**3GPP TSG RAN WG2#109e *R2-200xxxx***

**Electronic meeting, 24th February – 6th March, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.331** | **CR** | **1498** | **rev** | **1** | **Current version:** | **15.8.0** |  |
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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 | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Introduction of NR IIoT | | | | | | | | | |
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| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IIOT, NR\_L1enh\_URLLC | | | | |  | ***Date:*** | | | 2020-03-06 |
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| ***Category:*** | **B** |  | | | | | ***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-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | New features specified in the Work Item on support of Industrial Internet of Things (NR\_IIOT) and the Work Item on Physical layer enhancements for NR ultra-reliable and low latency communication (NR\_L1enh\_URLLC). | | | | | | | | |
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| ***Summary of change:*** | | This CR introduces new features specified in NR\_IIOT WI and new features related to UL configured grant and UL Intra-UE prioritization in NR\_L1enh\_URLLC WI. The features introduced under NR\_L1enh\_URLLC WI are specifically indicated. If not indicated, the features are introduced under NR\_IIOT WI.   1. Add the new information element *ReferenceTimeInfo* and its usage in SIB9 and DLInformationTransfer 2. Add support of multiple DL SPS and UL CG in one BWP and shorter periodicity for DL SPS and UL CG. UL CG is introduced in NR\_L1enh\_URLLC. 3. Add LCP restriction enhancement: LCH-CG restrictive mapping and LCH to dynamic grant with priority-indication mapping. 4. Add the RRC parameter list in R1-1913674, in relation to UL configured grant (NR\_L1enh\_URLLC), DL SPS and Intra-UE prioritization (NR\_L1enh\_URLLC). The field *harq-CodebookID* under the sub-feature group UCI enhancement is added in the CR, due to its relevance to SPS configuration. 5. Add EHC header compression support in PDCP-Config 6. Add support for PDCP duplication with more than two RLC entities in PDCP config. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | If the CR is not approved, the features introduced in NR IIoT and NR\_L1enh\_URLLC WI are not supported. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2.2.4.10, 5.7.1.3, 6.2.2, 6.3.1, 6.3.2, 6.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **XX**  **X** |  | Other core specifications | | | | TS 38.321 CR 0698  TS 38.323 CR 0039  TS 38.306 CR 0244 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*START OF CHANGES*

##### 5.2.2.4.10 Actions upon reception of *SIB9*

Upon receiving *SIB9* with r*eferenceTimeInfo*, the UE may perform the related actions as specified in subclause 5.7.1.3.

*NEXT CHANGE*

#### 5.7.1.3 Reception of the *DLInformationTransfer* by the UE

Upon receiving *DLInformationTransfer* message, the UE shall:

1> if *dedicatedNAS-Message* is included:

2> forward *dedicatedNAS-Message* to upper layers.

1> if *referenceTimeInfo* is included:

2> calculate the reference time based on the included *time*, *timeInfoType* and *referenceSFN*;

2> calculate the uncertainty of the reference time based on the *uncertainty*, if *uncertainty* is included;

2> inform upper layers of the reference time and, if *uncertainty* is included, of the uncertainty.

*NEXT CHANGE*

### 6.2.2 Message definitions

#### – *DLInformationTransfer*

The *DLInformationTransfer* message is used for the downlink transfer of NAS dedicated information and timing information for the 5G internal system clock.

Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet. If SRB2 is suspended, the network does not send this message until SRB2 is resumed.)

RLC-SAP: AM

Logical channel: DCCH

Direction: Network to UE

*DLInformationTransfer* message

-- ASN1START

-- TAG-DLINFORMATIONTRANSFER-START

DLInformationTransfer ::= SEQUENCE {

rrc-TransactionIdentifier RRC-TransactionIdentifier,

criticalExtensions CHOICE {

dlInformationTransfer DLInformationTransfer-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

DLInformationTransfer-IEs ::= SEQUENCE {

dedicatedNAS-Message DedicatedNAS-Message OPTIONAL, -- Need N

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension DLInformationTransfer-v16xy-IEs OPTIONAL

}

DLInformationTransfer-v16xy-IEs ::= SEQUENCE {

referenceTimeInfo-r16 ReferenceTimeInfo-r16 OPTIONAL, -- Need N

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

-- TAG-DLINFORMATIONTRANSFER-STOP

-- ASN1STOP

*NEXT CHANGE*

### 6.3.1 System information blocks

#### – *SIB9*

*SIB9* contains information related to GPS time and Coordinated Universal Time (UTC). The UE may use the parameters provided in this system information block to obtain the UTC, the GPS and the local time.

NOTE: The UE may use the time information for numerous purposes, possibly involving upper layers e.g. to assist GPS initialisation, to synchronise the UE clock.

*SIB9* information element

-- ASN1START

-- TAG-SIB9-START

SIB9 ::= SEQUENCE {

timeInfo SEQUENCE {

timeInfoUTC INTEGER (0..549755813887),

dayLightSavingTime BIT STRING (SIZE (2)) OPTIONAL, -- Need R

leapSeconds INTEGER (-127..128) OPTIONAL, -- Need R

localTimeOffset INTEGER (-63..64) OPTIONAL -- Need R

} OPTIONAL, -- Need R

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[

referenceTimeInfo-r16 ReferenceTimeInfo-r16 OPTIONAL -- Need R

]]

}

-- TAG-SIB9-STOP

-- ASN1STOP

|  |
| --- |
| *SIB9* field descriptions |
| ***dayLightSavingTime***  Indicates if and how daylight-saving time (DST) is applied to obtain the local time. The semantics are the same as the semantics of the *Daylight Saving Time* IE in TS 24.501 [23] and TS 24.008 [38]. The first/leftmost bit of the bit string contains the b2 of octet 3 and the second bit of the bit string contains b1 of octet 3 in the value part of the *Daylight Saving Time* IE in TS 24.008 [38]. |
| ***leapSeconds***  Number of leap seconds offset between GPS Time and UTC. UTC and GPS time are related i.e. GPS time -leapSeconds = UTC time. |
| ***localTimeOffset***  Offset between UTC and local time in units of 15 minutes. Actual value = field value \* 15 minutes. Local time of the day is calculated as UTC time + localTimeOffset. |
| ***timeInfoUTC***  Coordinated Universal Time corresponding to the SFN boundary at or immediately after the ending boundary of the SI-window in which SIB9 is transmitted. The field counts the number of UTC seconds in 10 ms units since 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Sunday, December 31, 1899 and Monday, January 1, 1900). See NOTE 1. This field is excluded when determining changes in system information, i.e. changes of *timeInfoUTC* should neither result in system information change notifications nor in a modification of *valueTag* in *SIB1*. |

NOTE 1: The UE may use this field together with the *leapSeconds* field to obtain GPS time as follows: GPS Time (in seconds) = timeInfoUTC (in seconds) - 2,524,953,600 (seconds) + leapSeconds, where 2,524,953,600 is the number of seconds between 00:00:00 on Gregorian calendar date 1 January, 1900 and 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time).

*NEXT CHANGE*

### 6.3.2 Radio resource control information elements

#### – *BWP-DownlinkDedicated*

The IE *BWP-DownlinkDedicated* is used to configure the dedicated (UE specific) parameters of a downlink BWP.

*BWP-DownlinkDedicated* information element

-- ASN1START

-- TAG-BWP-DOWNLINKDEDICATED-START

BWP-DownlinkDedicated ::= SEQUENCE {

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

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

sps-Config SetupRelease { SPS-Config } OPTIONAL, -- Need M

radioLinkMonitoringConfig SetupRelease { RadioLinkMonitoringConfig } OPTIONAL, -- Need M

...,

[[

sps-ConfigList-r16 SetupRelease { SPS-ConfigList-r16 } OPTIONAL -- Need M

]]

}

-- TAG-BWP-DOWNLINKDEDICATED-STOP

-- ASN1STOP

|  |
| --- |
| *BWP-DownlinkDedicated* field descriptions |
| ***pdcch-Config***  UE specific PDCCH configuration for one BWP. |
| ***pdsch-Config***  UE specific PDSCH configuration for one BWP. |
| ***sps-Config***  UE specific SPS (Semi-Persistent Scheduling) configuration for one BWP. Except for reconfiguration with sync, the NW does not reconfigure *sps-Config* when there is an active configured downlink assignment (see TS 38.321 [3]). However, the NW may release the *sps-Config* at any time. |
| ***sps-ConfigList***  UE specific multiple SPS (Semi-Persistent Scheduling) configurations for one BWP. Except for reconfiguration with sync, the NW does not reconfigure a SPS configuration when it is active (see TS 38.321 [3]). However, the NW may release a SPS configuration at any time. |
| ***radioLinkMonitoringConfig***  UE specific configuration of radio link monitoring for detecting cell- and beam radio link failure occasions. The maximum number of failure detection resources should be limited up to 8 for both cell and beam radio link failure detection in Rel-15. |

*NEXT CHANGE*

#### – *BWP-UplinkDedicated*

The IE *BWP-UplinkDedicated* is used to configure the dedicated (UE specific) parameters of an uplink BWP.

*BWP-UplinkDedicated* information element

-- ASN1START

-- TAG-BWP-UPLINKDEDICATED-START

BWP-UplinkDedicated ::= SEQUENCE {

pucch-Config SetupRelease { PUCCH-Config } OPTIONAL, -- Need M

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

configuredGrantConfig SetupRelease { ConfiguredGrantConfig } OPTIONAL, -- Need M

srs-Config SetupRelease { SRS-Config } OPTIONAL, -- Need M

beamFailureRecoveryConfig SetupRelease { BeamFailureRecoveryConfig } OPTIONAL, -- Cond SpCellOnly

...,

[[

configuredGrantConfigList-r16 SetupRelease { ConfiguredGrantConfigList-r16 } OPTIONAL -- Need M

]]

}

-- TAG-BWP-UPLINKDEDICATED-STOP

-- ASN1STOP

|  |
| --- |
| *BWP-UplinkDedicated* field descriptions |
| ***beamFailureRecoveryConfig***  Configuration of beam failure recovery. If *supplementaryUplink* is present, the field is present only in one of the uplink carriers, either UL or SUL. |
| ***configuredGrantConfig***  A *Configured-Grant* of *type1* or *type2*. It may be configured for UL or SUL but in case of *type1* not for both at a time. Except for reconfiguration with sync, the NW does not reconfigure *configuredGrantConfig* when there is an active configured uplink grant Type 2 (see TS 38.321 [3]). However, the NW may release the *configuredGrantConfig* at any time. |
| ***configuredGrantConfigList***  A list of multiple configured grant configurations for one BWP. Except for reconfiguration with sync, the NW does not reconfigure a Type 2 configured grant configuration when it is active (see TS 38.321 [3]). However, the NW may release a configured grant configuration at any time. |
| ***pucch-Config***  PUCCH configuration for one BWP of the normal UL or SUL of a serving cell. If the UE is configured with SUL, the network configures PUCCH only on the BWPs of one of the uplinks (normal UL or SUL). The network configures *PUCCH-Config* at least on non-initial BWP(s) for SpCell and PUCCH SCell. If supported by the UE, the network may configure at most one additional SCell of a cell group with *PUCCH-Config* (i.e. PUCCH SCell).  In EN-DC, The NW configures at most one serving cell per frequency range with PUCCH. And in EN-DC, if two PUCCH groups are configured, the serving cells of the NR PUCCH group in FR2 use the same numerology.  The NW may configure PUCCH for a BWP when setting up the BWP. The network may also add/remove the *pucch-Config* in an *RRCReconfiguration* with *reconfigurationWithSync* (for SpCell or PUCCH SCell) or with SCell release and add (for PUCCH SCell) to move the PUCCH between the UL and SUL carrier of one serving cell. In other cases, only modifications of a previously configured *pucch-Config* are allowed.  If one (S)UL BWP of a serving cell is configured with PUCCH, all other (S)UL BWPs must be configured with PUCCH, too. |
| ***pusch-Config***  PUSCH configuration for one BWP of the normal UL or SUL of a serving cell. If the UE is configured with SUL and if it has a *PUSCH-Config* for both UL and SUL, an UL/SUL indicator field in DCI indicates which of the two to use. See TS 38.212 [17], clause 7.3.1. |
| ***srs-Config***  Uplink sounding reference signal configuration. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *SpCellOnly* | The field is optionally present, Need M, in the *BWP-UplinkDedicated* of an SpCell. It is absent otherwise. |

*NEXT CHANGE*

#### – *ConfiguredGrantConfig*

The IE *ConfiguredGrantConfig* is used to configure uplink transmission without dynamic grant according to two possible schemes. The actual uplink grant may either be configured via RRC (*type1*) or provided via the PDCCH (addressed to CS-RNTI) (*type2*). Multiple Configured Grant configurations may be configured in one BWP of a serving cell.

*ConfiguredGrantConfig* information element

-- ASN1START

-- TAG-CONFIGUREDGRANTCONFIG-START

ConfiguredGrantConfig ::= SEQUENCE {

frequencyHopping ENUMERATED {intraSlot, interSlot} OPTIONAL, -- Need S

cg-DMRS-Configuration DMRS-UplinkConfig,

mcs-Table ENUMERATED {qam256, qam64LowSE} OPTIONAL, -- Need S

mcs-TableTransformPrecoder ENUMERATED {qam256, qam64LowSE} OPTIONAL, -- Need S

uci-OnPUSCH SetupRelease { CG-UCI-OnPUSCH } OPTIONAL, -- Need M

resourceAllocation ENUMERATED { resourceAllocationType0, resourceAllocationType1, dynamicSwitch },

rbg-Size ENUMERATED {config2} OPTIONAL, -- Need S

powerControlLoopToUse ENUMERATED {n0, n1},

p0-PUSCH-Alpha P0-PUSCH-AlphaSetId,

transformPrecoder ENUMERATED {enabled, disabled} OPTIONAL, -- Need S

nrofHARQ-Processes INTEGER(1..16),

repK ENUMERATED {n1, n2, n4, n8},

repK-RV ENUMERATED {s1-0231, s2-0303, s3-0000} OPTIONAL, -- Need R

periodicity ENUMERATED {

sym2, sym7, sym1x14, sym2x14, sym4x14, sym5x14, sym8x14, sym10x14, sym16x14, sym20x14,

sym32x14, sym40x14, sym64x14, sym80x14, sym128x14, sym160x14, sym256x14, sym320x14, sym512x14,

sym640x14, sym1024x14, sym1280x14, sym2560x14, sym5120x14,

sym6, sym1x12, sym2x12, sym4x12, sym5x12, sym8x12, sym10x12, sym16x12, sym20x12, sym32x12,

sym40x12, sym64x12, sym80x12, sym128x12, sym160x12, sym256x12, sym320x12, sym512x12, sym640x12,

sym1280x12, sym2560x12

},

configuredGrantTimer INTEGER (1..64) OPTIONAL, -- Need R

rrc-ConfiguredUplinkGrant SEQUENCE {

timeDomainOffset INTEGER (0..5119),

timeDomainAllocation INTEGER (0..15),

frequencyDomainAllocation BIT STRING (SIZE(18)),

antennaPort INTEGER (0..31),

dmrs-SeqInitialization INTEGER (0..1) OPTIONAL, -- Need R

precodingAndNumberOfLayers INTEGER (0..63),

srs-ResourceIndicator INTEGER (0..15) OPTIONAL, -- Need R

mcsAndTBS INTEGER (0..31),

frequencyHoppingOffset INTEGER (1.. maxNrofPhysicalResourceBlocks-1) OPTIONAL, -- Need R

pathlossReferenceIndex INTEGER (0..maxNrofPUSCH-PathlossReferenceRSs-1),

...

[[

timeReferenceSFN-r16 ENUMERATED {sfn512} OPTIONAL -- Need R

]]

} OPTIONAL, -- Need R

...,

[[

configuredGrantConfigIndex-r16 ConfiguredGrantConfigIndex-r16 OPTIONAL, -- Need M

configuredGrantConfigIndexMAC-r16 ConfiguredGrantConfigIndexMAC-r16 OPTIONAL, -- Need M

harq-ProcID-Offset-r16 INTEGER (0..15) OPTIONAL, -- Need M

periodicityExt-r16 INTEGER (1..5120) OPTIONAL, -- Need M

startingFromRV0-r16 ENUMERATED {on, off} OPTIONAL, -- Need M

phy-PriorityIndex-r16 ENUMERATED {p0, p1} OPTIONAL, -- Need M

]]

}

CG-UCI-OnPUSCH ::= CHOICE {

dynamic SEQUENCE (SIZE (1..4)) OF BetaOffsets,

semiStatic BetaOffsets

}

-- TAG-CONFIGUREDGRANTCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *ConfiguredGrantConfig* field descriptions |
| ***antennaPort***  Indicates the antenna port(s) to be used for this configuration, and the maximum bitwidth is 5. See TS 38.214 [19], clause 6.1.2, and TS 38.212 [17], clause 7.3.1. |
| ***autonomousReTx***  If this field is present, the Configured Grant configuration is configured with autonomous retransmission, see TS 38.321 [3]. |
| ***cg-DMRS-Configuration***  DMRS configuration (see TS 38.214 [19], clause 6.1.2.3). |
| ***configuredGrantConfigIndex***  Indicates the index of the Configured Grant configurations within the BWP. |
| ***configuredGrantConfigIndexMAC***  Indicates the index of the Configured Grant configurations within the MAC entity. |
| ***configuredGrantTimer***  Indicates the initial value of the configured grant timer (see TS 38.321 [3]) in multiples of periodicity. |
| ***dmrs-SeqInitialization***  The network configures this field if *transformPrecoder* is disabled. Otherwise the field is absent. |
| ***frequencyDomainAllocation***  Indicates the frequency domain resource allocation, see TS 38.214 [19], clause 6.1.2, and TS 38.212 [17], clause 7.3.1). |
| ***frequencyHopping***  The value *intraSlot* enables 'Intra-slot frequency hopping' and the value *interSlot* enables 'Inter-slot frequency hopping'. If the field is absent, frequency hopping is not configured. |
| ***frequencyHoppingOffset***  Frequency hopping offset used when frequency hopping is enabled (see TS 38.214 [19], clause 6.1.2 and clause 6.3). |
| ***harq-ProcID-Offset***  Indicates the offset used in deriving the HARQ process IDs, see TS 38.321 [3], clause 5.4.1. |
| ***mcs-Table***  Indicates the MCS table the UE shall use for PUSCH without transform precoding. If the field is absent the UE applies the value *qam64*. |
| ***mcs-TableTransformPrecoder***  Indicates the MCS table the UE shall use for PUSCH with transform precoding. If the field is absent the UE applies the value *qam64*. |
| ***mcsAndTBS***  The modulation order, target code rate and TB size (see TS 38.214 [19], clause 6.1.2). The NW does not configure the values 28~31 in this version of the specification. |
| ***nrofHARQ-Processes***  The number of HARQ processes configured. It applies for both Type 1 and Type 2. See TS 38.321 [3], clause 5.4.1. |
| ***p0-PUSCH-Alpha***  Index of the *P0-PUSCH-AlphaSet* to be used for this configuration. |
| ***periodicity***  Periodicity for UL transmission without UL grant for type 1 and type 2 (see TS 38.321 [3], clause 5.8.2).  The following periodicities are supported depending on the configured subcarrier spacing [symbols]:  15 kHz: 2, 7, n\*14, where n={1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 320, 640}  30 kHz: 2, 7, n\*14, where n={1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 640, 1280}  60 kHz with normal CP 2, 7, n\*14, where n={1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 512, 640, 1280, 2560}  60 kHz with ECP: 2, 6, n\*12, where n={1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 512, 640, 1280, 2560}  120 kHz: 2, 7, n\*14, where n={1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 128, 160, 256, 320, 512, 640, 1024, 1280, 2560, 5120} |
| ***periodicityExt***  This field is used to calculate the periodicity for UL transmission without UL grant for type 1 and type 2 (see TS 38.321 [3], clause 5,8.2). If this field is present, the field *periodicity* is ignored.  The following periodicites are supported depending on the configured subcarrier spacing [symbols]:  15 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 640.  30 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 1280.  60 kHz with normal CP: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 2560.  60 kHz with ECP: *periodicityExt*\*12, where *periodicityExt* has a value between 1 and 2560.  120 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 5120. |
| ***powerControlLoopToUse***  Closed control loop to apply (see TS 38.213 [13], clause 7.1.1). |
| ***phy-PriorityIndex***  Indicates the PHY priority of CG PUSCH at least for PHY-layer collision handling. Value *p0* indicates low priority and value *p1* indicates high priority. |
| ***rbg-Size***  Selection between configuration 1 and configuration 2 for RBG size for PUSCH. The UE does not apply this field if *resourceAllocation* is set to *resourceAllocationType1*. Otherwise, the UE applies the value *config1* when the field is absent. Note: *rbg-Size* is used when the *transformPrecoder* parameter is disabled. |
| ***repK-RV***  The redundancy version (RV) sequence to use. See TS 38.214 [19], clause 6.1.2. The network configures this field if repetitions are used, i.e., if *repK* is set to *n2*, *n4* or *n8*. Otherwise, the field is absent. |
| ***repK***  The number of repetitions of K. |
| ***resourceAllocation***  Configuration of resource allocation type 0 and resource allocation type 1. For Type 1 UL data transmission without grant, *resourceAllocation* should be *resourceAllocationType0* or *resourceAllocationType1*. |
| ***rrc-ConfiguredUplinkGrant***  Configuration for "configured grant" transmission with fully RRC-configured UL grant (Type1). If this field is absent the UE uses UL grant configured by DCI addressed to CS-RNTI (Type2). Type 1 configured grant may be configured for UL or SUL, but not for both simultaneously. |
| ***srs-ResourceIndicator***  Indicates the SRS resource to be used. |
| ***startingFromRV0***  This field is used to determine the initial transmission occasion of a transport block for a given RV sequence, see TS 38.214 [19], clause 6.1.2.3.1. |
| ***timeDomainAllocation***  Indicates a combination of start symbol and length and PUSCH mapping type, see TS 38.214 [19], clause 6.1.2 and TS 38.212 [17], clause 7.3.1. |
| ***timeDomainOffset***  Offset related to the reference SFN indicated by *timeReferenceSFN*, see TS 38.321 [3], clause 5.8.2. If the field *timeReferenceSFN* is not present, the reference SFN is 0. |
| ***timeReferenceSFN***  Indicates the reference SFN, i.e., the SFN immediately preceding the reception of the configured grant configuration, see TS 38.321 [3], clause 5.8.2. |
| ***transformPrecoder***  Enables or disables transform precoding for *type1* and *type2*. If the field is absent, the UE enables or disables transform precoding in accordance with the field *msg3-transformPrecoder* in *RACH-ConfigCommon*, see TS 38.214 [19], clause 6.1.3. |
| ***uci-OnPUSCH***  Selection between and configuration of dynamic and semi-static beta-offset. For Type 1 UL data transmission without grant, *uci-OnPUSCH* should be set to *semiStatic.* |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *LCH-BasedPrioritization* | This fiels is optionally present, Need R, if *lch-BasedPrioritization* is configured in the MAC entity. It is absent otherwise. |

#### – *ConfiguredGrantConfigIndex*

The IE *ConfiguredGrantConfigIndex* is used to indicate the index of one of multiple UL Configured Grant configurations in one BWP.

*ConfiguredGrantConfigIndex* information element

-- ASN1START

-- TAG-CONFIGUREDGRANTCONFIGINDEX-START

ConfiguredGrantConfigIndex-r16 ::= INTEGER (0.. maxNrofConfiguredGrantConfig-r16-1)

-- TAG-CONFIGUREDGRANTCONFIGINDEX-STOP

-- ASN1STOP

#### – *ConfiguredGrantConfigIndexMAC*

The IE *ConfiguredGrantConfigIndexMAC* is used to indicate the unique Configured Grant configurations index per MAC entity.

*ConfiguredGrantConfigIndexMAC* information element

-- ASN1START

-- TAG-CONFIGUREDGRANTCONFIGINDEXMAC-START

ConfiguredGrantConfigIndexMAC-r16 ::= INTEGER (0.. maxNrofConfiguredGrantConfigMAC-r16-1)

-- TAG-CONFIGUREDGRANTCONFIGINDEXMAC-STOP

-- ASN1STOP

#### – *ConfiguredGrantConfigList*

The IE *ConfiguredGrantConfigList* is used to configure multiple uplink Configured Grant configurations in one BWP.

*ConfiguredGrantConfigList* information element

-- ASN1START

-- TAG-CONFIGUREDGRANTCONFIGLIST-START

ConfiguredGrantConfigList-r16 ::= SEQUENCE {

configuredGrantConfigToAddModList-r16 ConfiguredGrantConfigToAddModList-r16 OPTIONAL, -- Need N

configuredGrantConfigToReleaseList-r16 ConfiguredGrantConfigToReleaseList-r16 OPTIONAL, -- Need N

configuredGrantConfigType2DeactivationStateList-r16 ConfiguredGrantConfigType2DeactivationStateList-r16 OPTIONAL -- Need N

}

ConfiguredGrantConfigToAddModList-r16 ::= SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfig

ConfiguredGrantConfigToReleaseList-r16 ::= SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfigIndex-r16

ConfiguredGrantConfigType2DeactivationState-r16 ::= SEQUENCE (SIZE (1..maxNrofConfiguredGrantConfig-r16)) OF ConfiguredGrantConfigIndex-r16

ConfiguredGrantConfigType2DeactivationStateList-r16 ::= SEQUENCE (SIZE (1..16)) OF ConfiguredGrantConfigType2DeactivationState-r16

-- TAG-CONFIGUREDGRANTCONFIGLIST-STOP

-- ASN1STOP

|  |
| --- |
| *ConfiguredGrantConfigList field descriptions* |
| ***configuredGrantConfigToAddModList***  Indicates a list of multiple UL Configured Grant configurations to be added or modified. |
| ***configuredGrantConfigToReleaseList***  Indicates a list of multiple UL Configured Grant configurations to be released. |
| ***configuredGrantConfigType2DeactivationStateList***  Indicates a list of the deactivation states in which each state can be mapped to a single or multiple Configured Grant type 2 configurations to be deactivated when the corresponding deactivation DCI is received, see clause 7.3.1 in TS 38.212 [17] and clause 6.1 in TS 38.214 [19]. |

*NEXT CHANGE*

#### – *LogicalChannelConfig*

The IE *LogicalChannelConfig* is used to configure the logical channel parameters.

*LogicalChannelConfig* information element

-- ASN1START

-- TAG-LOGICALCHANNELCONFIG-START

LogicalChannelConfig ::= SEQUENCE {

ul-SpecificParameters SEQUENCE {

priority INTEGER (1..16),

prioritisedBitRate ENUMERATED {kBps0, kBps8, kBps16, kBps32, kBps64, kBps128, kBps256, kBps512,

kBps1024, kBps2048, kBps4096, kBps8192, kBps16384, kBps32768, kBps65536, infinity},

bucketSizeDuration ENUMERATED {ms5, ms10, ms20, ms50, ms100, ms150, ms300, ms500, ms1000,

spare7, spare6, spare5, spare4, spare3,spare2, spare1},

allowedServingCells SEQUENCE (SIZE (1..maxNrofServingCells-1)) OF ServCellIndex

OPTIONAL, -- PDCP-CADuplication

allowedSCS-List SEQUENCE (SIZE (1..maxSCSs)) OF SubcarrierSpacing OPTIONAL, -- Need R

maxPUSCH-Duration ENUMERATED {ms0p02, ms0p04, ms0p0625, ms0p125, ms0p25, ms0p5, spare2, spare1}

OPTIONAL, -- Need R

configuredGrantType1Allowed ENUMERATED {true} OPTIONAL, -- Need R

logicalChannelGroup INTEGER (0..maxLCG-ID) OPTIONAL, -- Need R

schedulingRequestID SchedulingRequestId OPTIONAL, -- Need R

logicalChannelSR-Mask BOOLEAN,

logicalChannelSR-DelayTimerApplied BOOLEAN,

...,

bitRateQueryProhibitTimer ENUMERATED { s0, s0dot4, s0dot8, s1dot6, s3, s6, s12,s30} OPTIONAL, -- Need R

[[

allowedCG-List-r16 SEQUENCE (SIZE (0.. maxNrofConfiguredGrantConfigMAC-r16-1)) OF ConfiguredGrantConfigIndexMAC-r16

OPTIONAL, -- Need R

allowedPHY-PriorityIndex-r16 ENUMERATED {p0, p1} OPTIONAL -- Need R

]]

} OPTIONAL, -- Cond UL

...

}

-- TAG-LOGICALCHANNELCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *LogicalChannelConfig* field descriptions |
| ***allowedCG-List***  This restriction applies only when the UL grant is a configured grant. If present, UL MAC SDUs from this logical channel can only be mapped to the indicated configured grant configuration. If the size of the sequence is zero, then UL MAC SDUs from this logical channel cannot be mapped to any configured grant configurations. If the field is not present, UL MAC SDUs from this logical channel can be mapped to any configured grant configurations. Corresponds to “allowedCG-List” as specified in TS 38.321 [3]. |
| ***allowedPHY-PriorityIndex***  This restriction applies only when the UL grant is a dynamic grant. If the field is present and the dynamic grant has a PHY-priority index, UL MAC SDUs from this logical channel can only be mapped to the dynamic grants indicating PHY-priority index equal to the values configured by this field. If the field is present and the dynamic grant does not have a PHY-priority index, UL MAC SDUs from this logical channel can only be mapped to this dynamic grant if the value of the field is *p0*, see TS 38.213 [13], clause 9. |
| ***allowedSCS-List***  If present, UL MAC SDUs from this logical channel can only be mapped to the indicated numerology. Otherwise, UL MAC SDUs from this logical channel can be mapped to any configured numerology. Only the values 15/30/60 kHz (for FR1) and 60/120 kHz (for FR2) are applicable. Corresponds to 'allowedSCS-List' as specified in TS 38.321 [3]. |
| ***allowedServingCells***  If present, UL MAC SDUs from this logical channel can only be mapped to the serving cells indicated in this list. Otherwise, UL MAC SDUs from this logical channel can be mapped to any configured serving cell of this cell group. Corresponds to 'allowedServingCells' in TS 38.321 [3]. |
| ***bitRateQueryProhibitTimer***  The timer is used for bit rate recommendation query in TS 38.321 [3], in seconds. Value *s0* means 0 s, *s0dot4* means 0.4 s and so on. |
| ***bucketSizeDuration***  Value in ms. *ms5* corresponds to 5 ms, value *ms10* corresponds to 10 ms, and so on. |
| ***configuredGrantType1Allowed***  If present, UL MAC SDUs from this logical channel can be transmitted on a configured grant type 1. Corresponds to 'configuredGrantType1Allowed' in TS 38.321 [3]. |
| ***logicalChannelGroup***  ID of the logical channel group, as specified in TS 38.321 [3], which the logical channel belongs to. |
| ***logicalChannelSR-Mask***  Controls SR triggering when a configured uplink grant of *type1* or *type2* is configured. *true* indicates that SR masking is configured for this logical channel as specified in TS 38.321 [3]. |
| ***logicalChannelSR-DelayTimerApplied***  Indicates whether to apply the delay timer for SR transmission for this logical channel. Set to *false* if *logicalChannelSR-DelayTimer* is not included in *BSR-Config*. |
| ***maxPUSCH-Duration***  If present, UL MAC SDUs from this logical channel can only be transmitted using uplink grants that result in a PUSCH duration shorter than or equal to the duration indicated by this field. Otherwise, UL MAC SDUs from this logical channel can be transmitted using an uplink grant resulting in any PUSCH duration. Corresponds to "maxPUSCH-Duration" in TS 38.321 [3]. |
| ***priority***  Logical channel priority, as specified in TS 38.321 [3]. |
| ***prioritisedBitRate***  Value in kiloBytes/s. Value *kBps0* corresponds to 0 kiloBytes/s, value *kBps8* corresponds to 8 kiloBytes/s, value *kBps16* corresponds to 16 kiloBytes/s, and so on. For SRBs, the value can only be set to *infinity*. |
| ***schedulingRequestId***  If present, it indicates the scheduling request configuration applicable for this logical channel, as specified in TS 38.321 [3]. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *PDCP-CADuplication* | The field is mandatory present if the DRB/SRB associated with this logical channel is configured with PDCP CA duplication in UL (i.e. the PDCP entity is associated with multiple RLC entities belonging to the same cell group). Otherwise the field is optionally present, need R. |
| *UL* | The field is mandatory present for a logical channel with uplink if it serves DRB. It is optionally present, Need R, for a logical channel with uplink if it serves an SRB. Otherwise it is absent. |

*NEXT CHANGE*

#### – *MAC-CellGroupConfig*

The IE *MAC-CellGroupConfig* is used to configure MAC parameters for a cell group, including DRX.

*MAC-CellGroupConfig* information element

-- ASN1START

-- TAG-MAC-CELLGROUPCONFIG-START

MAC-CellGroupConfig ::= SEQUENCE {

drx-Config SetupRelease { DRX-Config } OPTIONAL, -- Need M

schedulingRequestConfig SchedulingRequestConfig OPTIONAL, -- Need M

bsr-Config BSR-Config OPTIONAL, -- Need M

tag-Config TAG-Config OPTIONAL, -- Need M

phr-Config SetupRelease { PHR-Config } OPTIONAL, -- Need M

skipUplinkTxDynamic BOOLEAN,

...,

[[

csi-Mask BOOLEAN OPTIONAL, -- Need M

dataInactivityTimer SetupRelease { DataInactivityTimer } OPTIONAL -- Cond MCG-Only

]],

[[

lch-BasedPrioritization-r16 ENUMERATED {enabled} OPTIONAL -- Need R

]]

}

DataInactivityTimer ::= ENUMERATED {s1, s2, s3, s5, s7, s10, s15, s20, s40, s50, s60, s80, s100, s120, s150, s180}

-- TAG-MAC-CELLGROUPCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *MAC-CellGroupConfig* field descriptions |
| ***csi-Mask***  If set to true, the UE limits CSI reports to the on-duration period of the DRX cycle, see TS 38.321 [3]. |
| ***dataInactivityTimer***  Releases the RRC connection upon data inactivity as specified in clause 5.3.8.5 and in TS 38.321 [3]. Value *s1* corresponds to 1 second, value s2 corresponds to 2 seconds, and so on. |
| ***drx-Config***  Used to configure DRX as specified in TS 38.321 [3]. |
| ***lch-BasedPrioritization***  If this field is present, the UE is configured with prioritization between overlapping grants and between scheduling request and overlapping grants based on LCH priority, see see TS 38.321 [3].  Editor’s Note: It is FFS whether SR/data prioritization can be a separate configurable parameter from data/data prioritization. |
| ***skipUplinkTxDynamic***  If set to *true*, the UE skips UL transmissions as described in TS 38.321 [3]. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *MCG-Only* | This field is optionally present, Need M, for the *MAC-CellGroupConfig* of the MCG. It is absent otherwise. |

*NEXT CHANGE*

#### – *PDCP-Config*

The IE *PDCP-Config* is used to set the configurable PDCP parameters for signalling and data radio bearers.

*PDCP-Config* information element

-- ASN1START

-- TAG-PDCP-CONFIG-START

PDCP-Config ::= SEQUENCE {

drb SEQUENCE {

discardTimer ENUMERATED {ms10, ms20, ms30, ms40, ms50, ms60, ms75, ms100, ms150, ms200,

ms250, ms300, ms500, ms750, ms1500, infinity} OPTIONAL, -- Cond Setup

pdcp-SN-SizeUL ENUMERATED {len12bits, len18bits} OPTIONAL, -- Cond Setup2

pdcp-SN-SizeDL ENUMERATED {len12bits, len18bits} OPTIONAL, -- Cond Setup2

headerCompression CHOICE {

notUsed NULL,

rohc SEQUENCE {

maxCID INTEGER (1..16383) DEFAULT 15,

profiles SEQUENCE {

profile0x0001 BOOLEAN,

profile0x0002 BOOLEAN,

profile0x0003 BOOLEAN,

profile0x0004 BOOLEAN,

profile0x0006 BOOLEAN,

profile0x0101 BOOLEAN,

profile0x0102 BOOLEAN,

profile0x0103 BOOLEAN,

profile0x0104 BOOLEAN

},

drb-ContinueROHC ENUMERATED { true } OPTIONAL -- Need N

},

uplinkOnlyROHC SEQUENCE {

maxCID INTEGER (1..16383) DEFAULT 15,

profiles SEQUENCE {

profile0x0006 BOOLEAN

},

drb-ContinueROHC ENUMERATED { true } OPTIONAL -- Need N

},

...

},

integrityProtection ENUMERATED { enabled } OPTIONAL, -- Cond ConnectedTo5GC1

statusReportRequired ENUMERATED { true } OPTIONAL, -- Cond Rlc-AM

outOfOrderDelivery ENUMERATED { true } OPTIONAL -- Need R

} OPTIONAL, -- Cond DRB

moreThanOneRLC SEQUENCE {

primaryPath SEQUENCE {

cellGroup CellGroupId OPTIONAL, -- Need R

logicalChannel LogicalChannelIdentity OPTIONAL -- Need R

},

ul-DataSplitThreshold UL-DataSplitThreshold OPTIONAL, -- Cond SplitBearer

pdcp-Duplication BOOLEAN OPTIONAL -- Need R

} OPTIONAL, -- Cond MoreThanOneRLC

t-Reordering ENUMERATED {

ms0, ms1, ms2, ms4, ms5, ms8, ms10, ms15, ms20, ms30, ms40,

ms50, ms60, ms80, ms100, ms120, ms140, ms160, ms180, ms200, ms220,

ms240, ms260, ms280, ms300, ms500, ms750, ms1000, ms1250,

ms1500, ms1750, ms2000, ms2250, ms2500, ms2750,

ms3000, spare28, spare27, spare26, spare25, spare24,

spare23, spare22, spare21, spare20,

spare19, spare18, spare17, spare16, spare15, spare14,

spare13, spare12, spare11, spare10, spare09,

spare08, spare07, spare06, spare05, spare04, spare03,

spare02, spare01 } OPTIONAL, -- Need S

...,

[[

cipheringDisabled ENUMERATED {true} OPTIONAL -- Cond ConnectedTo5GC

]],

[[

moreThanTwoRLC-r16 SEQUENCE {

secondaryPath LogicalChannelIdentity OPTIONAL, -- Cond SplitBearer2

duplicationState SEQUENCE (SIZE (3)) OF BOOLEAN OPTIONAL -- Need M

} OPTIONAL, -- Cond MoreThanTwoRLC

ethernetHeaderCompression-r16 CHOICE {

notUsed NULL,

ehc SEQUENCE {

ehc-Common SEQUENCE {

ehc-HeaderSize ENUMERATED { byte1, byte2 },

...

}

ehc-Downlink SEQUENCE {

drb-ContinueEHC-DL ENUMERATED { true } OPTIONAL, -- Need N

...

} OPTIONAL, -- Need N

ehc-Uplink SEQUENCE {

drb-ContinueEHC-UL ENUMERATED { true } OPTIONAL, -- Need N

...

} OPTIONAL, -- Need N

...

},

...

} OPTIONAL -- Cond DRB

]]

}

UL-DataSplitThreshold ::= ENUMERATED {

b0, b100, b200, b400, b800, b1600, b3200, b6400, b12800, b25600, b51200, b102400, b204800,

b409600, b819200, b1228800, b1638400, b2457600, b3276800, b4096000, b4915200, b5734400,

b6553600, infinity, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1}

-- TAG-PDCP-CONFIG-STOP

-- ASN1STOP

| *PDCP-Config* field descriptions |
| --- |
| ***cipheringDisabled***  If included, ciphering is disabled for this DRB regardless of which ciphering algorithm is configured for the SRB/DRBs. The field may only be included if the UE is connected to 5GC. Otherwise the field is absent. The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. |
| ***discardTimer***  Value in ms of *discardTimer* specified in TS 38.323 [5]. Value *ms10* corresponds to 10 ms, value *ms20* corresponds to 20 ms and so on. |
| ***duplicationState***  This field indicates the initial uplink PDCP duplication state for the associated RLC entities. If set to *true,* the initial PDCP duplication state is activated for the associated RLC entity. The index for the indication is determined by ascending order of logical channel ID of all RLC entities other than the primary RLC entityindicated by *primaryPath* in the order of MCG and SCG, as in clause 6.1.3.Y of TS 38.321 [3]. If the number of associated RLC entities other than the primary RLC entity is two, UE ignores the value in the largest index of this field. The initial PDCP duplication state of the associated RLC entity is always activated for SRB. |
| ***drb-ContinueEHC-DL, drb-ContinueEHC-UL***  The fieldsindicate whether the PDCP entity continues or resets the EHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. The field *drb-ContinueEHC-DL* indicates whether the PDCP entity continues or resets for downlink and the field *drb-ContinueEHC-UL* indicates whether the PDCP entity continues or resets for uplink. These fields are configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. |
| ***drb-ContinueROHC***  Indicates whether the PDCP entity continues or resets the ROHC header compression protocol during PDCP re-establishment, as specified in TS 38.323 [5]. This field is configured only in case of resuming an RRC connection or reconfiguration with sync, where the PDCP termination point is not changed and the *fullConfig* is not indicated. |
| ***ehc-HeaderSize***  Indicates the size of the header for EHC packet. |
| ***ethernetHeaderCompression***  If *ehc-Downlink* is configured, then Ethernet header compression is configured for downlink. Otherwise, it is not configured for downlink.  If *ehc-Uplink* is configured, then Ethernet header compression is configured for uplink. Otherwise, it is not configured for uplink.  The fields in *ehc-Common* applies for both downlink and uplink once configured. Ethernet Header compression can only be configured for DRB. |
| ***headerCompression***  If rohc is configured, the UE shall apply the configured ROHC profile(s) in both uplink and downlink. If *uplinkOnlyROHC* is configured, the UE shall apply the configured ROHC profile(s) in uplink (there is no header compression in downlink). ROHC can be configured for any bearer type. ROHC and EHC can be both configured simultaneously for a DRB. The network reconfigures *headerCompression* only upon reconfiguration involving PDCP re-establishment. Network configures *headerCompression* to *notUsed* when *outOfOrderDelivery* is configured. |
| ***integrityProtection***  Indicates whether or not integrity protection is configured for this radio bearer. The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. |
| ***maxCID***  Indicates the value of the MAX\_CID parameter as specified in TS 38.323 [5].  The total value of MAX\_CIDs across all bearers for the UE should be less than or equal to the value of *maxNumberROHC-ContextSessions* parameter as indicated by the UE. |
| ***moreThanOneRLC***  This field configures UL data transmission when more than one RLC entity is associated with the PDCP entity. |
| ***moreThanTwoRLC***  This field configures UL data transmission when more than two RLC entities are associated with the PDCP entity. The presence of this field indicates that PDCP duplication is configured. PDCP duplication is not configured for CA packet duplication of LTE RLC bearer. |
| ***outOfOrderDelivery***  Indicates whether or not *outOfOrderDelivery* specified in TS 38.323 [5] is configured. This field should be either always present or always absent, after the radio bearer is established. |
| ***pdcp-Duplication***  Indicates whether or not uplink duplication status at the time of receiving this IE is configured and activated as specified in TS 38.323 [5]. The presence of this field indicates that duplication is configured. PDCP duplication is not configured for CA packet duplication of LTE RLC bearer. The value of this field, when the field is present, indicates the initial state of the duplication. If set to *true*, duplication is activated. The value of this field is always *true*, when configured for a SRB. This field is absent, if the field *moreThanTwoRLC* is present. |
| ***pdcp-SN-SizeDL***  PDCP sequence number size for downlink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value *len12bits* is applicable. |
| ***pdcp-SN-SizeUL***  PDCP sequence number size for uplink, 12 or 18 bits, as specified in TS 38.323 [5]. For SRBs only the value *len12bits* is applicable. |
| ***primaryPath***  Indicates the cell group ID and LCID of the primary RLC entity as specified in TS 38.323 [5], clause 5.2.1 for UL data transmission when more than one RLC entity is associated with the PDCP entity. In this version of the specification, only cell group ID corresponding to MCG is supported for SRBs. The NW indicates *cellGroup* for split bearers using logical channels in different cell groups. The NW indicates *logicalChannel* for CA based PDCP duplication, i.e., if both logical channels terminate in the same cell group. |
| ***secondaryPath***  Indicates the LCID of the split secondary RLC entity as specified in TS 38.323 [5] for fallback to split bearer operation when UL data transmission with more than two RLC entities is associated with the PDCP entity. This RLC entity belongs to a cell group that is different from the cell group indicated by *cellGroup* in the field *primaryPath.* |
| ***statusReportRequired***  For AM DRBs, indicates whether the DRB is configured to send a PDCP status report in the uplink, as specified in TS 38.323 [5]. |
| ***t-Reordering***  Value in ms of t-Reordering specified in TS 38.323 [5]. Value *ms0* corresponds to 0 ms, value *ms20* corresponds to 20 ms, value *ms40* corresponds to 40 ms, and so on. When the field is absent the UE applies the value *infinity*. |
| ***ul-DataSplitThreshold***  Parameter specified in TS 38.323 [5]. Value *b0* corresponds to 0 bytes, value *b100* corresponds to 100 bytes, value *b200* corresponds to 200 bytes, and so on. The network sets this field to *infinity* for UEs not supporting *splitDRB-withUL-Both-MCG-SCG*. If the field is absent when the split bearer is configured for the radio bearer first time, then the default value *infinity* is applied. |

| Conditional presence | Explanation |
| --- | --- |
| *DRB* | This field is mandatory present when the corresponding DRB is being set up, absent for SRBs. Otherwise this field is optionally present, need M. |
| *MoreThanOneRLC* | This field is mandatory present upon RRC reconfiguration with setup of a PDCP entity for a radio bearer with more than one associated logical channel and upon RRC reconfiguration with the association of additional logical channels to the PDCP entity.  The field is also mandatory present in case the field *moreThanTwoRLC* is included in *PDCP-Config*.  Upon RRC reconfiguration when a PDCP entity is associated with multiple logical channels, this field is optionally present need M. Otherwise, this field is absent. Need R. |
| *MoreThanTwoRLC* | This field is mandatory present upon RRC reconfiguration with setup of a PDCP entity for a radio bearer with more than two associated logical channels and upon RRC reconfiguration with the association of more than one additional logical channel to the PDCP entity.  Upon RRC reconfiguration when none of the RLC entities is re-established, this field is optionally present, Need M. Otherwise, the field is absent, Need R. |
| *Rlc-AM* | For RLC AM, the field is optionally present, need R. Otherwise, the field is absent. |
| *Setup* | The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need M. |
| *SplitBearer* | The field is absent for SRBs. Otherwise, the field is optional present, need M, in case of radio bearer with more than one associated RLC mapped to different cell groups. |
| *SplitBearer2* | The field is mandatory present, in case of a split radio bearer. Otherwise the field is absent. |
| *ConnectedTo5GC* | The field is optionally present, need R, if the UE is connected to 5GC. Otherwise the field is absent. |
| *ConnectedTo5GC1* | The field is optionally present, need R, if the UE is connected to NR/5GC. Otherwise the field is absent. |
| *Setup2* | This field is mandatory present in case for radio bearer setup for RLC-AM and RLC-UM. Otherwise, this field is absent, Need M. |

*NEXT CHANGE*

#### – *ReferenceTimeInfo*

The IE *ReferenceTimeInfo* contains timing information for 5G internal system clock used for, e.g., time stamping, see TS 23.501 [32], clause 5.27.1.2.

*ReferenceTimeInfo* information element

-- ASN1START

-- TAG-REFERENCETIMEINFO-START

ReferenceTimeInfo-r16 ::= SEQUENCE {

time-r16 ReferenceTime-r16,

uncertainty-r16 INTEGER (0..32767) OPTIONAL, -- Need R

timeInfoType-r16 ENUMERATED {localClock} OPTIONAL, -- Need R

referenceSFN-r16 INTEGER (0..1023) OPTIONAL, -- Cond RefTime

}

ReferenceTime-r16 ::= SEQUENCE {

refDays-r16 INTEGER (0..72999),

refSeconds-r16 INTEGER (0..86399),

refMilliSeconds-r16 INTEGER (0..999),

refTenNanoSeconds-r16 INTEGER (0..99999)

}

-- TAG-REFERENCETIMEINFO-STOP

-- ASN1STOP

|  |
| --- |
| *ReferenceTimeInfo field descriptions* |
| ***referenceSFN***  This field indicates the reference SFN corresponding to the reference time information. If *referenceTimeInfo* field is received in *DLInformationTransfer* message, this field indicates the SFN of PCell. |
| ***time***  This field indicates time reference with 10ns granularity. The indicated time is referenced at the network, i.e., without compensating for RF propagation delay. The indicated time in 10ns unit from the origin is *refDays*\*86400\*1000\*100000 + *refSeconds*\*1000\*100000 + *refMilliSeconds*\*100000 + *refTenNanoSeconds*. The *refDays* field specifies the sequential number of days (with day count starting at 0) from the origin of the *time* field.  If the *referenceTimeInfo* field is received in *DLInformationTransfer* message, the time field indicates the *time* at the ending boundary of the system frame indicated by *referenceSFN*. The UE considers this frame (indicated by *referenceSFN*) to be the frame which is nearest to the frame where the message is received (which can be either in the past or in the future).  If the *referenceTimeInfo* field is received in *SIB9*, the *time* field indicates the time at the SFN boundary at or immediately after the ending boundary of the SI-window in which *SIB9* is transmitted.  If *referenceTimeInfo* field is received in *SIB9*, this field is excluded when determining changes in system information, i.e. changes of time should neither result in system information change notifications nor in a modification of *valueTag* in *SIB1*. |
| ***timeInfoType***  If *timeInfoType* is not included, the *time* indicates the GPS time and the origin of the *time* field is 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time). If *timeInfoType* is set to *localClock*, the origin of the *time* is unspecified. |
| ***uncertainty***  This field indicates the uncertainty of the reference time information provided by the time field. The uncertainty is 25ns multiplied by this field*.* If this field is absent, the uncertainty is unspecified. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *RefTime* | The field is mandatory present if *referenceTimeInfo* is included in *DLInformationTransfer* message; otherwise the field is absent. |

*NEXT CHANGE*

#### – *SchedulingRequestResourceConfig*

The IE *SchedulingRequestResourceConfig* determines physical layer resources on PUCCH where the UE may send the dedicated scheduling request (D-SR) (see TS 38.213 [13], clause 9.2.4).

*SchedulingRequestResourceConfig* information element

-- ASN1START

-- TAG-SCHEDULINGREQUESTRESOURCECONFIG-START

SchedulingRequestResourceConfig ::= SEQUENCE {

schedulingRequestResourceId SchedulingRequestResourceId,

schedulingRequestID SchedulingRequestId,

periodicityAndOffset CHOICE {

sym2 NULL,

sym6or7 NULL,

sl1 NULL, -- Recurs in every slot

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)

} OPTIONAL, -- Need M

resource PUCCH-ResourceId OPTIONAL -- Need M

}

SchedulingRequestResourceConfig-v16xy ::= SEQUENCE {

phy-PriorityIndex-r16 ENUMERATED {p0, p1} OPTIONAL, -- Need M

...

}

-- TAG-SCHEDULINGREQUESTRESOURCECONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *SchedulingRequestResourceConfig* field descriptions |
| ***periodicityAndOffset***  SR periodicity and offset in number of symbols or slots (see TS 38.213 [13], clause 9.2.4) The following periodicities may be configured depending on the chosen subcarrier spacing:  SCS = 15 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 5sl, 8sl, 10sl, 16sl, 20sl, 40sl, 80sl  SCS = 30 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 8sl, 10sl, 16sl, 20sl, 40sl, 80sl, 160sl  SCS = 60 kHz: 2sym, 7sym/6sym, 1sl, 2sl, 4sl, 8sl, 16sl, 20sl, 40sl, 80sl, 160sl, 320sl  SCS = 120 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 8sl, 16sl, 40sl, 80sl, 160sl, 320sl, 640sl  sym6or7 corresponds to 6 symbols if extended cyclic prefix and a SCS of 60 kHz are configured, otherwise it corresponds to 7 symbols.  For periodicities 2sym, 7sym and sl1 the UE assumes an offset of 0 slots. |
| ***phy-PriorityIndex***  Indicates whether this scheduling request resource is *high* or *low* priority in PHY prioritization/multiplexing handling (see TS 38.213 [13], clause 9.2.4). Value *p0* indicates low priority and value *p1* indicates high priority. |
| ***resource***  ID of the PUCCH resource in which the UE shall send the scheduling request. The actual *PUCCH-Resource* is configured in *PUCCH-Config* of the same UL BWP and serving cell as this *SchedulingRequestResourceConfig*. The network configures a *PUCCH-Resource* of *PUCCH-format0* or *PUCCH-format1* (other formats not supported) (see TS 38.213 [13], clause 9.2.4) |
| ***schedulingRequestID***  The ID of the *SchedulingRequestConfig* that uses this scheduling request resource. |

*NEXT CHANGE*

#### – *SPS-Config*

The IE *SPS-Config* is used to configure downlink semi-persistent transmission. Multiple Downlink SPS configurations may be configured in one BWP of a serving cell.

*SPS-Config* information element

-- ASN1START

-- TAG-SPS-CONFIG-START

SPS-Config ::= SEQUENCE {

periodicity ENUMERATED {ms10, ms20, ms32, ms40, ms64, ms80, ms128, ms160, ms320, ms640,

spare6, spare5, spare4, spare3, spare2, spare1},

nrofHARQ-Processes INTEGER (1..8),

n1PUCCH-AN PUCCH-ResourceId OPTIONAL, -- Need M

mcs-Table ENUMERATED {qam64LowSE} OPTIONAL, -- Need S

...,

[[

sps-ConfigIndex-r16 SPS-ConfigIndex-r16 OPTIONAL, -- Need N

harq-ProcID-Offset-r16 INTEGER (0..15) OPTIONAL, -- Need N

periodicityExt-r16 INTEGER (1..5120) OPTIONAL, -- Need N

harq-CodebookID-r16 INTEGER (1..2) OPTIONAL -- Need N

]]

}

-- TAG-SPS-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *SPS-Config* field descriptions |
| ***harq-CodebookID***  Indicates the HARQ-ACK codebook index for the corresponding HARQ-ACK codebook for SPS PDSCH and ACK for SPS PDSCH release. |
| ***harq-ProcID-Offset***  Indicates the offset used in deriving the HARQ process IDs, see TS 38.321 [3], clause 5.3.1. |
| ***mcs-Table***  Indicates the MCS table the UE shall use for DL SPS (see TS 38.214 [19],clause 5.1.3.1. If present, the UE shall use the MCS table of low-SE 64QAM table indicated in Table 5.1.3.1-3 of TS 38.214 [19]. If this field is absent and field mcs-table in PDSCH-Config is set to 'qam256' and the activating DCI is of format 1\_1, the UE applies the 256QAM table indicated in Table 5.1.3.1-2 of TS 38.214 [19]. Otherwise, the UE applies the non-low-SE 64QAM table indicated in Table 5.1.3.1-1 of TS 38.214 [19]. |
| ***n1PUCCH-AN***  HARQ resource for PUCCH for DL SPS. The network configures the resource either as format0 or format1. The actual *PUCCH-Resource* is configured in *PUCCH-Config* and referred to by its ID. See TS 38.213 [13], clause 9.2.3. |
| ***nrofHARQ-Processes***  Number of configured HARQ processes for SPS DL (see TS 38.321 [3], clause 5.8.1). |
| ***periodicity***  Periodicity for DL SPS (see TS 38.214 [19] and TS 38.321 [3], clause 5.8.1). |
| ***periodicityExt***  This field is used to calculate the periodicity for DL SPS (see TS 38.214 [19] and see TS 38.321 [3], clause 5,8.1). If this field is present, the field *periodicity* is ignored.  The following periodicities are supported depending on the configured subcarrier spacing [slots]:  15 kHz: *periodicityExt*, where *periodicityExt* has a value between 1 and 640.  30 kHz: *periodicityExt*, where *periodicityExt* has a value between 1 and 1280.  60 kHz with normal CP: *periodicityExt*, where *periodicityExt* has a value between 1 and 2560.  60 kHz with ECP: *periodicityExt*, where *periodicityExt* has a value between 1 and 2560.  120 kHz: *periodicityExt*, where *periodicityExt* has a value between 1 and 5120. |
| ***sps-ConfigIndex***  Indicates the index of one of multiple SPS configurations. |

#### – *SPS-ConfigIndex*

The IE *SPS-ConfigIndex* is used to indicate the index of one of multiple DL SPS configurations in one BWP.

*SPS-ConfigIndex* information element

-- ASN1START

-- TAG-SPS-CONFIGINDEX-START

SPS-ConfigIndex-r16 ::= INTEGER (0.. maxNrofSPS-Config-r16-1)

-- TAG-SPS-CONFIGINDEX-STOP

-- ASN1STOP

#### – *SPS-ConfigList*

The IE *SPS-ConfigList* is used to configure multiple downlink SPS configurations in one BWP.

*SPS-ConfigList* information element

-- ASN1START

-- TAG-SPS-CONFIGLIST-START

SPS-ConfigList-r16 ::= SEQUENCE {

sps-ConfigDeactivationStateList-r16 SPS-ConfigDeactivationStateList-r16 OPTIONAL, -- Need N

sps-ConfigToAddModList-r16 SPS-ConfigToAddModList-r16 OPTIONAL, -- Need N

sps-ConfigToReleaseList-r16 SPS-ConfigToReleaseList-r16 OPTIONAL, -- Need N

sps-PUCCH-AN-ListPerCodebook-r16 SPS-PUCCH-AN-ListPerCodebook-r16 OPTIONAL -- Need N

}

SPS-ConfigToAddModList-r16 ::= SEQUENCE (SIZE (1..maxNrofSPS-Config-r16)) OF SPS-Config

SPS-ConfigToReleaseList-r16 ::= SEQUENCE (SIZE (1..maxNrofSPS-Config-r16)) OF SPS-ConfigIndex-r16

SPS-ConfigDeactivationState-r16 ::= SEQUENCE (SIZE (1..maxNrofSPS-Config-r16)) OF SPS-ConfigIndex-r16

SPS-ConfigDeactivationStateList-r16 ::= SEQUENCE (SIZE (1..16)) OF SPS-ConfigDeactivationState-r16

SPS-PUCCH-AN-ListPerCodebook-r16 ::= SEQUENCE (SIZE (1..2)) OF SPS-PUCCH-AN-List-r16

-- TAG-SPS-CONFIGLIST-STOP

-- ASN1STOP

|  |
| --- |
| *SPS-ConfigList field descriptions* |
| ***sps-ConfigDeactivationStateList***  Indicates a list of the deactivation states in which each state can be mapped to a single or multiple SPS configurations to be deactivated, see clause 10.2 in TS 38.213 [13] . If a state is mapped to multiple SPS configurations, each of these SPS configurations is configured with the same *harq-CodebookID*. |
| ***sps-ConfigToAddModList***  Indicates a list of multiple DL SPS configurations to be added or modified. |
| ***sps-ConfigToReleaseList***  Indicates a list of multiple DL SPS configurations to be released. |
| ***sps-PUCCH-AN-ListPerCodebook***  Indicates a list of PUCCH resources per configured HARQ-ACK codebook. The PUCCH resources are common for all SPS configurations with the indicated HARQ-ACK codebook. If configured, this overrides *n1PUCCH-AN* in *SPS-config*. |

#### – *SPS-PUCCH-AN*

The IE *SPS-PUCCH-AN* is used to indicate a PUCCH resource for HARQ ACK and configure the corresponding maximum payload size for the PUCCH resource.

*SPS-PUCCH-AN* information element

-- ASN1START

-- TAG-SPS-PUCCH-AN-START

SPS-PUCCH-AN-r16 ::= SEQUENCE {

sps-PUCCH-AN-ResourceID-r16 PUCCH-ResourceId,

maxPayloadSize-r16 INTEGER (4..256) OPTIONAL -- Need N

}

-- TAG-SPS-PUCCH-AN-STOP

-- ASN1STOP

|  |
| --- |
| *SPS-PUCCH-AN field descriptions* |
| ***maxPayloadSize***  Indicates the maximum payload size for the corresponding PUCCH resource ID. |
| ***sps-PUCCH-AN-ResourceID***  Indicates the PUCCH resource ID |

#### – *SPS-PUCCH-AN-List*

The IE *SPS-PUCCH-AN-List* is used to configure the list of PUCCH resources per HARQ ACK codebook

*SPS-PUCCH-AN-List* information element

-- ASN1START

-- TAG-SPS-PUCCH-AN-LIST-START

SPS-PUCCH-AN-List-r16 ::= SEQUENCE {

harq-CodebookID-r16 INTEGER (1..2),

sps-PUCCH-AN-CodebookResource-r16 SEQUENCE (SIZE(1..4)) OF SPS-PUCCH-AN-r16

}

-- TAG-SPS-PUCCH-AN-LIST-STOP

-- ASN1STOP

|  |
| --- |
| *SPS-PUCCH-AN-List field descriptions* |
| ***harq-CodebookID***  Indicates the HARQ codebook ID. |
| ***sps-PUCCH-AN-CodebookResource***  Indicates a list of PUCCH resources for HARQ ACK. The field *maxPayloadSize* is absent for the first and the last *SPS-PUCCH-AN* in the list. |

*NEXT CHANGE*

## 6.4 RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-START

maxBandComb INTEGER ::= 65536 -- Maximum number of DL band combinations

maxCellBlack INTEGER ::= 16 -- Maximum number of NR blacklisted cell ranges in SIB3, SIB4

maxCellInter INTEGER ::= 16 -- Maximum number of inter-Freq cells listed in SIB4

maxCellIntra INTEGER ::= 16 -- Maximum number of intra-Freq cells listed in SIB3

maxCellMeasEUTRA INTEGER ::= 32 -- Maximum number of cells in E-UTRAN

maxEARFCN INTEGER ::= 262143 -- Maximum value of E-UTRA carrier frequency

maxEUTRA-CellBlack INTEGER ::= 16 -- Maximum number of E-UTRA blacklisted physical cell identity ranges

-- in SIB5

maxEUTRA-NS-Pmax INTEGER ::= 8 -- Maximum number of NS and P-Max values per band

maxMultiBands INTEGER ::= 8 -- Maximum number of additional frequency bands that a cell belongs to

maxNARFCN INTEGER ::= 3279165 -- Maximum value of NR carrier frequency

maxNR-NS-Pmax INTEGER ::= 8 -- Maximum number of NS and P-Max values per band

maxNrofServingCells INTEGER ::= 32 -- Max number of serving cells (SpCells + SCells)

maxNrofServingCells-1 INTEGER ::= 31 -- Max number of serving cells (SpCell + SCells) per cell group

maxNrofAggregatedCellsPerCellGroup INTEGER ::= 16

maxNrofSCells INTEGER ::= 31 -- Max number of secondary serving cells per cell group

maxNrofCellMeas INTEGER ::= 32 -- Maximum number of entries in each of the cell lists in a measurement

-- object

maxNrofSS-BlocksToAverage INTEGER ::= 16 -- Max number for the (max) number of SS blocks to average to determine cell

-- measurement

maxNrofCSI-RS-ResourcesToAverage INTEGER ::= 16 -- Max number for the (max) number of CSI-RS to average to determine cell

-- measurement

maxNrofDL-Allocations INTEGER ::= 16 -- Maximum number of PDSCH time domain resource allocations

maxNrofSR-ConfigPerCellGroup INTEGER ::= 8 -- Maximum number of SR configurations per cell group

maxLCG-ID INTEGER ::= 7 -- Maximum value of LCG ID

maxLC-ID INTEGER ::= 32 -- Maximum value of Logical Channel ID

maxNrofTAGs INTEGER ::= 4 -- Maximum number of Timing Advance Groups

maxNrofTAGs-1 INTEGER ::= 3 -- Maximum number of Timing Advance Groups minus 1

maxNrofBWPs INTEGER ::= 4 -- Maximum number of BWPs per serving cell

maxNrofCombIDC INTEGER ::= 128 -- Maximum number of reported MR-DC combinations for IDC

maxNrofSymbols-1 INTEGER ::= 13 -- Maximum index identifying a symbol within a slot (14 symbols, indexed

-- from 0..13)

maxNrofSlots INTEGER ::= 320 -- Maximum number of slots in a 10 ms period

maxNrofSlots-1 INTEGER ::= 319 -- Maximum number of slots in a 10 ms period minus 1

maxNrofPhysicalResourceBlocks INTEGER ::= 275 -- Maximum number of PRBs

maxNrofPhysicalResourceBlocks-1 INTEGER ::= 274 -- Maximum number of PRBs minus 1

maxNrofPhysicalResourceBlocksPlus1 INTEGER ::= 276 -- Maximum number of PRBs plus 1

maxNrofControlResourceSets-1 INTEGER ::= 11 -- Max number of CoReSets configurable on a serving cell minus 1

maxCoReSetDuration INTEGER ::= 3 -- Max number of OFDM symbols in a control resource set

maxNrofSearchSpaces-1 INTEGER ::= 39 -- Max number of Search Spaces minus 1

maxSFI-DCI-PayloadSize INTEGER ::= 128 -- Max number payload of a DCI scrambled with SFI-RNTI

maxSFI-DCI-PayloadSize-1 INTEGER ::= 127 -- Max number payload of a DCI scrambled with SFI-RNTI minus 1

maxINT-DCI-PayloadSize INTEGER ::= 126 -- Max number payload of a DCI scrambled with INT-RNTI

maxINT-DCI-PayloadSize-1 INTEGER ::= 125 -- Max number payload of a DCI scrambled with INT-RNTI minus 1

maxNrofRateMatchPatterns INTEGER ::= 4 -- Max number of rate matching patterns that may be configured

maxNrofRateMatchPatterns-1 INTEGER ::= 3 -- Max number of rate matching patterns that may be configured minus 1

maxNrofRateMatchPatternsPerGroup INTEGER ::= 8 -- Max number of rate matching patterns that may be configured in one group

maxNrofCSI-ReportConfigurations INTEGER ::= 48 -- Maximum number of report configurations

maxNrofCSI-ReportConfigurations-1 INTEGER ::= 47 -- Maximum number of report configurations minus 1

maxNrofCSI-ResourceConfigurations INTEGER ::= 112 -- Maximum number of resource configurations

maxNrofCSI-ResourceConfigurations-1 INTEGER ::= 111 -- Maximum number of resource configurations minus 1

maxNrofAP-CSI-RS-ResourcesPerSet INTEGER ::= 16

maxNrOfCSI-AperiodicTriggers INTEGER ::= 128 -- Maximum number of triggers for aperiodic CSI reporting

maxNrofReportConfigPerAperiodicTrigger INTEGER ::= 16 -- Maximum number of report configurations per trigger state for aperiodic

-- reporting

maxNrofNZP-CSI-RS-Resources INTEGER ::= 192 -- Maximum number of Non-Zero-Power (NZP) CSI-RS resources

maxNrofNZP-CSI-RS-Resources-1 INTEGER ::= 191 -- Maximum number of Non-Zero-Power (NZP) CSI-RS resources minus 1

maxNrofNZP-CSI-RS-ResourcesPerSet INTEGER ::= 64 -- Maximum number of NZP CSI-RS resources per resource set

maxNrofNZP-CSI-RS-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-RS resources per cell

maxNrofNZP-CSI-RS-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-RS resources per cell minus 1

maxNrofNZP-CSI-RS-ResourceSetsPerConfig INTEGER ::= 16 -- Maximum number of resource sets per resource configuration

maxNrofNZP-CSI-RS-ResourcesPerConfig INTEGER ::= 128 -- Maximum number of resources per resource configuration

maxNrofZP-CSI-RS-Resources INTEGER ::= 32 -- Maximum number of Zero-Power (ZP) CSI-RS resources

maxNrofZP-CSI-RS-Resources-1 INTEGER ::= 31 -- Maximum number of Zero-Power (ZP) CSI-RS resources minus 1

maxNrofZP-CSI-RS-ResourceSets-1 INTEGER ::= 15

maxNrofZP-CSI-RS-ResourcesPerSet INTEGER ::= 16

maxNrofZP-CSI-RS-ResourceSets INTEGER ::= 16

maxNrofCSI-IM-Resources INTEGER ::= 32 -- Maximum number of CSI-IM resources. See CSI-IM-ResourceMax in 38.214.

maxNrofCSI-IM-Resources-1 INTEGER ::= 31 -- Maximum number of CSI-IM resources minus 1. See CSI-IM-ResourceMax

-- in 38.214.

maxNrofCSI-IM-ResourcesPerSet INTEGER ::= 8 -- Maximum number of CSI-IM resources per set. See CSI-IM-ResourcePerSetMax

-- in 38.214

maxNrofCSI-IM-ResourceSets INTEGER ::= 64 -- Maximum number of NZP CSI-IM resources per cell

maxNrofCSI-IM-ResourceSets-1 INTEGER ::= 63 -- Maximum number of NZP CSI-IM resources per cell minus 1

maxNrofCSI-IM-ResourceSetsPerConfig INTEGER ::= 16 -- Maximum number of CSI IM resource sets per resource configuration

maxNrofCSI-SSB-ResourcePerSet INTEGER ::= 64 -- Maximum number of SSB resources in a resource set

maxNrofCSI-SSB-ResourceSets INTEGER ::= 64 -- Maximum number of CSI SSB resource sets per cell

maxNrofCSI-SSB-ResourceSets-1 INTEGER ::= 63 -- Maximum number of CSI SSB resource sets per cell minus 1

maxNrofCSI-SSB-ResourceSetsPerConfig INTEGER ::= 1 -- Maximum number of CSI SSB resource sets per resource configuration

maxNrofFailureDetectionResources INTEGER ::= 10 -- Maximum number of failure detection resources

maxNrofFailureDetectionResources-1 INTEGER ::= 9 -- Maximum number of failure detection resources minus 1

maxNrofObjectId INTEGER ::= 64 -- Maximum number of measurement objects

maxNrofPageRec INTEGER ::= 32 -- Maximum number of page records

maxNrofPCI-Ranges INTEGER ::= 8 -- Maximum number of PCI ranges

maxPLMN INTEGER ::= 12 -- Maximum number of PLMNs broadcast and reported by UE at establisghment

maxNrofCSI-RS-ResourcesRRM INTEGER ::= 96 -- Maximum number of CSI-RS resources for an RRM measurement object

maxNrofCSI-RS-ResourcesRRM-1 INTEGER ::= 95 -- Maximum number of CSI-RS resources for an RRM measurement object minus 1

maxNrofMeasId INTEGER ::= 64 -- Maximum number of configured measurements

maxNrofQuantityConfig INTEGER ::= 2 -- Maximum number of quantity configurations

maxNrofCSI-RS-CellsRRM INTEGER ::= 96 -- Maximum number of cells with CSI-RS resources for an RRM measurement

-- object

maxNrofSRS-ResourceSets INTEGER ::= 16 -- Maximum number of SRS resource sets in a BWP.

maxNrofSRS-ResourceSets-1 INTEGER ::= 15 -- Maximum number of SRS resource sets in a BWP minus 1.

maxNrofSRS-Resources INTEGER ::= 64 -- Maximum number of SRS resources.

maxNrofSRS-Resources-1 INTEGER ::= 63 -- Maximum number of SRS resources in an SRS resource set minus 1.

maxNrofSRS-ResourcesPerSet INTEGER ::= 16 -- Maximum number of SRS resources in an SRS resource set

maxNrofSRS-TriggerStates-1 INTEGER ::= 3 -- Maximum number of SRS trigger states minus 1, i.e., the largest code

-- point.

maxNrofSRS-TriggerStates-2 INTEGER ::= 2 -- Maximum number of SRS trigger states minus 2.

maxRAT-CapabilityContainers INTEGER ::= 8 -- Maximum number of interworking RAT containers (incl NR and MRDC)

maxSimultaneousBands INTEGER ::= 32 -- Maximum number of simultaneously aggregated bands

maxNrofSlotFormatCombinationsPerSet INTEGER ::= 512 -- Maximum number of Slot Format Combinations in a SF-Set.

maxNrofSlotFormatCombinationsPerSet-1 INTEGER ::= 511 -- Maximum number of Slot Format Combinations in a SF-Set minus 1.

maxNrofPUCCH-Resources INTEGER ::= 128

maxNrofPUCCH-Resources-1 INTEGER ::= 127

maxNrofPUCCH-ResourceSets INTEGER ::= 4 -- Maximum number of PUCCH Resource Sets

maxNrofPUCCH-ResourceSets-1 INTEGER ::= 3 -- Maximum number of PUCCH Resource Sets minus 1.

maxNrofPUCCH-ResourcesPerSet INTEGER ::= 32 -- Maximum number of PUCCH Resources per PUCCH-ResourceSet

maxNrofPUCCH-P0-PerSet INTEGER ::= 8 -- Maximum number of P0-pucch present in a p0-pucch set

maxNrofPUCCH-PathlossReferenceRSs INTEGER ::= 4 -- Maximum number of RSs used as pathloss reference for PUCCH power control.

maxNrofPUCCH-PathlossReferenceRSs-1 INTEGER ::= 3 -- Maximum number of RSs used as pathloss reference for PUCCH power

-- control minus 1.

maxNrofP0-PUSCH-AlphaSets INTEGER ::= 30 -- Maximum number of P0-pusch-alpha-sets (see 38,213, clause 7.1)

maxNrofP0-PUSCH-AlphaSets-1 INTEGER ::= 29 -- Maximum number of P0-pusch-alpha-sets minus 1 (see 38,213, clause 7.1)

maxNrofPUSCH-PathlossReferenceRSs INTEGER ::= 4 -- Maximum number of RSs used as pathloss reference for PUSCH power control.

maxNrofPUSCH-PathlossReferenceRSs-1 INTEGER ::= 3 -- Maximum number of RSs used as pathloss reference for PUSCH power

-- control minus 1.

maxNrofNAICS-Entries INTEGER ::= 8 -- Maximum number of supported NAICS capability set

maxBands INTEGER ::= 1024 -- Maximum number of supported bands in UE capability.

maxBandsMRDC INTEGER ::= 1280

maxBandsEUTRA INTEGER ::= 256

maxCellReport INTEGER ::= 8

maxDRB INTEGER ::= 29 -- Maximum number of DRBs (that can be added in DRB-ToAddModLIst).

maxFreq INTEGER ::= 8 -- Max number of frequencies.

maxFreqIDC-MRDC INTEGER ::= 32 -- Maximum number of candidate NR frequencies for MR-DC IDC indication

maxNrofCandidateBeams INTEGER ::= 16 -- Max number of PRACH-ResourceDedicatedBFR that in BFR config.

maxNrofPCIsPerSMTC INTEGER ::= 64 -- Maximun number of PCIs per SMTC.

maxNrofQFIs INTEGER ::= 64

maxNrOfSemiPersistentPUSCH-Triggers INTEGER ::= 64 -- Maximum number of triggers for semi persistent reporting on PUSCH

maxNrofSR-Resources INTEGER ::= 8 -- Maximum number of SR resources per BWP in a cell.

maxNrofSlotFormatsPerCombination INTEGER ::= 256

maxNrofSpatialRelationInfos INTEGER ::= 8

maxNrofIndexesToReport INTEGER ::= 32

maxNrofIndexesToReport2 INTEGER ::= 64

maxNrofSSBs-1 INTEGER ::= 63 -- Maximum number of SSB resources in a resource set minus 1.

maxNrofS-NSSAI INTEGER ::= 8 -- Maximum number of S-NSSAI.

maxNrofTCI-StatesPDCCH INTEGER ::= 64

maxNrofTCI-States INTEGER ::= 128 -- Maximum number of TCI states.

maxNrofTCI-States-1 INTEGER ::= 127 -- Maximum number of TCI states minus 1.

maxNrofUL-Allocations INTEGER ::= 16 -- Maximum number of PUSCH time domain resource allocations.

maxQFI INTEGER ::= 63

maxRA-CSIRS-Resources INTEGER ::= 96

maxRA-OccasionsPerCSIRS INTEGER ::= 64 -- Maximum number of RA occasions for one CSI-RS

maxRA-Occasions-1 INTEGER ::= 511 -- Maximum number of RA occasions in the system

maxRA-SSB-Resources INTEGER ::= 64

maxSCSs INTEGER ::= 5

maxSecondaryCellGroups INTEGER ::= 3

maxNrofServingCellsEUTRA INTEGER ::= 32

maxMBSFN-Allocations INTEGER ::= 8

maxNrofMultiBands INTEGER ::= 8

maxCellSFTD INTEGER ::= 3 -- Maximum number of cells for SFTD reporting

maxReportConfigId INTEGER ::= 64

maxNrofCodebooks INTEGER ::= 16 -- Maximum number of codebooks suppoted by the UE

maxNrofCSI-RS-Resources INTEGER ::= 7 -- Maximum number of codebook resources supported by the UE

maxNrofSRI-PUSCH-Mappings INTEGER ::= 16

maxNrofSRI-PUSCH-Mappings-1 INTEGER ::= 15

maxSIB INTEGER::= 32 -- Maximum number of SIBs

maxSI-Message INTEGER::= 32 -- Maximum number of SI messages

maxPO-perPF INTEGER ::= 4 -- Maximum number of paging occasion per paging frame

maxAccessCat-1 INTEGER ::= 63 -- Maximum number of Access Categories minus 1

maxBarringInfoSet INTEGER ::= 8 -- Maximum number of Access Categories

maxCellEUTRA INTEGER ::= 8 -- Maximum number of E-UTRA cells in SIB list

maxEUTRA-Carrier INTEGER ::= 8 -- Maximum number of E-UTRA carriers in SIB list

maxPLMNIdentities INTEGER ::= 8 -- Maximum number of PLMN identites in RAN area configurations

maxDownlinkFeatureSets INTEGER ::= 1024 -- (for NR DL) Total number of FeatureSets (size of the pool)

maxUplinkFeatureSets INTEGER ::= 1024 -- (for NR UL) Total number of FeatureSets (size of the pool)

maxEUTRA-DL-FeatureSets INTEGER ::= 256 -- (for E-UTRA) Total number of FeatureSets (size of the pool)

maxEUTRA-UL-FeatureSets INTEGER ::= 256 -- (for E-UTRA) Total number of FeatureSets (size of the pool)

maxFeatureSetsPerBand INTEGER ::= 128 -- (for NR) The number of feature sets associated with one band.

maxPerCC-FeatureSets INTEGER ::= 1024 -- (for NR) Total number of CC-specific FeatureSets (size of the pool)

maxFeatureSetCombinations INTEGER ::= 1024 -- (for MR-DC/NR)Total number of Feature set combinations (size of the

-- pool)

maxInterRAT-RSTD-Freq INTEGER ::= 3

maxNrofConfiguredGrantConfig-r16 INTEGER ::= 12 -- Maximum number of configured grant configurations per BWP

maxNrofConfiguredGrantConfig-r16-1 INTEGER ::= 11 -- Maximum number of configured grant configurations per BWP minus 1

maxNrofConfiguredGrantConfigMAC-r16 INTEGER ::= 32 -- Maximum number of configured grant configurations per MAC entity

maxNrofConfiguredGrantConfigMAC-r16-1 INTEGER ::= 31 -- Maximum number of configured grant configurations per MAC entity minus 1

maxNrofSPS-Config-r16 INTEGER ::= 8 -- Maximum number of SPS configurations per BWP

maxNrofSPS-Config-r16-1 INTEGER ::= 7 -- Maximum number of SPS configurations per BWP minus 1

-- TAG-MULTIPLICITY-AND-TYPE-CONSTRAINT-DEFINITIONS-STOP

-- ASN1STOP

### – End of NR-RRC-Definitions

-- ASN1START

END

-- ASN1STOP

Annex- capture status of RAN2 Agreements in RRC running CR for IIOT WI

**No Color: Captured**

**Gray: No RRC impact**

**Blue: Not clear if RRC impact, will re-visit in the next ruuning CR when more agreements are reached.**

**Red: Not Captured**

1. Accurate reference timing

1.1 RAN2#105bis

* **Confirm that we use LTE rel-15 SIB and RRC unicast based methods for reference time delivery**
* **The reference time information shall correspond to a reference SFN, explicitly indicated in unicast signalling, FFS if inferred from the transmission of the SIB for SIB signalling.**
* **R2 assumes the UE shall use the end of the reference SFN value as the precise point in time to which the reference time corresponds.**
* **FFS whether the reference SFN refers to time in the future, past or whether this need to mandated one way or another.**
* **R2 assumes that some propagation delay compensation may be needed for distance > 200m.**
* **FFS what would be the method, e.g. based on current TA, and whether this can be left for UE implementation or something need to be specified.**

1.2 RAN2#106

* **SFN boundary at or immediately after the ending boundary of the SI-window in which SIB is transmitted is always used as a reference in case the time reference information is provided by broadcast signalling (as in LTE)**
* **The UE considers the frame indicated by the referenceSFN nearest to the frame where the time information is received, which can be either in the past or in future, in case the time reference information is provided by unicast signalling**
* **Signalling to support 10ns granularity.**
* **R2 assumes that either SIB9 or a new SIB is used for reference time information broadcast delivery, depending on R3 discussion outcome.**
* **“00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time)” as the origin of the time reference information, at least for the baseline case where time info type is not present or used (as in LTE).**
* **The field used for reference time information delivery is excluded from estimation of changes in system information.**
* **Specify uncertainty parameter in the reference time information in NR, encoding FFS**
* **We will have the clock type field, similar to LTE. R2 considers that this have no relation to ongoing discussions in SA2 on TSC**

1.3 RAN2#107

1.4 RAN2#107bis

* **SIB9 is used for accurate reference timing delivery by broadcast.**
* **DLInformationTransfer message is used for serving cell’s accurate reference timing delivery by unicast.**
* **R2 assumes there will be no particular functionality to ensure accurate timing distribution at the moment of handover in Rel-16**
* **The uncertainty of reference time info is unspecified, if the uncertainty field is absent.**
* **We send an LS: RAN2 asks SA2 to provide information on whether and how the need for reference time information can be determined for any given connected UE**
* **FFS if The referenceSFN field indicates the time at the ending boundary of the SFN indicated by referenceSFN of PCell.**

1.5 RAN2#108

* **The following is FFS:**
  + - **R2 assume that UE may perform propagation delay compensation.**
    - **We don’t specify how the UE perform propagation delay compensation.**
    - **For unicast and broadcast, the network can indicate to the UE to not do delay compensation.**
* **The reference cell of the time at the ending boundary of the SFN indicated by referenceSFN can be PCell**
* **We use linear encoding**
* **The uncertainty value of reference time info is the uncertainty field value multiplied by 25 ns**
* **The number of bits to encode uncertainty field is 15 and the maximum value of uncertainty field is 2^15 -1, i.e., the maximum uncertainty value of reference time info is 0.8096 millisecond**
* **The smallest uncertainty field value is zero**

1.6 RAN2#109e

* **2a seems non-agreeable**
* **Capture for the reference time information in 38.331 that “The indicated time is referenced at the network, i.e., without compensating for RF propagation delay.”**
* **In Rel-16, propagation delay compensation may be done by UE implementation.**
* **Do not capture propagation delay compensation aspect in stage-2 specifications.**
* **No EN-DC specific enhancements are pursued for accurate reference time objective of Rel-16 IIOT WI.**
* **Do not make any specifications changes to indicate which of the received reference time information takes precedence in case the UE receives reference time via both unicast and broadcast signalling.**
* **It is FFS if UE in RRC Connected can request SIB9 using on-demand SI request (by reusing OSI mechanism defined for RRC Connected UEs, with assumption of no additional work is needed in IIOT WI).**

1. Scheduling Enhancement

2.1 RAN2#105bis

* **RAN2 think that knowledge of survival time is beneficial to gNB. FFS whether there would be any impact to AS specifications to make use of this, and such discussions would have lower priority, as it is not explicitly a WI objective. There are also concerns that QoS framework may be impacted due to survival time being provided explicitly.**
* **R2 assumes that the maximum number of active SPS configurations for a given BWP of a serving cell in the specification is 8 or 16 (FFS).**
* **R2 assumes short SPS/CG periodicities and/or multiple SPS/CG configurations and/or combination thereof could be used to mitigate the periodicity misalignment between the TSN periodicity and CG/SPS periodicity. Other solutions not precluded, e.g. to address resource consumption.**
* **Will support “short” SPS periodicities, at least down to 0.5ms**
* **Ask R1 on feasibility, and additionally the feasibility to go down to even lower values, e.g. 2 symb.**
* **R2 assumes that activation/deactivation is done by DCI.**
* **RAN1 should address activation/deactivation DCIs related with configured grant Type 2 and SPS in the case of multiple configurations**
* **When multiple UL CG or DL SPS configurations is configured, an offset for each configuration is needed for the calculation of the HARQ process ID**

2.2 RAN2#106

2.3 RAN2#107

2.4 RAN2#107bis

* **R2 assumes to support 8 as the maximum number of simultaneously activated SPS configurations per BWP per serving cell.**
* **Introduce SPS/CG index to identify each SPS/CG among multiple SPS/CG configurations, i.e., as in Rel-15 LTE.**
* **The association between “state” (used in the joint release DCI) and the CG configuration(s) for type-2 CG is configured via RRC message.**
* **Each CG configuration is always configured independently, as in Rel-15 LTE.**
* **The association between “state” (used in the joint release DCI) and the SPS configuration(s) is configured via RRC message, if RAN1 working assumption for joint release for multiple SPS configuration is confirmed.**
* **Each SPS configuration is always configured independently, as in Rel-15 LTE.**
* **Support simultaneous Type 1 & 2 CG configurations in a BWP.**
* **CG periodicities of any integer-multiple of one slot (FFS if we go even lower, e.g. 2 symb, 7 symb) below a maximum value should be supported. FFS on the maximum value of integer N.**
* **SPS periodicities of any integer-multiple of one slot below a maximum value should be supported in Rel-16. FFS on the maximum value of integer N.**
* **R2 assumes that HARQ offset parameter is explicitly configured by the network for each CG/SPS configuration.**
* **For CG, HARQ Process ID = [floor(CURRENT\_symbol/periodicity)] modulo nrofHARQ-Processes + harq-procID-offset.**
* **FFS (for checking) if For SPS, HARQ Process ID = [floor(CURRENT\_slot/periodicity)] modulo nrofHARQ-Processes + harq-ProcID-offset, Where CURRENT\_slot = [(SFN × numberOfSlotsPerFrame) + slot number in the frame].**
* **Introduce a new confirmation MAC CE format in Rel-16, which reflects the confirmation of multiple configured grant configurations**
* **A single LCH can be map to multiple CG configurations.**
* **Multiple LCHs can be map to a single CG configuration.**
* **R2 think it would be useful to introduce a new LCP restriction in the following way: The DCI that is scheduling PUSCH may include a specific indication. LCH configuration in RRC contains information on whether the LCH can utilize grant with this indication or not. R2 intends that this mechanism can be used to differentiate grants for traffic that requires high reliability.**
* **Granularity of burst arrival time and periodicity signalled to RAN should be preferably 1 us.**

2.5 RAN2#108

* **For CG/SPS periodicity determination, support the maximum values of N as specified already, depending on SCS, i.e. N= 640 for 15kHz, 1280 for 30kHz, 2560 for 60kHz and 5120 for 120kHz.**
* **In addition to specific CG-LCH mapping It should be possible to configure that all CGs are allowed, and none of the CGs are allowed**
* **Multiple CG activation/deactivation confirmation MAC CE contains only a bitmap of CG configurations using CG ID unique per MAC entity and configured by RRC in addition to CG ID introduced by RAN1.**
* **Multiple CG activation/deactivation confirmation MAC CE uses new LCID value.**
* **In MAC specifications, correct formulas for CG occasion determination so that they consider N sequentially, as for SPS.**
* **HARQ process ID determination with multiple SPS configurations is based on the following formula: HARQ Process ID = [floor(CURRENT\_slot/periodicity)] modulo nrofHARQ-Processes + harq-ProcID-offset, Where CURRENT\_slot = [(SFN × numberOfSlotsPerFrame) + slot number in the frame]**
* **In Rel-16, SPS periodicities in RRC are expressed in number of slots.**
* **We don’t introduce additional mechanism to align CG/SPS to TSC traffic pattern period**

2.6 RAN2#109e

* **Confirm LCH configured with allowedCG-List is allowed to be mapped to dynamic grant**
* **LCH configured with allowedPHY-PriorityIndex is allowed to be mapped to dynamic grant without any priority indication only in case the configuration allows it to be mapped on low priority grant.**
* **allowedPHY-PriorityIndex restriction applies only to dynamic grants.**
* **If configuredGrantConfigList-r16 is configured in the MAC entity, the multiple entry configured grant confirmation MAC CE is always used.**
* **As in legacy, the multiple entry configured grant confirmation MAC CE is generated if 1) the MAC entity has UL resources allocated for new transmission; 2) there is at least one triggered but not cancelled confirmation.**
* **Confirm that Multiple Entry Configured Grant Confirmation MAC CE has the same priority as Confirmation Grant Confirmation MAC CE.**
* **For Type-1 CG, after receiving the configuration, UE should first identify the lowest N value corresponding to the nearest available CG occasion, then, N is incremented after each CG occasion starting from the N identified in the first step.**
* **Introduce timeReferenceSFN in RRC CG type 1 configuration.**
* **Align the terminology and use name “phy-PriorityIndex” in TS 38.300, TS 38.321, TS 38.331 to indicate the priority of the grant/SR-source agreed by RAN1**
* **Maximum 32 CG configurations per MAC entity.**
* **MAC CE for CG configuration has a fixed size of 4 bytes.**
* **Confirm that multiple entry configured confirmation MAC CE only confirms configured grant type 2 configurations and other entries can be ignored.**
* **Multiple entry confirmation MAC CE confirms the reception of (re)-activation/de-activation DCI.**
* **Two CGs of any type, one activated in UL and another activated in SUL, are not time-overlapping by the control of the network. This can be captured in the stage-2 spec.**

1. Intra-UE prioritzation

3.1 RAN2#105bis

3.2 RAN2#106

* **For de-prioritized PUSCH on dynamic grant, the UE should store the de-prioritized MAC PDU in the HARQ buffer, to allow gNB to schedule re-transmission using the same HARQ process.**
* **For de-prioritized PUSCH on configured grants, a) the UE could store the de-prioritized MAC PDU in the HARQ buffer, to allow gNB to schedule re-transmission. b) FFS if the UE could transmit it using the subsequent radio resources e.g. associated with the same HARQ process**
* **The above agreements are at least applicable for cases when MAC has already generated the de-prioritized MAC PDU**

3.3 RAN2#107

* **R2 will de-prioritize work on intra-UE prioritization until R1 has made more progress.**
* **same prioritization solution for CG vs CG conflict and CG vs DG conflict**
* **Extend LCP restrictions by allowing restrictive mapping between an LCH and certain CG configurations.**
* **LCP restriction enhancements for DG to take into account reliability is needed, details FFS.**
* **no need to define UE processing time in MAC**
* **The same UE prioritization behaviour should be applied for resource conflicts between new transmissions or a new transmission and a retransmission.**
* **RAN2 assumes that MAC PDU recovery method in grant prioritization could be reused for PUSCH vs SR conflict.**
* **The case of highest priorities of two conflicting grants are equal is handled according to the following: for CG DG conflict, DG is prioritized, other cases FFS to what extent to specify.**
* **For the case when no PDU has been generated at all yet, and there are two grants where one will be de-prioritized (and there is data available for both grants). One PDU is generated**
* **If PUCCH resource for an SR’s transmission occasion overlaps a UL-SCH resource, SR’s transmission is allowed based on a comparison of priority of the LCH that triggered the SR and a priority value for the UL-SCH resource, if the priority of the LCH that triggered the SR is “high” (FFS). Priority value of the UL-SCH resource is FFS**
* **If an SR was triggered before MAC PDU assembly and PUCCH resource for the SR’s transmission occasion conflicts with UL-SCH resource of the MAC PDU, and the UL-SCH transmission is deprioritized, a MAC PDU will not be generated. (conflict = they cannot both be transmitted)**
* **When a PUSCH transmission is deprioritized, desired PHY behaviour is for RAN1 to decide**

3.4 RAN2#107bis

* **We don’t do the solution where the UE indicate explicitly to the network that there is data for a deprioritized PDU**
* **There is support to have “UE autonomous retransmission in a CG resource”. Allow checking of complexity to next meeting.**

3.5 RAN2#108

* **The TPs can work, as baseline (maybe some details to fix)**
* **UE autonomously transmits the de-prioritized PDU as a new transmission in a CG resource from the same CG configuration (FFS different CG configuration)**
* **The new CG uses the same HARQ process as the deprioritized CG.**
* **The Aut (re-) transmission feature is optional**
* **The case when the next CG resource cannot be used for a retransmission because of UE processing time limitation can occur (no consensus on whether this is a corner case or a mainstream case). Leave the timeline restriction to UE implementation (we don’t specify a new number, can specify something).**
* **UE shall not perform autonomous transmission of the PDU if network has scheduled a retransmission grant for the PDU. FFS whether we specify some time restriction.**
* **RRC configures a LCH with one or more allowed L1-priority level values (e.g. in a allowedPriorityLevels list) in LogicalChannelConfig (as in the current LCH restrictions), applied at least for mapping to DG, FFS for CG**
* **For CGCG conflicts, and CGDG conflicts, the priority value of an uplink grant (UL-SCH resource) is the highest priority of the LCHs that is multiplexed or can be multiplexed in MAC PDU, taking into account LCH restrictions and data availability.**
* **If PUCCH resource for an SR’s transmission occasion overlaps a UL-SCH resource, SR’s transmission is allowed (prioritized) based on a comparison of priority of the LCH that triggered the SR and a priority value for the UL-SCH resource (where the priority value is determined as in previous agreement), if the priority of the LCH that triggered the SR is higher.**
* **For CG-CG conflict with equal priority, prioritization is up to UE implementation.**
* **For SR-Data conflict with equal priority, UL-SCH (i.e. data) is prioritized.**

3.6 RAN2#109e

* **UE autonomous transmission uses the same HARQ process and the same CG configuration. No change to the current running CR.**
* **A PDU from a de-prioritized DG scheduled for a re-transmission of a de-prioritized CG cannot be autonomously transmitted using the subsequent CG with same HARQ process. No change to the current running CR.**
* **autonomousReTx is only configurable per configured grant configuration.**
* **No limit (timer or counter) is specified in Rel-16 on the number of times a MAC PDU is consecutively de-prioritized. No specification changes are required.**
* **No optimization of the configuredGrantTimer procedure is foreseen to reduce the delay to the next available CG for autonomous transmission.**
* **No new condition on whether at least some DM-RS symbols associated with the de-prioritized PUSCH have been transmitted is added to trigger/no trigger an autonomous transmission.**
* **No optimization is foreseen to address the issue of a PDCCH scheduling a dynamic retransmission of the deprioritized TB received before the PUSCH used for the autonomous transmission whereas the PUSCH corresponding to the PDCCH occurs after the PUSCH resource for the autonomous transmission**
* **The issue of a type-2 CG configuration change between the de-prioritized CG and the new CG resource for autonomous transmission preventing the de-prioritized PDU to fit the new CG resource will be addressed.**
* **A HARQ process cannot be shared between different CGs.**
* **The issue of a running configuredGrantTimer when the HARQ buffer of the corresponding HARQ process is empty is not addressed.**
* **The issue of a LCH mapping restrictions mismatch when rescheduling a dropped CG with new transmission DG (as opposed to re-transmission DG) is not addressed.**
* **Postpone the discussion on the solution addressing autonomous transmission when type-2 CG’s configuration changes to the next meeting.**
* **RAN2 confirms to introduce lch-basedPrioritization (configuration parameter of intra-UE prioritization based on LCH priority) in MAC running CR.**
* **RAN2 confirms that UE can perform autonomous transmission of the de-prioritized configured uplink grant by the prioritized SR transmission.**
* **An uplink grant addressed to CS-RNTI with NDI=1 (retransmission of CG) is a dynamic grant in prioritization.**
* **An uplink grant addressed to CS-RNTI with NDI=0 ((re-)activation of type 2 CG) is a configured grant in prioritization.**
* **RAN2 confirms the current MAC running CR already captures that CG with configuredGrantTimer running is not considered in prioritization.**
* **An uplink grant is not de-prioritized by other de-prioritized SR or uplink grant. TP in Phase-2 discussion is a baseline.**

The below agreements are from the chairman notes and implemented in r2

* **Retransmission grants are not reused for new transmissions in Rel-16. No specification changes are required.**
* **When the CG is de-prioritized, it is up to the UE implementation to determine the processing time restriction determining whether the very next CG resource with same HARQ process can be used, or the/a following one, for an autonomous transmission**
* **Observation, acc to current R2 agreements: In case that two MAC PDUs with the same L1 priority (i.e. high-high or low-low) are delivered by MAC, the second PDU has priority from RAN2 perspective (based on LCH priority).**

1. Ethernet Header Compression

4.1 RAN2#105bis

* **IETF see no issues for 3GPP to develop and maintain a ROHC profile. Also, it seems feasible in the time frame of Rel-16.**
* **We develop Ethernet header compression 100% in 3GPP TS (not by extending ROHC)**

4.2 RAN2#106

* **Ethernet Header Compression (EHC) is configured per DRB, separately for UL and DL.**
* **Use context ID concept such that compressor and decompressor associates a context ID with Ethernet header contents.**
* **Compression is done with following principle:**

**- For Ethernet flow resulting in creation of new context, compressor transmits at least one packet with full header and context id (to establish context in decompressor).**

**- After above, compressor starts transmits compressed packets. FFS if multiple transmissions and/or feedback is needed.**

* **EHC header format is designed to include following mandatory fields: Context ID, Indication of header format (i.e. full header and compressed header), FFS other field, e.g. profile ID**

4.3 RAN2#107

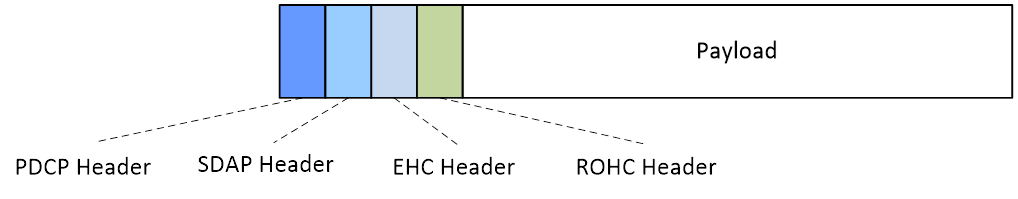
4.4 RAN2#107bis

* **The EHC function is in PDCP**
* **The EHC header is located after the SDAP header, and it is ciphered**
* **The EHC can removes the following fields: SOURCE/DESTINATION ADDRESS, TYPE, and EHC do not support multiple formats**
* **FFS: Pad removal**
* **For context establishment the compressor send the full header and the context ID via PDCP data PDU**
* **ROHC and EHC are independent, e.g. from specification point of view they could both be configured for a DRB.**
* **FFS if for context establishment the explicit feedback is sent via PDCP control PDU.**
* **For context establishment the de-compressor sends an explicit feedback to the compressor after the establishment of the context, i.e. when a full header packet is received with a context id.**
* **For context establishment the explicit feedback includes the “Context ID”.**
* **When the compressor receives the feedback it is confident that the context is successfully established, and from this time compressed header packets can be transmitted.**
* **FFS if EHC is allowed to be configured for a unidirectional link.**

4.5 RAN2#108

* **There is support in R2 to have Ethernet Padding Removal for IIOT**
* **The following tentative agreements are postponed, we send an LS to SA1, but we will decide next meeting regardless if get a reply in time or not.**
  + - **Specify the EHC decompressor behaviour such that it checks the frame size after reapplying the Ethernet header and in case it is lower than 64 bytes, the decompressor appends random bytes to make the frame a valid Ethernet frame (e.g. 64 bytes long).**
    - **We don’t specify the behaviour of the compressor/padding removal side**
    - **Padding removal is an optional feature that is configurable.**
* **RAN2 confirm the feedback mechanism already agreed in the last meeting and apply this to both AM DRB and UM DRB.**
* **The EHC algorithm is not allowed to be configured for a uni-directional link.**
* **Q-TAGs can be removed in EHC, considering all sub-fields, assuming this is static (i.e. no dynamic indications in EHC)**

4.6 RAN2#109e

* **EHC doesn’t handle padding, no removal/compression etc.**
* **Each different PCP/DE value combination in a flow across all Q Tags (single or multiple) is associated with a separate context ID.**
* **The ROHC header is located after EHC header (illustrated below).**
* ****
* **When a DRB is configured with RoHC and EHC, the sender/compressor behaviour for a non-IP Ethernet packet shall be to bypass ROHC and deliver that packet from EHC compressor to lower layers.**
* **When a DRB is configured with RoHC and EHC, the receiver/decompressor behaviour for a packet that has non-IP Ethertype (after EHC decompression) is to bypass RoHC and deliver the packet directly to higher layers.**
* **For SDAP Control PDU, the EHC header is not generated.**
* **1-bit Indication in EHC header is used for header format differentiation.**
* **CID overwriting mechanism is supported.**
* **Use a NOTE to specify CID overwriting mechanism in the specification.**
* **The compressor can use an “all zeros” context ID to indicate that no context is to be established, when transmitting uncompressed packets.**
* **EHC feedback is transmitted via PDCP Control PDU.**
* **No need to specify how the compressor to determine that a context establishment procedure was unsuccessful.**
* **Configuration of a parameters (e.g. drb-ContinueEHC) indicates whether or not EHC is reset at PDCP re-establishment.**
* **EHC context continue function can be indicated separately for UL and DL, through configuration of parameters, e.g. ul-drb-ContinueEHC and dl-drb-ContinueEHC.**
* **The processing order of the EHC and ROHC is up to UE implementation.**
* **Only the feedback based mechanism is supported for EHC context establishment.**
* **No enhancement needed on the compressor side. The compressor keeps sending full header packets till the first feedback is received and start to transmit the compressed header packets.**
* **No special mechanism is needed on the decompressor side to control the number of feedbacks.**

The below agreements are from the chairman notes and implemented in r2

* **Both 1-byte header and 2-bytes header is supported and the choice depends on RRC configuration (of DRB). For one DRB the header size is fixed.**
* **If the Ethernet frame header contains a LENGTH field, the header can be sent compressed or uncompressed, no special handling**
* **EHC header only contains Context ID field, format indication bit, and reserved bit(s) if needed. The number of reserved bit(s) are FFS**

1. PDCP duplication

5.1 RAN2#105bis

5.2 RAN2#106

* **Intention is that Copies are sent on different legs**
* **Dynamic Network control of DRB duplication is by MAC CE**
* **By the MAC CE, Network to control which of the configured RLC entities that is/are active**
* **Support the case that no of copies = no of active RLC entities**

5.3 RAN2#107

* **The number of copies generated is equal to the number of active RLC entities, i.e. one copy per leg/RLC entity, and active/inactive state is determined by MAC CE.**
* **The network provides in RRC only one LCH cell restriction configuration per LCH, like in Rel-15. Changes to LCH cell restriction configuration is only possible via RRC.**
* **At PDCP duplication, application of the configured cell restrictions are not dynamically changed upon activation or deactivation of PDCP duplication beyond Rel-15. (FFS the case of CA duplication)**
* **The MAC CE signaling structure is either:**

[**a. Per DRB signaling with the activation status of the associated RLC entities, or**](#_Toc16232069)

**b. All DRBs with the activation status of the associated RLC entities for each DRB, or**

* **A new LCID is used for the Rel-16 MAC CE controlling PDCP duplication.**

5.4 RAN2#107bis

* **The mechanism of primary path defined for Rel-15 PDCP duplication should be retained for Rel-16 (FFS if allowed to deactivate a primary path ie to not send data PDU).**

5.5 RAN2#108

* **Network coordination is beneficial for PDCP duplication in the uplink in NR-DC/CA architectures.**
* **The primary path should not be de-activated for data PDUs.**
* **For PDCP duplication controlling MAC CE format, per DRB signaling with the activation status of the associated RLC entities should be adopted in Rel-16.**
* **The initial state for each leg can be configured by RRC**
* **When multiple RLC entities are configured for the DRB, and PDCP duplication is deactivated (less than 2 RLC entities activated for duplication), fallback to Split bearer operation is supported in Dual Connectivity (2 RLC entities belonging to different cell groups).**
* **For fallback to split bearer operation, a pointer to the secondary RLC entity is introduced in RRC to identify which of the multiple configured RLC entities shall be used.**
* **One PDCP entity has one primary path.**
* **R16 MAC CE for both leg selection and on/off**
* **R15 MAC CE on/off (for R16 configurations) is FFS**

5.6 RAN2#109e

* **Rel-16 PDCP duplication is applied to SRBs.**
* **For SRBs, all secondary RLC entities are activated when configured.**
* **MAC CE based activation/deactivation of PDCP duplication is not supported for SRBs.**
* **When a secondary RLC entity is deactivated (but PDCP duplication is still activated), the UE shall discard duplicated PDCP PDUs in the deactivated secondary RLC entity.**
* **If Rel-16 MAC CE indicates all secondary RLC entities are deactivated for a DRB, the UE shall deactivate PDCP duplication for the DRB. FFS whether and how this has TS impact.**
* **DRBdup ID in Rel-16 MAC CE is set to 5bits full DRB ID.**
* **FFS if and how Rel-15 MAC CE is used for Rel-16 Duplication**