scheduled cell only if the DL BWPs in which the linked search spaces are configured in scheduling cell and scheduled cell are both active.  For an IAB-MT, the search space defines how/where to search for PDCCH candidates for an IAB-MT. Each search space is associated with one ControlResearchSet. For a scheduled cell in the case of cross carrier scheduling, except for nrofCandidates, all the optional fields are absent. |
| ***searchSpaceType***  Indicates whether this is a common search space (present) or a UE specific search space as well as DCI formats to monitor for. |
| ***ue-Specific***  Configures this search space as UE specific search space (USS). The UE monitors the DCI format with CRC scrambled by C-RNTI, CS-RNTI (if configured), and SP-CSI-RNTI (if configured) |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *Setup* | This field is mandatory present upon creation of a new *SearchSpace*. It is optionally present, Need M, otherwise. |
| *Setup2* | This field is mandatory present when a new *SearchSpace* is set up, if the same *SearchSpace* ID is not included in *searchSpacesToAddModListExt-r16* of the parent IE with the field *searchSpaceType-r16* included. Otherwise it is optionally present, Need M. |
| *Setup3* | This field is mandatory present when a new *SearchSpace* is set up, if the same *SearchSpace* ID is not included in *searchSpacesToAddModListExt* (without suffix) of the parent IE with the field *searchSpaceType* (without suffix) included. Otherwise it is optionally present, Need M. |
| *SetupOnly* | This field is mandatory present upon creation of a new *SearchSpace*. It is absent, Need M, otherwise. |
| *SetupOnly2* | In PDCCH-Config, the field is optionally present upon creation of a new SearchSpace and absent, Need M upon reconfiguration of an existing SearchSpace.  In PDCCH-ConfigCommon, the field is absent. |

– *ServingCellConfig*

The IE *ServingCellConfig* is used to configure (add or modify) the UE with a serving cell, which may be the SpCell or an SCell of an MCG or SCG. The parameters herein are mostly UE specific but partly also cell specific (e.g. in additionally configured bandwidth parts). Reconfiguration between a PUCCH and PUCCHless SCell is only supported using an SCell release and add.

***ServingCellConfig* information element**

-- ASN1START

-- TAG-SERVINGCELLCONFIG-START

ServingCellConfig ::= SEQUENCE {

tdd-UL-DL-ConfigurationDedicated TDD-UL-DL-ConfigDedicated OPTIONAL, -- Cond TDD

initialDownlinkBWP BWP-DownlinkDedicated OPTIONAL, -- Need M

downlinkBWP-ToReleaseList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Id OPTIONAL, -- Need N

downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink OPTIONAL, -- Need N

firstActiveDownlinkBWP-Id BWP-Id OPTIONAL, -- Cond SyncAndCellAdd

bwp-InactivityTimer ENUMERATED {ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30,

ms40,ms50, ms60, ms80,ms100, ms200,ms300, ms500,

ms750, ms1280, ms1920, ms2560, spare10, spare9, spare8,

spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL, --Need R

defaultDownlinkBWP-Id BWP-Id OPTIONAL, -- Need S

uplinkConfig UplinkConfig OPTIONAL, -- Need M

supplementaryUplink UplinkConfig OPTIONAL, -- Need M

pdcch-ServingCellConfig SetupRelease { PDCCH-ServingCellConfig } OPTIONAL, -- Need M

pdsch-ServingCellConfig SetupRelease { PDSCH-ServingCellConfig } OPTIONAL, -- Need M

csi-MeasConfig SetupRelease { CSI-MeasConfig } OPTIONAL, -- Need M

sCellDeactivationTimer ENUMERATED {ms20, ms40, ms80, ms160, ms200, ms240,

ms320, ms400, ms480, ms520, ms640, ms720,

ms840, ms1280, spare2,spare1} OPTIONAL, -- Cond ServingCellWithoutPUCCH

crossCarrierSchedulingConfig CrossCarrierSchedulingConfig OPTIONAL, -- Need M

tag-Id TAG-Id,

dummy1 ENUMERATED {enabled} OPTIONAL, -- Need R

pathlossReferenceLinking ENUMERATED {spCell, sCell} OPTIONAL, -- Cond SCellOnly

servingCellMO MeasObjectId OPTIONAL, -- Cond MeasObject

...,

[[

lte-CRS-ToMatchAround SetupRelease { RateMatchPatternLTE-CRS } OPTIONAL, -- Need M

rateMatchPatternToAddModList SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPattern OPTIONAL, -- Need N

rateMatchPatternToReleaseList SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPatternId OPTIONAL, -- Need N

downlinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier OPTIONAL -- Need S

]],

[[

supplementaryUplinkRelease-r16 ENUMERATED {true} OPTIONAL, -- Need N

tdd-UL-DL-ConfigurationDedicated-IAB-MT-r16 TDD-UL-DL-ConfigDedicated-IAB-MT-r16 OPTIONAL, -- Cond TDD\_IAB

dormantBWP-Config-r16 SetupRelease { DormantBWP-Config-r16 } OPTIONAL, -- Need M

ca-SlotOffset-r16 CHOICE {

refSCS15kHz INTEGER (-2..2),

refSCS30KHz INTEGER (-5..5),

refSCS60KHz INTEGER (-10..10),

refSCS120KHz INTEGER (-20..20)

} OPTIONAL, -- Cond AsyncCA

dummy2 SetupRelease { DummyJ } OPTIONAL, -- Need M

intraCellGuardBandsDL-List-r16 SEQUENCE (SIZE (1..maxSCSs)) OF IntraCellGuardBandsPerSCS-r16 OPTIONAL, -- Need S

intraCellGuardBandsUL-List-r16 SEQUENCE (SIZE (1..maxSCSs)) OF IntraCellGuardBandsPerSCS-r16 OPTIONAL, -- Need S

csi-RS-ValidationWithDCI-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

lte-CRS-PatternList1-r16 SetupRelease { LTE-CRS-PatternList-r16 } OPTIONAL, -- Need M

lte-CRS-PatternList2-r16 SetupRelease { LTE-CRS-PatternList-r16 } OPTIONAL, -- Need M

crs-RateMatch-PerCORESETPoolIndex-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableTwoDefaultTCI-States-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultTCI-StatePerCoresetPoolIndex-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableBeamSwitchTiming-r16 ENUMERATED {true} OPTIONAL, -- Need R

cbg-TxDiffTBsProcessingType1-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

cbg-TxDiffTBsProcessingType2-r16 ENUMERATED {enabled} OPTIONAL -- Need R

]],

[[

directionalCollisionHandling-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

channelAccessConfig-r16 SetupRelease { ChannelAccessConfig-r16 } OPTIONAL -- Need M

]]

}

UplinkConfig ::= SEQUENCE {

initialUplinkBWP BWP-UplinkDedicated OPTIONAL, -- Need M

uplinkBWP-ToReleaseList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Id OPTIONAL, -- Need N

uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink OPTIONAL, -- Need N

firstActiveUplinkBWP-Id BWP-Id OPTIONAL, -- Cond SyncAndCellAdd

pusch-ServingCellConfig SetupRelease { PUSCH-ServingCellConfig } OPTIONAL, -- Need M

carrierSwitching SetupRelease { SRS-CarrierSwitching } OPTIONAL, -- Need M

...,

[[

powerBoostPi2BPSK BOOLEAN OPTIONAL, -- Need M

uplinkChannelBW-PerSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SCS-SpecificCarrier OPTIONAL -- Need S

]],

[[

enablePL-RS-UpdateForPUSCH-SRS-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultBeamPL-ForPUSCH0-0-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultBeamPL-ForPUCCH-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

enableDefaultBeamPL-ForSRS-r16 ENUMERATED {enabled} OPTIONAL, -- Need R

uplinkTxSwitching-r16 SetupRelease { UplinkTxSwitching-r16 } OPTIONAL, -- Need M

mpr-PowerBoost-FR2-r16 ENUMERATED {true} OPTIONAL -- Need R

]]

}

DummyJ ::= SEQUENCE {

maxEnergyDetectionThreshold-r16 INTEGER(-85..-52),

energyDetectionThresholdOffset-r16 INTEGER (-20..-13),

ul-toDL-COT-SharingED-Threshold-r16 INTEGER (-85..-52) OPTIONAL, -- Need R

absenceOfAnyOtherTechnology-r16 ENUMERATED {true} OPTIONAL -- Need R

}

ChannelAccessConfig-r16 ::= SEQUENCE {

energyDetectionConfig-r16 CHOICE {

maxEnergyDetectionThreshold-r16 INTEGER (-85..-52),

energyDetectionThresholdOffset-r16 INTEGER (-13..20)

} OPTIONAL, -- Need R

ul-toDL-COT-SharingED-Threshold-r16 INTEGER (-85..-52) OPTIONAL, -- Need R

absenceOfAnyOtherTechnology-r16 ENUMERATED {true} OPTIONAL -- Need R

}

IntraCellGuardBandsPerSCS-r16 ::= SEQUENCE {

guardBandSCS-r16 SubcarrierSpacing,

intraCellGuardBands-r16 SEQUENCE (SIZE (1..4)) OF GuardBand-r16

}

GuardBand-r16 ::= SEQUENCE {

startCRB-r16 INTEGER (0..274),

nrofCRBs-r16 INTEGER (0..15)

}

DormancyGroupID-r16 ::= INTEGER (0..4)

DormantBWP-Config-r16::= SEQUENCE {

dormantBWP-Id-r16 BWP-Id OPTIONAL, -- Need M

withinActiveTimeConfig-r16 SetupRelease { WithinActiveTimeConfig-r16 } OPTIONAL, -- Need M

outsideActiveTimeConfig-r16 SetupRelease { OutsideActiveTimeConfig-r16 } OPTIONAL -- Need M

}

WithinActiveTimeConfig-r16 ::= SEQUENCE {

firstWithinActiveTimeBWP-Id-r16 BWP-Id OPTIONAL, -- Need M

dormancyGroupWithinActiveTime-r16 DormancyGroupID-r16 OPTIONAL -- Need R

}

OutsideActiveTimeConfig-r16 ::= SEQUENCE {

firstOutsideActiveTimeBWP-Id-r16 BWP-Id OPTIONAL, -- Need M

dormancyGroupOutsideActiveTime-r16 DormancyGroupID-r16 OPTIONAL -- Need R

}

UplinkTxSwitching-r16 ::= SEQUENCE {

uplinkTxSwitchingPeriodLocation-r16 BOOLEAN,

uplinkTxSwitchingCarrier-r16 ENUMERATED {carrier1, carrier2}

}

-- TAG-SERVINGCELLCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| ***ChannelAccessConfig* field descriptions** |
| ***absenceOfAnyOtherTechnology***  Presence of this field indicates absence on a long term basis (e.g. by level of regulation) of any other technology sharing the carrier; absence of this field indicates the potential presence of any other technology sharing the carrier, as specified in TS 37.213 [48] clauses 4.2.1 and 4.2.3. |
| ***energyDetectionConfig***  Indicates whether to use the *maxEnergyDetectionThreshold* or the *energyDetectionThresholdOffset* (see TS 37.213 [48], clause 4.2.3)*.* |
| ***energyDetectionThresholdOffset***  Indicates the offset to the default maximum energy detection threshold value. Unit in dB. Value -13 corresponds to -13dB, value -12 corresponds to -12dB, and so on (i.e. in steps of 1dB) as specified in TS 37.213 [48], clause 4.2.3. |
| ***maxEnergyDetectionThreshold***  Indicates the absolute maximum energy detection threshold value. Unit in dBm. Value -85 corresponds to -85 dBm, value -84 corresponds to -84 dBm, and so on (i.e. in steps of 1dBm) as specified in TS 37.213 [48], clause 4.2.3. |
| ***ul-toDL-COT-SharingED-Threshold***  Maximum energy detection threshold that the UE should use to share channel occupancy with gNB for DL transmission as specified in TS 37.213 [48], clause 4.1.3 for downlink channel access and clause 4.2.3 for uplink channel access. |

|  |
| --- |
| ***ServingCellConfig* field descriptions** |
| ***bwp-InactivityTimer***  The duration in ms after which the UE falls back to the default Bandwidth Part (see TS 38.321 [3], clause 5.15). When the network releases the timer configuration, the UE stops the timer without switching to the default BWP. |
| ***ca-SlotOffset***  Slot offset between the primary cell (PCell/PSCell) and the SCell in unaligned frame boundary with slot alignment and partial SFN alignment inter-band CA. Based on this field, the UE determines the time offset of the SCell as specified in clause 4.5 of TS 38.211 [16]. The granularity of this field is determined by the reference SCS for the slot offset (i.e. the maximum of PCell/PSCell lowest SCS among all the configured SCSs in DL/UL *SCS-SpecificCarrierList* in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB* and this serving cell's lowest SCS among all the configured SCSs in DL/UL *SCS-SpecificCarrierList* in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*).  The Network configures at most single non-zero offset duration in ms (independent on SCS) among CCs in the unaligned CA configuration. If the field is absent, the UE applies the value of 0. The slot offset value can only be changed with SCell release and add. |
| ***cbg-TxDiffTBsProcessingType1, cbg-TxDiffTBsProcessingType2***  Indicates whether processing types 1 and 2 based CBG based operation is enabled according to Rel-16 UE capabilities. |
| ***channelAccessConfig***  List of parameters used for access procedures of operation with shared spectrum channel access (see TS 37.213 [48). |
| ***crossCarrierSchedulingConfig***  Indicates whether this serving cell is cross-carrier scheduled by another serving cell or whether it cross-carrier schedules another serving cell. |
| ***crs-RateMatch-PerCORESETPoolIndex***  Indicates how UE performs rate matching when both lte-CRS-PatternList1-r16 and lte-CRS-PatternList2-r16 are configured as specified in TS 38.214 [19], clause 5.1.4.2. |
| ***csi-RS-ValidationWithDCI***  Indicates how the UE performs periodic and semi-persistent CSI-RS reception in a slot. The presence of this field indicates that the UE uses DCI detection to validate whether to receive CSI-RS (see TS 38.213 [13], clause 11.1). |
| ***defaultDownlinkBWP-Id***  The initial bandwidth part is referred to by BWP-Id = 0. ID of the downlink bandwidth part to be used upon expiry of the BWP inactivity timer. This field is UE specific. When the field is absent the UE uses the initial BWP as default BWP. (see TS 38.213 [13], clause 12 and TS 38.321 [3], clause 5.15). |
| ***directionalCollisionHandling***  Indicates that this serving cell is using directional collision handling between a reference and other cell(s) for half-duplex operation in TDD CA with same SCS as specified in TS 38.213 [13], clause 11.1. The half-duplex operation only applies within the same frequency range and cell group. The network only configures this field for TDD serving cells that are using the same SCS. |
| ***dormantBWP-Config***  The dormant BWP configuration for an SCell. This field can be configured only for a (non-PUCCH) SCell. |
| ***downlinkBWP-ToAddModList***  List of additional downlink bandwidth parts to be added or modified. (see TS 38.213 [13], clause 12). |
| ***downlinkBWP-ToReleaseList***  List of additional downlink bandwidth parts to be released. (see TS 38.213 [13], clause 12). |
| ***downlinkChannelBW-PerSCS-List***  A set of UE specific channel bandwidth and location configurations for different subcarrier spacings (numerologies). Defined in relation to Point A. The UE uses the configuration provided in this field only for the purpose of channel bandwidth and location determination. If absent, UE uses the configuration indicated in *scs-SpecificCarrierList* in *DownlinkConfigCommon* / *DownlinkConfigCommonSIB*. Network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 [15] and TS 38.101-2 [39]. |
| ***dummy1, dummy 2***  This field is not used in the specification. If received it shall be ignored by the UE. |
| ***enableBeamSwitchTiming***  Indicates the aperiodic CSI-RS triggering with beam switching triggering behaviour as defined in clause 5.2.1.5.1 of TS 38.214 [19]. |
| ***enableDefaultTCI-StatePerCoresetPoolIndex***  Presence of this field indicates the UE shall follow the release 16 behavior of default TCI state per CORESETPoolindex when the UE is configured by higher layer parameter PDCCH-Config that contains two different values of CORESETPoolIndex in ControlResourceSet is enabled. |
| ***enableTwoDefaultTCI-States***  Presence of this field indicates the UE shall follow the release 16 behavior of two default TCI states for PDSCH when at least one TCI codepoint is mapped to two TCI states is enabled |
| ***firstActiveDownlinkBWP-Id***  If configured for an SpCell, this field contains the ID of the DL BWP to be activated upon performing the RRC (re-)configuration. If the field is absent, the RRC (re-)configuration does not impose a BWP switch.  If configured for an SCell, this field contains the ID of the downlink bandwidth part to be used upon activation of an SCell. The initial bandwidth part is referred to by BWP-Id = 0.  Upon reconfiguration with *reconfigurationWithSync*, the network sets the *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* to the same value. |
| ***initialDownlinkBWP***  The dedicated (UE-specific) configuration for the initial downlink bandwidth-part (i.e. DL BWP#0). If any of the optional IEs are configured within this IE, the UE considers the BWP#0 to be an RRC configured BWP (from UE capability viewpoint). Otherwise, the UE does not consider the BWP#0 as an RRC configured BWP (from UE capability viewpoint). Network always configures the UE with a value for this field if no other BWPs are configured. NOTE1 |
| ***intraCellGuardBandsDL-List, intraCellGuardBandsUL-List***  List of intra-cell guard bands in a serving cell for operation with shared spectrum channel access. If not configured, the guard bands are defined according to 38.101-1 [15], see TS 38.214 [19], clause 7. For operation in licensed spectrum, this field is absent, and no UE action is required. |
| ***lte-CRS-PatternList1***  A list of LTE CRS patterns around which the UE shall do rate matching for PDSCH. The LTE CRS patterns in this list shall be non-overlapping in frequency. The network does not configure this field and *lte-CRS-ToMatchAround* simultaneously. |
| ***lte-CRS-PatternList2***  A list of LTE CRS patterns around which the UE shall do rate matching for PDSCH scheduled with a DCI detected on a CORESET with CORESETPoolIndex configured with 1. This list is configured only if CORESETPoolIndex configured with 1. The first LTE CRS pattern in this list shall be fully overlapping in frequency with the first LTE CRS pattern in lte-CRS-PatternList1, The second LTE CRS pattern in this list shall be fully overlapping in frequency with the second LTE CRS pattern in lte-CRS-PatternList1, and so on. Network configures this field only if the field *lte-CRS-ToMatchAround* is not configured and there is at least one ControlResourceSet in one DL BWP of this serving cell with *coresetPoolIndex* set to 1. |
| ***lte-CRS-ToMatchAround***  Parameters to determine an LTE CRS pattern that the UE shall rate match around. |
| ***pathlossReferenceLinking***  Indicates whether UE shall apply as pathloss reference either the downlink of SpCell (PCell for MCG or PSCell for SCG) or of SCell that corresponds with this uplink (see TS 38.213 [13], clause 7). |
| ***pdsch-ServingCellConfig***  PDSCH related parameters that are not BWP-specific. |
| ***rateMatchPatternToAddModList***  Resources patterns which the UE should rate match PDSCH around. The UE rate matches around the union of all resources indicated in the rate match patterns. Rate match patterns defined here on cell level apply only to PDSCH of the same numerology. See TS 38.214 [19], clause 5.1.4.1. |
| ***sCellDeactivationTimer***  SCell deactivation timer in TS 38.321 [3]. If the field is absent, the UE applies the value infinity. |
| ***servingCellMO***  *measObjectId* of the *MeasObjectNR* in *MeasConfig* which is associated to the serving cell. For this *MeasObjectNR*, the following relationship applies between this MeasObjectNR and *frequencyInfoDL* in *ServingCellConfigCommon* of the serving cell: if *ssbFrequency* is configured, its value is the same as the *absoluteFrequencySSB* and if *csi-rs-ResourceConfigMobility* is configured, the value of its *subcarrierSpacing* is present in one entry of the *scs-SpecificCarrierList*, *csi-RS-CellListMobility* includes an entry corresponding to the serving cell (with *cellId* equal to *physCellId* in *ServingCellConfigCommon*) and the frequency range indicated by the *csi-rs-MeasurementBW* of the entry in *csi-RS-CellListMobility* is included in the frequency range indicated by in the entry of the *scs-SpecificCarrierList*. The field is always configured for a serving cell if the UE is expected to measure the serving cell. |
| ***supplementaryUplink***  Network may configure this field only when *supplementaryUplinkConfig* is configured in *ServingCellConfigCommon* or *supplementaryUplink* is configured in *ServingCellConfigCommonSIB*. |
| ***supplementaryUplinkRelease***  If this field is included, the UE shall release the uplink configuration configured by *supplementaryUplink*. The network only includes either *supplementaryUplinkRelease* or *supplementaryUplink* at a time. |
| ***tag-Id***  Timing Advance Group ID, as specified in TS 38.321 [3], which this cell belongs to. |
| ***tdd-UL-DL-ConfigurationDedicated-IAB-MT***  Resource configuration per IAB-MT D/U/F overrides all symbols (with a limitation that effectively only flexible symbols can be overwritten in Rel-16) per slot over the number of slots as provided by *TDD-UL-DL ConfigurationCommon*. |
| ***uplinkConfig***  Network may configure this field only when *uplinkConfigCommon* is configured in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*. Addition or release of this field can only be done upon SCell addition or release (respectively). |

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| ***UplinkConfig* field descriptions** |
| ***carrierSwitching***  Includes parameters for configuration of carrier based SRS switching (see TS 38.214 [19], clause 6.2.1.3. |
| ***enableDefaultBeamPL-ForPUSCH0-0, enableDefaultBeamPL-ForPUCCH, enableDefaultBeamPL-ForSRS***  When the parameter is present, UE derives the spatial relation and the corresponding pathloss reference Rs as specified in 38.213, clauses 7.1.1, 7.2.1, 7.3.1 and 9.2.2. The network only configures these parameters for FR2. |
| ***enablePL-RS-UpdateForPUSCH-SRS***  When this parameter is present, the Rel-16 feature of MAC CE based pathloss RS updates for PUSCH/SRS is enabled. Network only configures this parameter when the UE is configured with *sri-PUSCH-PowerControl*. If this field is not configured, network configures at most 4 pathloss RS resources for PUSCH/PUCCH/SRS transmissions per BWP, not including pathloss RS resources for SRS transmissions for positioning. (See TS 38.213 [13], clause 7). |
| ***firstActiveUplinkBWP-Id***  If configured for an SpCell, this field contains the ID of the UL BWP to be activated upon performing the RRC (re-)configuration. If the field is absent, the RRC (re-)configuration does not impose a BWP switch.  If configured for an SCell, this field contains the ID of the uplink bandwidth part to be used upon activation of an SCell. The initial bandwidth part is referred to by BandiwdthPartId = 0. |
| ***initialUplinkBWP***  The dedicated (UE-specific) configuration for the initial uplink bandwidth-part (i.e. UL BWP#0). If any of the optional IEs are configured within this IE as part of the IE *uplinkConfig*, the UE considers the BWP#0 to be an RRC configured BWP (from UE capability viewpoint). Otherwise, the UE does not consider the BWP#0 as an RRC configured BWP (from UE capability viewpoint). Network always configures the UE with a value for this field if no other BWPs are configured. NOTE1 |
| ***mpr-PowerBoost-FR2***  Indicates whether UE is allowed to boost uplink transmission power by suspending in-band emission (IBE) requirements as specified in TS 38.101-2 [39]. Network only configures this field for FR2 serving cells. |
| ***powerBoostPi2BPSK***  If this field is set to *true*, the UE determines the maximum output power for PUCCH/PUSCH transmissions that use pi/2 BPSK modulation according to TS 38.101-1 [15], clause 6.2.4. |
| ***pusch-ServingCellConfig***  PUSCH related parameters that are not BWP-specific. |
| ***uplinkBWP-ToAddModList***  The additional bandwidth parts for uplink to be added or modified. In case of TDD uplink- and downlink BWP with the same *bandwidthPartId* are considered as a BWP pair and must have the same center frequency. |
| ***uplinkBWP-ToReleaseList***  The additional bandwidth parts for uplink to be released. |
| ***uplinkChannelBW-PerSCS-List***  A set of UE specific channel bandwidth and location configurations for different subcarrier spacings (numerologies). Defined in relation to Point A. The UE uses the configuration provided in this field only for the purpose of channel bandwidth and location determination. If absent, UE uses the configuration indicated in *scs-SpecificCarrierList* in *UplinkConfigCommon* / *UplinkConfigCommonSIB*. Network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 [15] and TS 38.101-2 [39]. |
| ***uplinkTxSwitchingPeriodLocation***  Indicates whether the location of UL Tx switching period is configured in this uplink carrier in case of inter-band UL CA, SUL, or (NG)EN-DC, as specified in TS 38.101-1 [15] and TS 38.101-3 [34]. In case of inter-band UL CA or SUL, network configures this field to TRUE for one of the uplink carriers involved in dynamic UL TX switching and configures this field in the other carrier to FALSE. In case of (NG)EN-DC, network always configures this field to TRUE for NR carrier (i.e. with (NG)EN-DC, the UL switching period always occurs on the NR carrier). |
| ***uplinkTxSwitchingCarrier***  Indicates that the configured carrier is carrier1 or carrier2 for dynamic uplink Tx switching, as defined in TS 38.101-1 [15] and TS 38.101-3 [34]. In case of inter-band UL CA or SUL, network configures one of the two uplink carriers involved in dynamic UL TX switching as carrier1 and the other as carrier2. In case of (NG)EN-DC, network always configures the NR carrier as carrier 2. |

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| ***DormantBWP-Config* field descriptions** |
| ***dormancyGroupWithinActiveTime***  This field contains the ID of an SCell group for Dormancy within active time, to which this SCell belongs. The use of the Dormancy within active time SCell groups is specified in TS 38.213 [13]. |
| ***dormancyGroupOutsideActiveTime***  This field contains the ID of an SCell group for Dormancy outside active time, to which this SCell belongs. The use of the Dormancy outside active time SCell groups is specified in TS 38.213 [13]. |
| ***dormantBWP-Id***  This field contains the ID of the downlink bandwidth part to be used as dormant BWP. If this field is configured, its value is different from *defaultDownlinkBWP-Id*, and at least one of the *withinActiveTimeConfig* and *outsideActiveTimeConfig* should be configured. |
| ***firstOutsideActiveTimeBWP-Id***  This field contains the ID of the downlink bandwidth part to be activated when receiving a DCI indication for SCell dormancy outside active time. |
| ***firstWithinActiveTimeBWP-Id***  This field contains the ID of the downlink bandwidth part to be activated when receiving a DCI indication for SCell dormancy within active time. |
| ***outsideActiveTimeConfig***  This field contains the configuration to be used for SCell dormancy outside active time, as specified in TS 38.213 [13]. The field can only be configured when the cell group the SCell belongs to is configured with *dcp-Config*. |
| ***withinActiveTimeConfig***  This field contains the configuration to be used for SCell dormancy within active time, as specified in TS 38.213 [13]. |

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| ***GuardBand* field descriptions** |
| ***startCRB***  Indicates the starting RB of the guard band. |
| ***nrofCRB***  Indicates the length of the guard band in RBs. When set to 0, zero-size guard band is used. |

NOTE 1: If the dedicated part of initial UL/DL BWP configuration is absent, the initial BWP can be used but with some limitations. For example, changing to another BWP requires *RRCReconfiguration* since DCI format 1\_0 doesn't support DCI-based switching.

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| **Conditional Presence** | **Explanation** |
| *AsyncCA* | This field is mandatory present for SCells whose slot offset between the SpCell is not 0. Otherwise it is absent, Need S. |
| *MeasObject* | This field is mandatory present for the SpCell if the UE has a *measConfig*, and it is optionally present, Need M, for SCells. |
| *SCellOnly* | This field is optionally present, Need R, for SCells. It is absent otherwise. |
| *ServingCellWithoutPUCCH* | This field is optionally present, Need S, for SCells except PUCCH SCells. It is absent otherwise. |
| *SyncAndCellAdd* | This field is mandatory present for a SpCell upon reconfiguration with *reconfigurationWithSync* and upon *RRCSetup*/*RRCResume*.  The field is optionally present for an SpCell, Need N, upon reconfiguration without *reconfigurationWithSync*.  The field is mandatory present for an SCell upon addition, and absent for SCell in other cases, Need M. |
| *TDD* | This field is optionally present, Need R, for TDD cells. It is absent otherwise. |
| *TDD\_IAB* | For IAB-MT, this field is optionally present, Need R, for TDD cells. It is absent otherwise. |