**3GPP TSG-RAN2#109e R2-201920**

**24 February – 6 March 2020**

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| *CR-Form-v11.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.331** | **CR** | **1477** | **rev** | **1** | **Current version:** | **15.8.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Introduction of NR operation with Shared Spectrum Access in RRC | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated (Rapporteur) | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_unlic-Core | | | | |  | | ***Date:*** | | 2019-03-06 |
|  |  | | | |  | | |  | |  |
| ***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:*** | | To capture RAN2 and RAN1 agreements which impact RRC | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | RAN2 agreements which impact RRC:   * Introduce CG retransmission timer and changes to CG timer * Introduce additional paging monitoring occasions * Specify RSSI and channel occupancy measurements * Support of white list for cell reselection * UE capability for RSSI and CO * CAPC configuration for SRB2 and DRBs * Configuration for the consistent UL LBT failure detection mechanism * Handling of not acquiring SRB1 * RACH parameters (extended RAR window) * Reporting of PSCell LBT failures * Short message indication to stop paging monitoring   RAN1 parameters in R1-1913764 were introduced in this CR. These parameters and related procedures are captured in the following RAN1 NR-U CRs:   * R1-1913629: 37.213 CR * R1-1913630: 38.211 CR * R1-1913631: 38.212 CR * R1-1913632: 38.213 CR * R1-1913633: 38.214 CR * R1-1913634: 38.215 CR   Editor’s Note: It is FFS whether the features introduced for NR operation with shared spectrum are also applicable to NR licensed. The CR will be updated according to the outcome of this discussion on UE features. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | NR operation with shared spectrum channel access will not be specified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.2, 4.2.2, 5.2.2.2, 5.2.2.5, 5.3.10.3, 5.5.2.X (new), 5.5.3.1, 5.5.4.1, 5.5.5.1, 5.7.3.3, 6.2.2, 6.3.1, 6.3.2, 6.3.3, 6.4, 6.5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | |  | | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | TS 38.300, TS 38.304, TS 38.321, TS 37.213, TS 38.211, TS 38.212, TS 38.213, TS 38.214, TS 38.215 | | | |
| ***affected:*** | |  | **x** | Test specifications | | |  | | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | |  | | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

*Start of Changes*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.300: "NR; Overall description; Stage 2".

[3] 3GPP TS 38.321: "NR; Medium Access Control (MAC); Protocol specification".

[4] 3GPP TS 38.322: "NR; Radio Link Control (RLC) protocol specification".

[5] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) protocol specification".

[6] ITU-T Recommendation X.680 (08/2015) "Information Technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation" (Same as the ISO/IEC International Standard 8824-1).

[7] ITU-T Recommendation X.681 (08/2015) "Information Technology – Abstract Syntax Notation One (ASN.1): Information object specification" (Same as the ISO/IEC International Standard 8824-2).

[8] ITU-T Recommendation X.691 (08/2015) "Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)" (Same as the ISO/IEC International Standard 8825-2).

[9] 3GPP TS 38.215: "NR; Physical layer measurements".

[10] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[11] 3GPP TS 33.501: "Security Architecture and Procedures for 5G System".

[12] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[13] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[14] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[15] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[16] 3GPP TS 38.211: "NR; Physical channels and modulation".

[17] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[18] ITU-T Recommendation X.683 (08/2015) "Information Technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications" (Same as the ISO/IEC International Standard 8824-4).

[19] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[20] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[21] 3GPP TS 23.003: "Numbering, addressing and identification".

[22] 3GPP TS 36.101: "E-UTRA; User Equipment (UE) radio transmission and reception".

[23] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[24] 3GPP TS 37.324: "Service Data Adaptation Protocol (SDAP) specification".

[25] 3GPP TS 22.261: "Service requirements for the 5G System".

[26] 3GPP TS 38.306: "User Equipment (UE) radio access capabilities".

[27] 3GPP TS 36.304: "E-UTRA; User Equipment (UE) procedures in idle mode".

[28] ATIS 0700041: "WEA 3.0: Device-Based Geo-Fencing".

[29] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[30] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

[31] 3GPP TS 36.211: "E-UTRA; Physical channels and modulation".

[32] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[33] 3GPP TS 36.104:"E-UTRA; Base Station (BS) radio transmission and reception".

[34] 3GPP TS 38.101-3 "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[35] 3GPP TS 38.423: "NG-RAN, Xn application protocol (XnAP)".

[36] 3GPP TS 38.473: "NG-RAN; F1 application protocol (F1AP)".

[37] 3GPP TS 36.423: "E-UTRA; X2 application protocol (X2AP)".

[38] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core network protocols; Stage 3".

[39] 3GPP TS 38.101-2 "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[40] 3GPP TS 36.133:"E-UTRA; Requirements for support of radio resource management".

[41] 3GPP TS 37.340: "E-UTRA and NR; Multi-connectivity; Stage 2".

[42] 3GPP TS 38.413: "NG-RAN, NG Application Protocol (NGAP)".

[XX] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access”.

*Next Change*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC 5G Core Network

ACK Acknowledgement

AM Acknowledged Mode

ARQ Automatic Repeat Request

AS Access Stratum

ASN.1 Abstract Syntax Notation One

BLER Block Error Rate

BWP Bandwidth Part

CA Carrier Aggregation

CAPC Channel Access Priority Class

CCCH Common Control Channel

CG Cell Group

CMAS Commercial Mobile Alert Service

CP Control Plane

C-RNTI Cell RNTI

CSI Channel State Information

DC Dual Connectivity

DCCH Dedicated Control Channel

DCI Downlink Control Information

DL Downlink

DL-SCH Downlink Shared Channel

DM-RS Demodulation Reference Signal

DRB (user) Data Radio Bearer

DRX Discontinuous Reception

DTCH Dedicated Traffic Channel

EN-DC E-UTRA NR Dual Connectivity with E-UTRA connected to EPC

EPC Evolved Packet Core

EPS Evolved Packet System

ETWS Earthquake and Tsunami Warning System

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRA/5GC E-UTRA connected to 5GC

E-UTRA/EPC E-UTRA connected to EPC

E-UTRAN Evolved Universal Terrestrial Radio Access Network

FDD Frequency Division Duplex

FFS For Further Study

GERAN GSM/EDGE Radio Access Network

GNSS Global Navigation Satellite System

GSM Global System for Mobile Communications

HARQ Hybrid Automatic Repeat Request

IE Information element

IMSI International Mobile Subscriber Identity

kB Kilobyte (1000 bytes)

L1 Layer 1

L2 Layer 2

L3 Layer 3

LBT Listen Before Talk

MAC Medium Access Control

MCG Master Cell Group

MIB Master Information Block

MR-DC Multi-Radio Dual Connectivity

N/A Not Applicable

NE-DC NR E-UTRA Dual Connectivity

(NG)EN-DC E-UTRA NR Dual Connectivity (covering E-UTRA connected to EPC or 5GC)

NGEN-DC E-UTRA NR Dual Connectivity with E-UTRA connected to 5GC

NR-DC NR-NR Dual Connectivity

NR/5GC NR connected to 5GC

PCell Primary Cell

PDCP Packet Data Convergence Protocol

PDU Protocol Data Unit

PLMN Public Land Mobile Network

PSCell Primary SCG Cell

PWS Public Warning System

QoS Quality of Service

RAN Radio Access Network

RAT Radio Access Technology

RLC Radio Link Control

RNA RAN-based Notification Area

RMTC RSSI Measurement Timing Configuration

RNTI Radio Network Temporary Identifier

ROHC Robust Header Compression

RRC Radio Resource Control

RS Reference Signal

SCell Secondary Cell

SCG Secondary Cell Group

SFN System Frame Number

SFTD SFN and Frame Timing Difference

SI System Information

SIB System Information Block

SpCell Special Cell

SRB Signalling Radio Bearer

SSB Synchronization Signal Block

TAG Timing Advance Group

TDD Time Division Duplex

TM Transparent Mode

UE User Equipment

UL Uplink

UM Unacknowledged Mode

UP User Plane

In the ASN.1, lower case may be used for some (parts) of the above abbreviations e.g. c-RNTI.

*Next Change*

### 4.2.2 Signalling radio bearers

"Signalling Radio Bearers" (SRBs) are defined as Radio Bearers (RBs) that are used only for the transmission of RRC and NAS messages. More specifically, the following SRBs are defined:

- SRB0 is for RRC messages using the CCCH logical channel;

- SRB1 is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel;

- SRB2 is for NAS messages, all using DCCH logical channel. SRB2 has a lower priority than SRB1 and may be configured by the network after AS security activation;

- SRB3 is for specific RRC messages when UE is in (NG)EN-DC or NR-DC, all using DCCH logical channel.

In downlink, piggybacking of NAS messages is used only for one dependant (i.e. with joint success/failure) procedure: bearer establishment/modification/release. In uplink piggybacking of NAS message is used only for transferring the initial NAS message during connection setup and connection resume.

NOTE 1: The NAS messages transferred via SRB2 are also contained in RRC messages, which however do not include any RRC protocol control information.

Once AS security is activated, all RRC messages on SRB1, SRB2 and SRB3, including those containing NAS messages, are integrity protected and ciphered by PDCP. NAS independently applies integrity protection and ciphering to the NAS messages, see TS 24.501 [23].

Split SRB is supported for all the MR-DC options in both SRB1 and SRB2 (split SRB is not supported for SRB0 and SRB3).

For operation with shared spectrum channel access, SRB0, SRB1 and SRB3 are assigned with the highest priority Channel Access Priority Class (CAPC), (i.e. CAPC = 1) while CAPC for SRB2 is configurable.

*Next Change*

##### 5.2.2.2.2 SI change indication and PWS notification

A modification period is used, i.e. updated SI (other than for ETWS and CMAS) is broadcasted in the modification period following the one where SI change indication is transmitted. The modification period boundaries are defined by SFN values for which SFN mod m = 0, where m is the number of radio frames comprising the modification period. The modification period is configured by system information. The UE receives indications about SI modifications and/or PWS notifications using Short Message transmitted with P-RNTI over DCI (see clause 6.5). Repetitions of SI change indication may occur within preceding modification period.

UEs in RRC\_IDLE or in RRC\_INACTIVE shall monitor for SI change indication in its own paging occasion every DRX cycle. UEs in RRC\_CONNECTED shall monitor for SI change indication in any paging occasion at least once per modification period if the UE is provided with common search space on the active BWP to monitor paging, as specified in TS 38.213 [13], clause 13.

ETWS or CMAS capable UEs in RRC\_IDLE or in RRC\_INACTIVE shall monitor for indications about PWS notification in its own paging occasion every DRX cycle. ETWS or CMAS capable UEs in RRC\_CONNECTED shall monitor for indication about PWS notification in any paging occasion at least once every *defaultPagingCycle* if the UE is provided with common search space on the active BWP to monitor paging.

For Short Message reception in a paging occasion, the UE monitors the PDCCH monitoring occasion(s) for paging as specified in TS 38.304 [20] and TS 38.213 [13].

If the UE receives a Short Message, the UE shall:

1> if the UE is ETWS capable or CMAS capable, the *etwsAndCmasIndication* bit of Short Message is set, and the UE is provided with *searchSpaceOtherSystemInformation* on the active BWP or the initial BWP:

2> immediately re-acquire the *SIB1*;

2> if the UE is ETWS capable and *si-SchedulingInfo* includes scheduling information for *SIB6*:

3> acquire *SIB6*, as specified in sub-clause 5.2.2.3.2,immediately;

2> if the UE is ETWS capable and *si-SchedulingInfo* includes scheduling information for *SIB7*:

3> acquire *SIB7*, as specified in sub-clause 5.2.2.3.2,immediately;

2> if the UE is CMAS capable and *si-SchedulingInfo* includes scheduling information for *SIB8*:

3> acquire *SIB8*, as specified in sub-clause 5.2.2.3.2,immediately;

1> if the *systemInfoModification* bit of Short Message is set:

2> apply the SI acquisition procedure as defined in sub-clause 5.2.2.3 from the start of the next modification period.

1> if the *stopPagingMonitoring* bit of Short Message is set:

2> stop monitoring PDCCH monitoring occasion(s) for paging in this Paging Occasion (PO).

Editor’s Note: As the title of this section is for SI change and PWS, introduction of *stopPagingMonitoring* in this section should be discussed further.

*Next Change*

#### 5.2.2.5 Essential system information missing

The UE shall:

1> if in RRC\_IDLE or in RRC\_INACTIVE or in RRC\_CONNECTED while T311 is running:

2> if the UE is unable to acquire the *MIB*:

3> consider the cell as barred in accordance with TS 38.304 [20]; and

3> perform barring as if *intraFreqReselection* is set to allowed;

2> else if the UE is unable to acquire the *SIB1*:

3> consider the cell as barred in accordance with TS 38.304 [20].

3> if the cell operates in licensed spectrum and *intraFreqReselection* in *MIB* is set to *notAllowed*:

4> consider cell re-selection to other cells on the same frequency as the barred cell as not allowed, as specified in TS 38.304 [20].

3> else:

4> consider cell re-selection to other cells on the same frequency as the barred cell as allowed, as specified in TS 38.304 [20].

*Next Change*

#### 5.3.10.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry in PCell; or

1> upon random access problem indication from MCG MAC while neither T300, T301, T304, T311 nor T319 are running; or

1> upon indication from MCG RLC that the maximum number of retransmissions has been reached; or

1> upon indication of consistent uplink LBT failures from MCG MAC:

2> if the indication is from MCG RLC and CA duplication is configured and activated, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the MCG i.e. RLF;

3> if AS security has not been activated:

4> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'other';-

3> else if AS security has been activated but SRB2 and at least one DRB have not been setup:

4> perform the actions upon going to RRC\_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

3> else:

4> initiate the connection re-establishment procedure as specified in 5.3.7.

The UE shall:

1> upon T310 expiry in PSCell; or

1> upon random access problem indication from SCG MAC; or

1> upon indication from SCG RLC that the maximum number of retransmissions has been reached:

1> upon indication of consistent uplink LBT failures from SCG MAC:

2> if the indication is from SCG RLC and CA duplication is configured and activated; and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the SCG, i.e. SCG RLF;

3> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

*Next Change*

### 5.5.1 Introduction

The network may configure an RRC\_CONNECTED UE to perform measurements and report them in accordance with the measurement configuration. The measurement configuration is provided by means of dedicated signalling i.e. using the *RRCReconfiguration* or *RRCResume.*

The network may configure the UE to perform the following types of measurements:

- NR measurements;

- Inter-RAT measurements of E-UTRA frequencies.

The network may configure the UE to report the following measurement information based on SS/PBCH block(s):

- Measurement results per SS/PBCH block;

- Measurement results per cell based on SS/PBCH block(s);

- SS/PBCH block(s) indexes.

The network may configure the UE to report the following measurement information based on CSI-RS resources:

- Measurement results per CSI-RS resource;

- Measurement results per cell based on CSI-RS resource(s);

- CSI-RS resource measurement identifiers.

The measurement configuration includes the following parameters:

**1. Measurement objects:** A list of objects on which the UE shall perform the measurements.

- For intra-frequency and inter-frequency measurements a measurement object indicates the frequency/time location and subcarrier spacing of reference signals to be measured. Associated with this measurement object, the network may configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not applicable in event evaluation or measurement reporting. Whitelisted cells are the only ones applicable in event evaluation or measurement reporting.

- The *measObjectId* of the MO which corresponds to each serving cell is indicated by *servingCellMO* within the serving cell configuration.

- For inter-RAT E-UTRA measurements a measurement object is a single E-UTRA carrier frequency. Associated with this E-UTRA carrier frequency, the network can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not applicable in event evaluation or measurement reporting. Whitelisted cells are the only ones applicable in event evaluation or measurement reporting.

**2. Reporting configurations:** A list of reporting configurations where there can be one or multiple reporting configurations per measurement object. Each reporting configuration consists of the following:

- Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.

- RS type: The RS that the UE uses for beam and cell measurement results (SS/PBCH block or CSI-RS).

- Reporting format: The quantities per cell and per beam that the UE includes in the measurement report (e.g. RSRP) and other associated information such as the maximum number of cells and the maximum number beams per cell to report.

**3. Measurement identities:** A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities, it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is also included in the measurement report that triggered the reporting, serving as a reference to the network.

**4. Quantity configurations:** The quantity configuration defines the measurement filtering configuration used for all event evaluation and related reporting, and for periodical reporting of that measurement. For NR measurements, the network may configure up to 2 quantity configurations with a reference in the NR measurement object to the configuration that is to be used. In each configuration, different filter coefficients can be configured for different measurement quantities, for different RS types, and for measurements per cell and per beam.

**5. Measurement gaps:** Periods that the UE may use to perform measurements.

A UE in RRC\_CONNECTED maintains a measurement object list, a reporting configuration list, and a measurement identities list according to signalling and procedures in this specification. The measurement object list possibly includes NR measurement object(s) and inter-RAT objects. Similarly, the reporting configuration list includes NR and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

The measurement procedures distinguish the following types of cells:

1. The NR serving cell(s) – these are the SpCell and one or more SCells.

2. Listed cells – these are cells listed within the measurement object(s).

3. Detected cells – these are cells that are not listed within the measurement object(s) but are detected by the UE on the SSB frequency(ies) and subcarrier spacing(s) indicated by the measurement object(s).

For NR measurement object(s), the UE measures and reports on the serving cell(s), listed cells and/or detected cells. For inter-RAT measurements object(s) of E-UTRA, the UE measures and reports on listed cells and detected cells and, for RSSI and channel occupancy measurements, the UE measures and reports on any reception on the indicated frequency.

Whenever the procedural specification, other than contained in sub-clause 5.5.2, refers to a field it concerns a field included in the *VarMeasConfig* unless explicitly stated otherwise i.e. only the measurement configuration procedure covers the direct UE action related to the received *measConfig*.

In NR-DC, the UE may receive two independent *measConfig*:

- a *measConfig*, associated with MCG, that is included in the *RRCReconfiguration* message received via SRB1; and

- a *measConfig*, associated with SCG, that is included in the *RRCReconfiguration* message received via SRB3, or, alternatively, included within a *RRCReconfiguration* message embedded in a *RRCReconfiguration* message received via SRB1.

In this case, the UE maintains two independent *VarMeasConfig* and *VarMeasReportList*, one associated with each *measConfig*, and independently performs all the procedures in clause 5.5 for each *measConfig* and the associated *VarMeasConfig* and *VarMeasReportList*, unless explicitly stated otherwise.

*Next Change*

#### 5.5.2.X RSSI measurement timing configuration

The UE shall setup the RSSI measurement timing configuration (RMTC) in accordance with the received *rmtc-Periodicity*, *rmtc-SubframeOffset* if configured otherwise determined by the UE randomly, i.e. the first symbol of each RMTC occasion occurs at first symbol of an SFN and subframe of the PCell meeting the following condition:

SFN mod *T* = FLOOR(*rmtc-SubframeOffset*/10);

subframe = *rmtc-SubframeOffset* mod 10;

with *T* = *rmtc-Periodicity*/10;

On the concerned frequency, the UE shall not consider RSSI measurements outside the configured RMTC occasion which lasts for *measDuration* for RSSI and channel occupancy measurements.

*Next Change*

#### 5.5.3.1 General

An RRC\_CONNECTED UE shall derive cell measurement results by measuring one or multiple beams associated per cell as configured by the network, as described in 5.5.3.3. For all cell measurement results in RRC\_CONNECTED, except for RSSI, the UE applies the layer 3 filtering as specified in 5.5.3.2, before using the measured results for evaluation of reporting criteria and measurement reporting. For cell measurements, the network can configure RSRP, RSRQ or SINR as trigger quantity. Reporting quantities can be any combination of quantities (i.e. only RSRP; only RSRQ; only SINR; RSRP and RSRQ; RSRP and SINR; RSRQ and SINR; RSRP, RSRQ and SINR), irrespective of the trigger quantity.

The network may also configure the UE to report measurement information per beam (which can either be measurement results per beam with respective beam identifier(s) or only beam identifier(s)), derived as described in 5.5.3.3a. If beam measurement information is configured to be included in measurement reports, the UE applies the layer 3 beam filtering as specified in 5.5.3.2. On the other hand, the exact L1 filtering of beam measurements used to derive cell measurement results is implementation dependent.

The UE shall:

1> whenever the UE has a *measConfig*, perform RSRP and RSRQ measurements for each serving cell for which *servingCellMO* is configured as follows:

2> if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains an *rsType* set to *ssb* and *ssb-ConfigMobility* is configured in the *measObject* indicated by the *servingCellMO*:

3> if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains a *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* and contains an *rsType* set to *ssb*:

4> derive layer 3 filtered RSRP and RSRQ per beam for the serving cell based on SS/PBCH block, as described in 5.5.3.3a;

3> derive serving cell measurement results based on SS/PBCH block, as described in 5.5.3.3;

2> if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains an *rsType* set to *csi-rs* and *CSI-RS-ResourceConfigMobility* is configured in the *measObject* indicated by the *servingCellMO*:

3> if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains a *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* and contains an *rsType* set to *csi-rs*:

4> derive layer 3 filtered RSRP and RSRQ per beam for the serving cell based on CSI-RS, as described in 5.5.3.3a;

3> derive serving cell measurement results based on CSI-RS, as described in 5.5.3.3;

1> for each serving cell for which *servingCellMO* is configured, if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains SINR as trigger quantity and/or reporting quantity:

2> if the *reportConfig* contains *rsType* set to *ssb* and *ssb-ConfigMobility* is configured in the *servingCellMO*:

3> if the *reportConfig*contains a *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport*:

4> derive layer 3 filtered SINR per beam for the serving cell based on SS/PBCH block, as described in 5.5.3.3a;

3> derive serving cell SINR based on SS/PBCH block, as described in 5.5.3.3;

2> if the *reportConfig* contains *rsType* set to *csi-rs* and *CSI-RS-ResourceConfigMobility* is configured in the *servingCellMO*:

3> if the *reportConfig*contains a *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport*:

4> derive layer 3 filtered SINR per beam for the serving cell based on CSI-RS, as described in 5.5.3.3a;

3> derive serving cell SINR based on CSI-RS, as described in 5.5.3.3;

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the *reportType* for the associated *reportConfig* is set to *reportCGI* and timer T321 is running:

3> perform the corresponding measurements on the frequency and RAT indicated in the associated *measObject* using available idle periods;

3> if the cell indicated by *reportCGI* field for the associated *measObject* is an NR cell and that indicated cell is broadcasting *SIB1* (see TS 38.213 [13], clause 13):

4> try to acquire *SIB1* in the concerned cell;

3> if the cell indicated by *reportCGI* field is an E-UTRA cell:

4> try to acquire *SystemInformationBlockType1* in the concerned cell;

2> if the *reportType* for the associated *reportConfig* is *periodical* or *eventTriggered*:

3> if a measurement gap configuration is setup, or

3> if the UE does not require measurement gaps to perform the concerned measurements:

4> if *s-MeasureConfig* is not configured, or

4> if *s-MeasureConfig* is set to *ssb-RSRP* and the NR SpCell RSRP based on SS/PBCH block, after layer 3 filtering, is lower than *ssb-RSRP,* or

4> if *s-MeasureConfig* is set to *csi-RSRP* and the NR SpCell RSRP based on CSI-RS, after layer 3 filtering, is lower than *csi-RSRP*:

5> if the *measObject* is associated to NR and the *rsType* is set to *csi-rs*:

6> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* for the associated *reportConfig* are configured:

7> derive layer 3 filtered beam measurements only based on CSI-RS for each measurement quantity indicated in *reportQuantityRS-Indexes*, as described in 5.5.3.3a;

6> derive cell measurement results based on CSI-RS for the trigger quantity and each measurement quantity indicated in *reportQuantityCell* using parameters from the associated *measObject*, as described in 5.5.3.3;

5> if the *measObject* is associated to NR and the *rsType* is set to *ssb*:

6> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* for the associated *reportConfig* are configured:

7> derive layer 3 beam measurements only based on SS/PBCH block for each measurement quantity indicated in *reportQuantityRS-Indexes*, as described in 5.5.3.3a;

6> derive cell measurement results based on SS/PBCH block for the trigger quantity and each measurement quantity indicated in *reportQuantityCell* using parameters from the associated *measObject*, as described in 5.5.3.3;

5> if the *measObject* is associated to E-UTRA:

6> perform the corresponding measurements associated to neighbouring cells on the frequencies indicated in the concerned *measObject*, as described in 5.5.3.2;

4> if the *measRSSI-ReportConfig* is configured in the associated *reportConfig*:

5> perform the RSSI and channel occupancy measurements on the frequency indicated in the associated *measObject*;

2> if the *reportType* for the associated *reportConfig* is set to *reportSFTD*:

3> if the *reportSFTD-Meas* is set to *true:*

4> if the *measObject* is associated to E-UTRA:

5> perform SFTD measurements between the PCell and the E-UTRA PSCell;

5> if the *reportRSRP* is set to *true*;

6> perform RSRP measurements for the E-UTRA PSCell;

4> else if the *measObject* is associated to NR:

5> perform SFTD measurements between the PCell and the NR PSCell;

5> if the *reportRSRP* is set to *true*;

6> perform RSRP measurements for the NR PSCell based on SSB;

3> else if the *reportSFTD-NeighMeas* is included*:*

4> if the *measObject* is associated to NR:

5> if the *drx-SFTD-NeighMeas* is included:

6> perform SFTD measurements between the PCell and the NR neighbouring cell(s) detected based on parameters in the associated *measObject* using available idle periods;

5> else:

6> perform SFTD measurements between the PCell and the NR neighbouring cell(s) detected based on parameters in the associated *measObject*;

5> if the *reportRSRP* is set to *true*:

6> perform RSRP measurements based on SSB for the NR neighbouring cell(s) detected based on parameters in the associated *measObject*;

2> perform the evaluation of reporting criteria as specified in 5.5.4.

Editor’s Note: It needs to be confirmed with RAN1 whether L3 filtering is applicable to RSSI measurements or not.

*Next Change*

#### 5.5.4.1 General

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:

3> if the corresponding *measObject* concerns NR:

4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:

5> consider only the serving cell to be applicable;

4> if the *eventA3* or *eventA5* is configured in the corresponding *reportConfig*:

5> if a serving cell is associated with a *measObjectNR* and neighbours are associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

4> if corresponding *reportConfig* includes *reportType* set to *periodical*; or

4> for measurement events other than *eventA1* or *eventA2*:

5> if *useWhiteCellList* is set to *true*:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is included in the *whiteCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

3> else if the corresponding *measObject* concerns E-UTRA:

4> if *eventB1* or *eventB2* is configured in the corresponding *reportConfig*:

5> consider a serving cell, if any, on the associated E-UTRA frequency as neighbour cell;

4> else:

5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;

2> else if the corresponding *reportConfig* includes a *reportType* set to *reportCGI*:

3> consider the cell detected on the associated *measObject* which has a physical cell identity matching the value of the *cellForWhichToReportCGI* included in the corresponding *reportConfig* within the *VarMeasConfig* to be applicable;

2> else if the corresponding *reportConfig* includes a *reportType* set to *reportSFTD*:

3> if the corresponding *measObject* concerns NR:

4> if the *reportSFTD-Meas* is set to *true*:

5> consider the NR PSCell to be applicable;

4> else if the *reportSFTD-NeighMeas* is included:

5> if *cellsForWhichToReportSFTD* is configured in the corresponding *reportConfig*:

6> consider any NR neighbouring cell detected on the associated *measObjectNR* which has a physical cell identity that is included in the *cellsForWhichToReportSFTD* to be applicable;

5> else:

6> consider up to 3 strongest NR neighbouring cells detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cells are not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

3> else if the corresponding *measObject* concerns E-UTRA:

4> if the *reportSFTD-Meas* is set to *true*:

5> consider the E-UTRA PSCell to be applicable;

2> else if the corresponding *reportConfig* includes *measRSSI-ReportConfig*:

3> consider the resource indicated by the *rmtc-Config* on the associated frequency to be applicable;

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> if *reportOnLeave* is set to *true* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

2> if *reportType* is set to *periodical* and if a (first) measurement result is available:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> if the *reportAmount* exceeds 1:

4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell;

3> else (i.e. the *reportAmount* is equal to 1):

4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell and for the strongest cell among the applicable cells;

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5.

2> if the corresponding *reportConfig* includes a *reportType* is set to *reportSFTD*:

3> if the corresponding *measObject* concerns NR:

4> if the *drx-SFTD-NeighMeas* is included:

5> if the quantity to be reported becomes available for each requested pair of PCell and NR cell:

6> stop timer T322;

6> initiate the measurement reporting procedure, as specified in 5.5.5;

4> else

5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for each requested pair of PCell and NR cell or the maximal measurement reporting delay as specified in TS 38.133 [14];

3> else if the corresponding *measObject* concerns E-UTRA:

4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the pair of PCell and E-UTRA PSCell or the maximal measurement reporting delay as specified in TS 38.133 [14];

2> if *reportType* is set to *reportCGI*:

3> if the UE acquired the *SIB1* or *SystemInformationBlockType1* for the requested cell; or

3> if the UE detects that the requested NR cell is not transmitting *SIB1* (see TS 38.213 [13], clause 13):

4> stop timer T321;

4> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

4> initiate the measurement reporting procedure, as specified in 5.5.5;

2> upon the expiry of T321 for this *measId*:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5.

2> upon the expiry of T322 for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the corresponding *reportConfig* includes *measRSSI-ReportConfig* and if a (first) measurement result is available:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure as specified in 5.5.5 immediately when RSSI sample values are reported by the physical layer after the first L1 measurement duration.

*Next Change*

#### 5.5.5.1 General



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> for each serving cell configured with *servingCellMO*:

2> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *rsType*:

3> if the serving cell measurements based on the *rsType* included in the *reportConfig* that triggered the measurement report are available:

4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on the *rsType* included in the *reportConfig* that triggered the measurement report;

2> else:

3> if SSB based serving cell measurements are available:

4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on SSB;

3> else if CSI-RS based serving cell measurements are available:

4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on CSI-RS;

1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport*:

2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

2> for each *measObjectId* referenced in the *measIdList* which is also referenced with *servingCellMO*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:

3> if the *measObjectNR* indicated by the *servingCellMO* includes the RS resource configuration corresponding to the *rsType* indicated in the *reportConfig*:

4> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;

4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport:*

5> for each best non-serving cell included in the measurement report:

6> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to *eventTriggered* and *eventID* is set to *eventA3*, or *eventA4*, or *eventA5*, or *eventB1*, or *eventB2*:

2> if the UE is in NE-DC and the measurement configuration that triggered this measurement report is associated with the MCG:

3> set the *measResultServFreqListEUTRA-SCG* to include an entry for each E-UTRA SCG serving frequency with the following:

4> include *carrierFreq* of the E-UTRA serving frequency;

4> set the *measResultServingCell* to include the available measurement quantities that the UE is configured to measure by the measurement configuration associated with the SCG;

4> if *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

5> set the *measResultServFreqListEUTRA-SCG* to include within *measResultBestNeighCell* the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;

1> if *reportConfig* associated with the *measId* that triggered the measurement reporting is set to *eventTriggered* and *eventID* is set to *eventA3*, or *eventA4*, or *eventA5*:

2> if the UE is in NR-DC and the measurement configuration that triggered this measurement report is associated with the MCG:

3> set the *measResultServFreqListNR-SCG* to include for each NR SCG serving cell that is configured with *servingCellMO*, if any, the following:

4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *rsType*:

5> if the serving cell measurements based on the *rsType* included in the *reportConfig* that triggered the measurement report are available according to the measurement configuration associated with the SCG:

6> set the *measResultServingCell* within *measResultServFreqListNR-SCG* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on the *rsType* included in the *reportConfig* that triggered the measurement report;

4> else:

5> if SSB based serving cell measurements are available according to the measurement configuration associated with the SCG:

6> set the *measResultServingCell* within *measResultServFreqListNR-SCG* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on SSB;

5> else if CSI-RS based serving cell measurements are available according to the measurement configuration associated with the SCG:

6> set the *measResultServingCell* within *measResultServFreqListNR-SCG* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on CSI-RS;

4> if results for the serving cell derived based on SSB are included:

5> include the *ssbFrequency* to the value indicated by ssbFrequency as included in the *MeasObjectNR* of the serving cell;

4> if results for the serving cell derived based on CSI-RS are included:

5> include the *refFreqCSI-RS* to the value indicated by *refFreqCSI-RS* as included in the *MeasObjectNR* of the serving cell;

4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport*:

5> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2, where availability is considered according to the measurement configuration associated with the SCG;

4> if *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

5> if the *measObjectNR* indicated by the *servingCellMO* includes the RS resource configuration corresponding to the *rsType* indicated in the *reportConfig*:

6> set the *measResultBestNeighCellListNR* within *measResultServFreqListNR-SCG* to include one entry with the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR, where availability is considered according to the measurement configuration associated with the SCG;

7> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport:*

8> for each best non-serving cell included in the measurement report:

9> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2, where availability is considered according to the measurement configuration associated with the SCG;

1> if the *measRSSI-ReportConfig* is configured within the corresponding *reportConfig* for this *measId*:

2> set the *rssi-Result* to the average of sample value(s) provided by lower layers in the *reportInterval;*

2> set the *channelOccupancy* to the rounded percentage of sample values which are beyond the *channelOccupancyThreshold* within all the sample values in the *reportInterval;*

1> if there is at least one applicable neighbouring cell to report:

2> if the *reportType* is set to *eventTriggered* or *periodical*:

3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

4> if the *reportType* is set to *eventTriggered*:

5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

4> else:

5> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

4> if the *reportType* is set to *eventTriggered* or *periodical*:

5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

6> if the *measObject* associated with this *measId* concerns NR:

7> if *rsType* in the associated *reportConfig* is set to *ssb*:

8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

8> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

7> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:

8> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

8> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

6> if the *measObject* associated with this *measId* concerns E-UTRA:

7> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

2> else:

3> if the cell indicated by *cellForWhichToReportCGI* is an NR cell:

4> if *plmn-IdentityInfoList* of the *cgi-Info* for the concerned cell has been obtained:

5> include the *plmn-IdentityInfoList* including *plmn-IdentityList*, *trackingAreaCode* (if available), *ranac* (if available), *cellIdentity* and *cellReservedForOperatorUse* for each entry of the *plmn-IdentityInfoList*;

5> include *frequencyBandList* if available;

4> else if *MIB* indicates the *SIB1* is not broadcast:

5> include the *noSIB1* including the *ssb-SubcarrierOffset* and *pdcch-ConfigSIB1* obtained from *MIB* of the concerned cell;

3> if the cell indicated by *cellForWhichToReportCGI* is an E-UTRA cell:

4> if all mandatory fields of the *cgi-Info-EPC* for the concerned cell have been obtained:

5> include in the *cgi-Info-EPC* the fields broadcasted in E-UTRA *SystemInformationBlockType1* associated to EPC;

4> if the UE is E-UTRA/5GC capable and all mandatory fields of the *cgi-Info-5GC* for the concerned cell have been obtained:

5> include in the *cgi-Info-5GC* the fields broadcasted in E-UTRA *SystemInformationBlockType1* associated to 5GC;

4> if the mandatory present fields of the *cgi-Info* for the cell indicated by the *cellForWhichToReportCGI* in the associated *measObject* have been obtained:

5> include the *freqBandIndicator*;

5> if the cell broadcasts the *multiBandInfoList*, include the *multiBandInfoList*;

5> if the cell broadcasts the *freqBandIndicatorPriority*, include the *freqBandIndicatorPriority*;

1> if the corresponding *measObject* concerns NR:

2> if the *reportSFTD-Meas* is set to *true* within the corresponding *reportConfigNR* for this *measId*:

3> set the *measResultSFTD-NR* in accordance with the following:

4> set *sfn-OffsetResult* and *frameBoundaryOffsetResult* to the measurement results provided by lower layers;

4> if the *reportRSRP* is set to *true*;

5> set *rsrp-Result* to the RSRP of the NR PSCell derived based on SSB;

2> else if the *reportSFTD-NeighMeas* is included within the corresponding *reportConfigNR* for this *measId*:

3> for each applicable cell which measurement results are available, include an entry in the *measResultCellListSFTD-NR* and set the contents as follows:

4> set *physCellId* to the physical cell identity of the concered NR neighbour cell.

4> set *sfn-OffsetResult* and *frameBoundaryOffsetResult* to the measurement results provided by lower layers;

4> if the *reportRSRP* is set to *true*:

5> set *rsrp-Result* to the RSRP of the concerned cell derived based on SSB;

1> else if the corresponding *measObject* concerns E-UTRA:

2> if the *reportSFTD-Meas* is set to *true* within the corresponding *reportConfigInterRAT* for this *measId*:

3> set the *measResultSFTD-EUTRA* in accordance with the following:

4> set *sfn-OffsetResult* and *frameBoundaryOffsetResult* to the measurement results provided by lower layers;

4> if the *reportRSRP* is set to *true*;

5> set *rsrpResult-EUTRA* to the RSRP of the EUTRA PSCell;

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

2> if the *reportType* is set to *periodical*:

3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the UE is in (NG)EN-DC:

2> if SRB3 is configured:

3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

2> else:

3> submit the *MeasurementReport* message via the E-UTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else if the UE is in NR-DC:

2> if the measurement configuration that triggered this measurement report is associated with the SCG:

3> if SRB3 is configured:

4> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

3> else:

4> submit the *MeasurementReport* message via the NR MCG embedded in NR RRC message *ULInformationTransferMRDC* as specified in5.7.2a.3;

2> else:

3> submit the *MeasurementReport* message via SRB1 to lower layers for transmission, upon which the procedure ends;

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

*Next Change*

#### 5.7.3.3 Failure type determination for (NG)EN-DC

The UE shall set the SCG failure type as follows:

1> if the UE initiates transmission of the *SCGFailureInformationNR* message due to T310 expiry:

2> set the *failureType* as t310-Expiry;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide reconfiguration with sync failure information for an SCG:

2> set the *failureType* as *synchReconfigFailure-SCG*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide random access problem indication from SCG MAC:

2> set the *failureType* as randomAccessProblem;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide indication from SCG RLC that the maximum number of retransmissions has been reached:

2> set the *failureType* as *rlc-MaxNumRetx*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to SRB3 integrity check failure:

2> set the *failureType* as *srb3-IntegrityFailure*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to Reconfiguration failure of NR RRC reconfiguration message:

2> set the *failureType* as *scg-reconfigFailure*.

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to consistent uplink LBT failures:

2> set the *failureType* as *scg-lbtFailure*.

*Next Change*

### 6.2.2 Message definitions

>>Skipped unchanged parts

#### – *MIB*

The *MIB* includes the system information transmitted on BCH.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: Network to UE

*MIB*

-- ASN1START

-- TAG-MIB-START

MIB ::= SEQUENCE {

systemFrameNumber BIT STRING (SIZE (6)),

subCarrierSpacingCommon ENUMERATED {scs15or60, scs30or120},

ssb-SubcarrierOffset INTEGER (0..15),

dmrs-TypeA-Position ENUMERATED {pos2, pos3},

pdcch-ConfigSIB1 PDCCH-ConfigSIB1,

cellBarred ENUMERATED {barred, notBarred},

intraFreqReselection ENUMERATED {allowed, notAllowed},

spare BIT STRING (SIZE (1))

}

-- TAG-MIB-STOP

-- ASN1STOP

|  |
| --- |
| *MIB* field descriptions |
| ***cellBarred***  Value *barred* means that the cell is barred, as defined in TS 38.304 [20]. |
| ***dmrs-TypeA-Position***  Position of (first) DM-RS for downlink (see TS 38.211 [16], clause 7.4.1.1.2) and uplink (see TS 38.211 [16], clause 6.4.1.1.3). |
| ***intraFreqReselection***  Controls cell selection/reselection to intra-frequency cells when the highest ranked cell is barred, or treated as barred by the UE, as specified in TS 38.304 [20]. |
| ***pdcch-ConfigSIB1***  Determines a common *ControlResourceSet* (CORESET), a common search space and necessary PDCCH parameters. If the field *ssb-SubcarrierOffset* indicates that *SIB1* is absent, the field *pdcch-ConfigSIB1* indicates the frequency positions where the UE may find SS/PBCH block with *SIB1* or the frequency range where the network does not provide SS/PBCH block with *SIB1* (see TS 38.213 [13], clause 13). |
| ***ssb-SubcarrierOffset***  Corresponds to kSSB (see TS 38.213 [13]), which is the frequency domain offset between SSB and the overall resource block grid in number of subcarriers. (See TS 38.211 [16], clause 7.4.3.1).  The value range of this field may be extended by an additional most significant bit encoded within PBCH as specified in TS 38.213 [13].  This field may indicate that this cell does not provide *SIB1* and that there is hence no CORESET#0 configured in *MIB* (see TS 38.213 [13], clause 13). In this case, the field *pdcch-ConfigSIB1* may indicate the frequency positions where the UE may (not) find a SS/PBCH with a control resource set and search space for *SIB1* (see TS 38.213 [13], clause 13). |
| ***subCarrierSpacingCommon***  Subcarrier spacing for *SIB1*, Msg.2/4 for initial access, paging and broadcast SI-messages. If the UE acquires this *MIB* on an FR1 carrier frequency, the value *scs15or60* corresponds to 15 kHz and the value *scs30or120* corresponds to 30 kHz. If the UE acquires this *MIB* on an FR2 carrier frequency, the value *scs15or60* corresponds to 60 kHz and the value *scs30or120* corresponds to 120 kHz. For operation with shared spectrum channel access, the subcarrier spacing for *SIB1* is same as that for the corresponding SSB and this IE instead is used for deriving the QCL relationship between SS/PBCH blocks in a serving cell as specified in TS 38.213 [13], clause 4.1. |
| ***systemFrameNumber***  The 6 most significant bits (MSB) of the 10-bit System Frame Number (SFN). The 4 LSB of the SFN are conveyed in the PBCH transport block as part of channel coding (i.e. outside the *MIB* encoding), as defined in clause 7.1 in TS 38.212 [17]. |

>>Skipped unchanged parts

#### *– SCGFailureInformation*

The *SCGFailureInformation* message is used to provide information regarding NR SCG failures detected by the UE.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to Network

*SCGFailureInformation* message

-- ASN1START

-- TAG-SCGFAILUREINFORMATION-START

SCGFailureInformation ::= SEQUENCE {

criticalExtensions CHOICE {

scgFailureInformation SCGFailureInformation-IEs,

criticalExtensionsFuture SEQUENCE {}

}

}

SCGFailureInformation-IEs ::= SEQUENCE {

failureReportSCG FailureReportSCG OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

FailureReportSCG ::= SEQUENCE {

failureType ENUMERATED {

t310-Expiry, randomAccessProblem,

rlc-MaxNumRetx,

synchReconfigFailureSCG, scg-ReconfigFailure,

srb3-IntegrityFailure, scg-lbtFailure, spare1},

measResultFreqList MeasResultFreqList OPTIONAL,

measResultSCG-Failure OCTET STRING (CONTAINING MeasResultSCG-Failure) OPTIONAL,

...

}

MeasResultFreqList ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2NR

-- TAG-SCGFAILUREINFORMATION-STOP

-- ASN1STOP

| *SCGFailureInformation field descriptions* |
| --- |
| ***measResultFreqList***  The field contains available results of measurements on NR frequencies the UE is configured to measure by *measConfig*. |
| ***measResultSCG-Failure***  The field contains the *MeasResultSCG-Failure* IE which includes available results of measurements on NR frequencies the UE is configured to measure by the NR SCG *RRCReconfiguration* message. |

*Next Change*

### 6.3.1 System information blocks

#### – *SIB2*

*SIB2* contains cell re-selection information common for intra-frequency, inter-frequency and/or inter-RAT cell re-selection (i.e. applicable for more than one type of cell re-selection but not necessarily all) as well as intra-frequency cell re-selection information other than neighbouring cell related.

*SIB2* information element

-- ASN1START

-- TAG-SIB2-START

SIB2 ::= SEQUENCE {

cellReselectionInfoCommon SEQUENCE {

nrofSS-BlocksToAverage INTEGER (2..maxNrofSS-BlocksToAverage) OPTIONAL, -- Need S

absThreshSS-BlocksConsolidation ThresholdNR OPTIONAL, -- Need S

rangeToBestCell RangeToBestCell OPTIONAL, -- Need R

q-Hyst ENUMERATED {

dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10,

dB12, dB14, dB16, dB18, dB20, dB22, dB24},

speedStateReselectionPars SEQUENCE {

mobilityStateParameters MobilityStateParameters,

q-HystSF SEQUENCE {

sf-Medium ENUMERATED {dB-6, dB-4, dB-2, dB0},

sf-High ENUMERATED {dB-6, dB-4, dB-2, dB0}

}

} OPTIONAL, -- Need R

...

},

cellReselectionServingFreqInfo SEQUENCE {

s-NonIntraSearchP ReselectionThreshold OPTIONAL, -- Need S

s-NonIntraSearchQ ReselectionThresholdQ OPTIONAL, -- Need S

threshServingLowP ReselectionThreshold,

threshServingLowQ ReselectionThresholdQ OPTIONAL, -- Need R

cellReselectionPriority CellReselectionPriority,

cellReselectionSubPriority CellReselectionSubPriority OPTIONAL, -- Need R

...

},

intraFreqCellReselectionInfo SEQUENCE {

q-RxLevMin Q-RxLevMin,

q-RxLevMinSUL Q-RxLevMin OPTIONAL, -- Need R

q-QualMin Q-QualMin OPTIONAL, -- Need S

s-IntraSearchP ReselectionThreshold,

s-IntraSearchQ ReselectionThresholdQ OPTIONAL, -- Need S

t-ReselectionNR T-Reselection,

frequencyBandList MultiFrequencyBandListNR-SIB OPTIONAL, -- Need S

frequencyBandListSUL MultiFrequencyBandListNR-SIB OPTIONAL, -- Need R

p-Max P-Max OPTIONAL, -- Need S

smtc SSB-MTC OPTIONAL, -- Need S

ss-RSSI-Measurement SS-RSSI-Measurement OPTIONAL, -- Need R

ssb-ToMeasure SSB-ToMeasure OPTIONAL, -- Need S

deriveSSB-IndexFromCell BOOLEAN,

...,

[[

t-ReselectionNR-SF SpeedStateScaleFactors OPTIONAL, -- Need N

ssb-PositionQCL-Common-r16 SSB-PositionQCL-Relationship-r16 OPTIONAL -- Need R

]]

},

...

}

RangeToBestCell ::= Q-OffsetRange

-- TAG-SIB2-STOP

-- ASN1STOP

| *SIB2* field descriptions |
| --- |
| ***absThreshSS-BlocksConsolidation***  Threshold for consolidation of L1 measurements per RS index. If the field is absent, the UE uses the measurement quantity as specified in TS 38.304 [20]. |
| ***cellReselectionInfoCommon***  Cell re-selection information common for intra-frequency, inter-frequency and/ or inter-RAT cell re-selection. |
| ***cellReselectionServingFreqInfo***  Information common for non-intra-frequency cell re-selection i.e. cell re-selection to inter-frequency and inter-RAT cells. |
| ***deriveSSB-IndexFromCell***  This field indicates whether the UE can utilize serving cell timing to derive the index of SS block transmitted by neighbour cell. If this field is set to *true*, the UE assumes SFN and frame boundary alignment across cells on the serving frequency as specified in TS 38.133 [14]. |
| ***frequencyBandList***  Indicates the list of frequency bands for which the NR cell reselection parameters apply. The UE behaviour in case the field is absent is described in subclause 5.2.2.4.3. |
| ***intraFreqCellReselectionInfo***  Cell re-selection information common for intra-frequency cells. |
| ***nrofSS-BlocksToAverage***  Number of SS blocks to average for cell measurement derivation. If the field is absent the UE uses the measurement quantity as specified in TS 38.304 [20]. |
| ***p-Max***  Value in dBm applicable for the intra-frequency neighbouring NR cells. If absent the UE applies the maximum power according to TS 38.101-1 [15] in case of an FR1 cell or TS 38.101-2 [39] in case of an FR2 cell. In this release of the specification, if *p-Max* is present on a carrier frequency in FR2, the UE shall ignore the field and applies the maximum power according to TS 38.101-2 [39]. |
| ***q-Hyst***  Parameter "*Qhyst*" in TS 38.304 [20], Value in dB. Value *dB1* corresponds to 1 dB, *dB2* corresponds to 2 dB and so on. |
| ***q-HystSF***  Parameter "Speed dependent ScalingFactor for Qhyst" in TS 38.304 [20]. The *sf-Medium* and *sf-High* concern the additional hysteresis to be applied, in Medium and High Mobility state respectively, to Qhyst as defined in TS 38.304 [20]. In dB. Value *dB-6* corresponds to -6dB, *dB-4* corresponds to -4dB and so on. |
| ***q-QualMin***  Parameter "Qqualmin" in TS 38.304 [20], applicable for intra-frequency neighbour cells. If the field is absent, the UE applies the (default) value of negative infinity for Qqualmin. |
| ***q-RxLevMin***  Parameter "Qrxlevmin" in TS 38.304 [20], applicable for intra-frequency neighbour cells. |
| ***q-RxLevMinSUL***  Parameter "Qrxlevmin" in TS 38.304 [20], applicable for intra-frequency neighbour cells. |
| ***rangeToBestCell***  Parameter "rangeToBestCell" in TS 38.304 [20]. The network configures only non-negative (in dB) values. |
| ***s-IntraSearchP***  Parameter "SIntraSearchP" in TS 38.304 [20]. |
| ***s-IntraSearchQ***  Parameter "SIntraSearchQ2 in TS 38.304 [20]. If the field is absent, the UE applies the (default) value of 0 dB for SIntraSearchQ. |
| ***s-NonIntraSearchP***  Parameter "SnonIntraSearchP" in TS 38.304 [20]. If this field is absent, the UE applies the (default) value of infinity for SnonIntraSearchP. |
| ***s-NonIntraSearchQ***  Parameter "SnonIntraSearchQ" in TS 38.304 [20]. If the field is absent, the UE applies the (default) value of 0 dB for SnonIntraSearchQ. |
| ***smtc***  Measurement timing configuration for intra-frequency measurement. If this field is absent, the UE assumes that SSB periodicity is 5 ms for the intra-frequnecy cells. |
| ***ssb-PositionQCL-Common***  Indicates the QCL relationship between SS/PBCH blocks for intra-frequency neighbor cells as specified in TS 38.213 [13], clause 4.1. |
| ***ssb-ToMeasure***  The set of SS blocks to be measured within the SMTC measurement duration (see TS 38.215 [9]). When the field is absent the UE measures on all SS-blocks. |
| ***t-ReselectionNR***  Parameter "TreselectionNR" in TS 38.304 [20]. |
| ***t-ReselectionNR-SF***  Parameter "Speed dependent ScalingFactor for TreselectionNR" in TS 38.304 [20]. If the field is absent, the UE behaviour is specified in TS 38.304 [20]. |
| ***threshServingLowP***  Parameter "ThreshServing, LowP" in TS 38.304 [20]. |
| ***threshServingLowQ***  Parameter "ThreshServing, LowQ" in TS 38.304 [20]. |

#### – *SIB3*

*SIB3* contains neighbouring cell related information relevant only for intra-frequency cell re-selection. The IE includes cells with specific re-selection parameters as well as blacklisted cells.

*SIB3* information element

-- ASN1START

-- TAG-SIB3-START

SIB3 ::= SEQUENCE {

intraFreqNeighCellList IntraFreqNeighCellList OPTIONAL, -- Need R

intraFreqBlackCellList IntraFreqBlackCellList OPTIONAL, -- Need R

lateNonCriticalExtension OCTET STRING OPTIONAL,

...,

[[

intraFreqWhiteCellList-r16 IntraFreqWhiteCellList-r16 OPTIONAL -- Need R

]]

}

IntraFreqNeighCellList ::= SEQUENCE (SIZE (1..maxCellIntra)) OF IntraFreqNeighCellInfo

IntraFreqNeighCellInfo ::= SEQUENCE {

physCellId PhysCellId,

q-OffsetCell Q-OffsetRange,

q-RxLevMinOffsetCell INTEGER (1..8) OPTIONAL, -- Need R

q-RxLevMinOffsetCellSUL INTEGER (1..8) OPTIONAL, -- Need R

q-QualMinOffsetCell INTEGER (1..8) OPTIONAL, -- Need R

...,

[[

ssb-PositionQCL-r16 SSB-PositionQCL-Relationship-r16 OPTIONAL -- Need R

]]

}

IntraFreqBlackCellList ::= SEQUENCE (SIZE (1..maxCellBlack)) OF PCI-Range

IntraFreqWhiteCellList-r16 ::= SEQUENCE (SIZE (1..maxCellWhite)) OF PCI-Range

-- TAG-SIB3-STOP

-- ASN1STOP

| *SIB3* field descriptions |
| --- |
| ***intraFreqBlackCellList***  List of blacklisted intra-frequency neighbouring cells. |
| ***intraFreqNeighCellList***  List of intra-frequency neighbouring cells with specific cell re-selection parameters. |
| ***intraFreqWhiteCellList***  List of whitelisted intra-frequency neighbouring cells, see TS 38.304 [20], clause 5.2.4. |
| ***q-OffsetCell***  Parameter "Qoffsets,n" in TS 38.304 [20]. |
| ***q-QualMinOffsetCell***  Parameter "Qqualminoffsetcell" in TS 38.304 [20]. Actual value Qqualminoffsetcell = field value [dB]. |
| ***q-RxLevMinOffsetCell***  Parameter "Qrxlevminoffsetcell" in TS 38.304 [20]. Actual value Qrxlevminoffsetcell = field value \* 2 [dB]. |
| ***q-RxLevMinOffsetCellSUL***  Parameter "QrxlevminoffsetcellSUL" in TS 38.304 [20]. Actual value QrxlevminoffsetcellSUL = field value \* 2 [dB]. |
| ***ssb-PositionQCL***  Indicates the QCL relationship between SS/PBCH blocks for a specific intra-frequency neighbor cell as specified in TS 38.213 [13], clause 4.1. If provided, the cell specific value overwrites the value signalled by *ssb-PositionQCL-Common* in *SIB2* for the indicated cell. |

#### – *SIB4*

*SIB4* contains information relevant only for inter-frequency cell re-selection i.e. information about other NR frequencies and inter-frequency neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

*SIB4* information element

-- ASN1START

-- TAG-SIB4-START

SIB4 ::= SEQUENCE {

interFreqCarrierFreqList InterFreqCarrierFreqList,

lateNonCriticalExtension OCTET STRING OPTIONAL,

...

}

InterFreqCarrierFreqList ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo

InterFreqCarrierFreqInfo ::= SEQUENCE {

dl-CarrierFreq ARFCN-ValueNR,

frequencyBandList MultiFrequencyBandListNR-SIB OPTIONAL, -- Cond Mandatory

frequencyBandListSUL MultiFrequencyBandListNR-SIB OPTIONAL, -- Need R

nrofSS-BlocksToAverage INTEGER (2..maxNrofSS-BlocksToAverage) OPTIONAL, -- Need S

absThreshSS-BlocksConsolidation ThresholdNR OPTIONAL, -- Need S

smtc SSB-MTC OPTIONAL, -- Need S

ssbSubcarrierSpacing SubcarrierSpacing,

ssb-ToMeasure SSB-ToMeasure OPTIONAL, -- Need S

deriveSSB-IndexFromCell BOOLEAN,

ss-RSSI-Measurement SS-RSSI-Measurement OPTIONAL,

q-RxLevMin Q-RxLevMin,

q-RxLevMinSUL Q-RxLevMin OPTIONAL, -- Need R

q-QualMin Q-QualMin OPTIONAL, -- Need S

p-Max P-Max OPTIONAL, -- Need S

t-ReselectionNR T-Reselection,

t-ReselectionNR-SF SpeedStateScaleFactors OPTIONAL, -- Need S

threshX-HighP ReselectionThreshold,

threshX-LowP ReselectionThreshold,

threshX-Q SEQUENCE {

threshX-HighQ ReselectionThresholdQ,

threshX-LowQ ReselectionThresholdQ

} OPTIONAL, -- Cond RSRQ

cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need R

cellReselectionSubPriority CellReselectionSubPriority OPTIONAL, -- Need R

q-OffsetFreq Q-OffsetRange DEFAULT dB0,

interFreqNeighCellList InterFreqNeighCellList OPTIONAL, -- Need R

interFreqBlackCellList InterFreqBlackCellList OPTIONAL, -- Need R

... ,

[[

interFreqWhiteCellList-r16 InterFreqWhiteCellList-r16 OPTIONAL, -- Need R

ssb-PositionQCL-Common-r16 SSB-PositionQCL-Relationship-r16 OPTIONAL -- Need R

]]

}

InterFreqNeighCellList ::= SEQUENCE (SIZE (1..maxCellInter)) OF InterFreqNeighCellInfo

InterFreqNeighCellInfo ::= SEQUENCE {

physCellId PhysCellId,

q-OffsetCell Q-OffsetRange,

q-RxLevMinOffsetCell INTEGER (1..8) OPTIONAL, -- Need R

q-RxLevMinOffsetCellSUL INTEGER (1..8) OPTIONAL, -- Need R

q-QualMinOffsetCell INTEGER (1..8) OPTIONAL, -- Need R

...,

[[

ssb-PositionQCL-r16 SSB-PositionQCL-Relationship-r16 OPTIONAL -- Need R

]]

}

InterFreqBlackCellList ::= SEQUENCE (SIZE (1..maxCellBlack)) OF PCI-Range

InterFreqWhiteCellList-r16 ::= SEQUENCE (SIZE (1..maxCellWhite)) OF PCI-Range

-- TAG-SIB4-STOP

-- ASN1STOP

| *SIB4* field descriptions |
| --- |
| ***absThreshSS-BlocksConsolidation***  Threshold for consolidation of L1 measurements per RS index. If the field is absent, the UE uses the measurement quantity as specified in TS 38.304 [20]. |
| ***deriveSSB-IndexFromCell***  This field indicates whether the UE may use the timing of any detected cell on that frequency to derive the SSB index of all neighbour cells on that frequency. If this field is set to *true*, the UE assumes SFN and frame boundary alignment across cells on the neighbor frequency as specified in TS 38.133 [14]. |
| ***dl-CarrierFreq***  This field indicates center frequency of the SS block of the neighbour cells, where the frequency corresponds to a GSCN value as specified in TS 38.101-1 [15]. |
| ***frequencyBandList***  Indicates the list of frequency bands for which the NR cell reselection parameters apply. |
| ***interFreqBlackCellList***  List of blacklisted inter-frequency neighbouring cells. |
| ***interFreqCarrierFreqList***  List of neighbouring carrier frequencies and frequency specific cell re-selection information. |
| ***interFreqNeighCellList***  List of inter-frequency neighbouring cells with specific cell re-selection parameters. |
| ***interFreqWhiteCellList***  List of whitelisted inter-frequency neighbouring cells, see TS 38.304 [20], clause 5.2.4. |
| ***nrofSS-BlocksToAverage***  Number of SS blocks to average for cell measurement derivation. If the field is absent, the UE uses the measurement quantity as specified in TS 38.304 [20]. |
| ***p-Max***  Value in dBm applicable for the neighbouring NR cells on this carrier frequency. If absent the UE applies the maximum power according to TS 38.101-1 [15] in case of an FR1 cell or TS 38.101-2 [39] in case of an FR2 cell. In this release of the specification, if *p-Max* is present on a carrier frequency in FR2, the UE shall ignore the field and applies the maximum power according to TS 38.101-2 [39]. |
| ***q-OffsetCell***  Parameter "Qoffsets,n" in TS 38.304 [20]. |
| ***q-OffsetFreq***  Parameter "Qoffsetfrequency" in TS 38.304 [20]. |
| ***q-QualMin***  Parameter "Qqualmin" in TS 38.304 [20]. If the field is absent, the UE applies the (default) value of negative infinity for Qqualmin. |
| ***q-QualMinOffsetCell***  Parameter "Qqualminoffsetcell" in TS 38.304 [20]. Actual value Qqualminoffsetcell = field value [dB]. |
| ***q-RxLevMin***  Parameter "Qrxlevmin" in TS 38.304 [20]. |
| ***q-RxLevMinOffsetCell***  Parameter "Qrxlevminoffsetcell" in TS 38.304 [20]. Actual value Qrxlevminoffsetcell = field value \* 2 [dB]. |
| ***q-RxLevMinOffsetCellSUL***  Parameter "QrxlevminoffsetcellSUL" in TS 38.304 [20]. Actual value QrxlevminoffsetcellSUL = field value \* 2 [dB]. |
| ***q-RxLevMinSUL***  Parameter "Qrxlevmin" in TS 38.304 [20]. |
| ***smtc***  Measurement timing configuration for inter-frequency measurement. If this field is absent, the UE assumes that SSB periodicity is 5 ms in this frequency. |
| ***ssb-ToMeasure***  The set of SS blocks to be measured within the SMTC measurement duration (see TS 38.215 [9]). When the field is absent the UE measures on all SS-blocks. |
| ***ssb-PositionQCL***  Indicates the QCL relationship between SS/PBCH blocks for a specific neighbor cell as specified in TS 38.213 [13], clause 4.1. If provided, the cell specific value overwrites the common value signalled by *ssb-PositionQCL-Common* in *SIB4* for the indicated cell. |
| ***ssb-PositionQCL-Common***  Indicates the QCL relationship between SS/PBCH blocks for inter-frequency neighbor cells as specified in TS 38.213 [13], clause 4.1. |
| ***ssbSubcarrierSpacing***  Subcarrier spacing of SSB. Only the values 15 kHz or 30 kHz (FR1), and 120 kHz or 240 kHz (FR2) are applicable. |
| ***threshX-HighP***  Parameter "ThreshX, HighP" in TS 38.304 [20]. |
| ***threshX-HighQ***  Parameter "ThreshX, HighQ" in TS 38.304 [20]. |
| ***threshX-LowP***Parameter "ThreshX, LowP" in TS 38.304 [20]. |
| ***threshX-LowQ***  Parameter "ThreshX, LowQ" in TS 38.304 [20]. |
| ***t-ReselectionNR***  Parameter "TreselectionNR" in TS 38.304 [20]. |
| ***t-ReselectionNR-SF***  Parameter "Speed dependent ScalingFactor for TreselectionNR" in TS 38.304 [20]. If the field is absent, the UE behaviour is specified in TS 38.304 [20]. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *Mandatory* | The field is mandatory present in SIB4. |
| *RSRQ* | The field is mandatory present if *threshServingLowQ* is present in *SIB2*; otherwise it is absent. |

*Next Change*

### 6.3.2 Radio resource control information elements

>>Skipped unchanged parts

#### – *AvailableRB-SetPerCell*

The IE *AvailableRB-SetPerCell* is used to configure position in DCI of the bit(s) indicating the availability of RB sets of a serving cell.

-- ASN1START

-- TAG-AVAILABLERB-SETPERCELL-START

AvailableRB-SetPerCell-r16 ::= SEQUENCE {

servingCellId ServCellIndex,

positionInDCI INTEGER(0..maxSFI-DCI-PayloadSize-1)

}

-- TAG-AVAILABLERB-SETPERCELL-STOP

-- ASN1STOP

|  |
| --- |
| *AvailableRB-SetPerCell* field descriptions |
| ***positionInDCI***  The (starting) position of the bits within DCI payload indicating the availability of the RB sets of a serving cell (see TS 38.213 [13], clause 11.1.1). |
| ***servingCellIId***  The ID of the serving cell for which the configuration is applicable. |

>>Skipped unchanged parts

#### – *BWP-UplinkCommon*

The IE *BWP-UplinkCommon* is used to configure the common parameters of an uplink BWP. They are "cell specific" and the network ensures the necessary alignment with corresponding parameters of other UEs. The common parameters of the initial bandwidth part of the PCell are also provided via system information. For all other serving cells, the network provides the common parameters via dedicated signalling.

*BWP-UplinkCommon* information element

-- ASN1START

-- TAG-BWP-UPLINKCOMMON-START

BWP-UplinkCommon ::= SEQUENCE {

genericParameters BWP,

rach-ConfigCommon SetupRelease { RACH-ConfigCommon } OPTIONAL, -- Need M

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

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

...,

useInterlacePUCCH-PUSCH-r16 ENUMERATED {enabled} OPTIONAL -- Need M

}

-- TAG-BWP-UPLINKCOMMON-STOP

-- ASN1STOP

|  |
| --- |
| *BWP-UplinkCommon* field descriptions |
| ***pucch-ConfigCommon***  Cell specific parameters for the PUCCH of this BWP. |
| ***pusch-ConfigCommon***  Cell specific parameters for the PUSCH of this BWP. |
| ***rach-ConfigCommon***  Configuration of cell specific random access parameters which the UE uses for contention based and contention free random access as well as for contention based beam failure recovery in this BWP. The NW configures SSB-based RA (and hence *RACH-ConfigCommon*) only for UL BWPs if the linked DL BWPs (same *bwp-Id* as UL-BWP) are the initial DL BWPs or DL BWPs containing the SSB associated to the initial DL BWP. The network configures *rach-ConfigCommon*, whenever it configures contention free random access (for reconfiguration with sync or for beam failure recovery). |
| ***useInterlacePUCCH-PUSCH***  If the field is present, the UE uses uplink frequency domain resource allocation Type 2 for cell-specific PUSCH, e.g., PUSCH scheduled by RAR UL grant (see 38.213 clause 8.3 and 38.214 clause 6.1.2.2) and uses interlaced PUCCH Format 0, 1, 2, and 3 for cell-specific PUCCH (see TS 38.213 [13], clause 9.2.1). |

#### – *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

...,

[[

cp-ExtensionC2-r16 INTEGER (1..28) OPTIONAL, -- Need R

cp-ExtensionC3-r16 INTEGER (1..28) OPTIONAL, -- Need R

useInterlacePUCCH-PUSCH-r16 ENUMERATED {enabled} 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. |
| ***cp-ExtensionC2, cp-ExtensionC3***  Configures the cyclic prefix (CP) extension (see TS 38.211 [16], clause 5.3.1). For 15 and 30KHz SCS, {1..28} are valid. For 60KHz SCS, {2..28} are valid. |
| ***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. |
| ***useInterlacePUCCH-PUSCH***  If the field is present, the UE uses uplink frequency domain resource allocation Type 2 for PUSCH (see 38.213 clause 8.3 and 38.214 clause 6.1.2.2) and uses interlaced PUCCH Format 0, 1, 2, and 3 for PUCCH (see TS 38.213 [13], clause 9.2.1). |

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

>>Skipped unchanged parts

#### – *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*).

*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),

...

} OPTIONAL, -- Need R

...,

[[

cg-RetransmissionTimer-r16 INTEGER (1..64) OPTIONAL, -- Need R

cg-minDFI-Delay-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R Upper limit 7 FFS

cg-nrofPUSCH-InSlot-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

cg-nrofSlots-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

cg-StartingFullBW-InsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

cg-StartingFullBW-OutsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

cg-StartingPartialBW-InsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

cg-StartingPartialBW-OutsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

cg-UCI-Multiplexing ENUMERATED {enabled} OPTIONAL, -- Need R

cg-COT-SharingOffset-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

betaOffsetCG-UCI-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

cg-COT-SharingList-r16 SEQUENCE (SIZE (1..ffsValue)) OF CG-COT-Sharing-r16 OPTIONAL, -- Need R

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

]]

}

CG-UCI-OnPUSCH ::= CHOICE {

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

semiStatic BetaOffsets

}

CG-COT-Sharing-r16 ::= SEQUENCE {

duration-r16 INTEGER (1..ffsValue),

offset-r16 INTEGER (1..ffsValue),

channelAccessPriority-r16 INTEGER (1..4)

}

-- 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. |
| ***betaOffsetCG-UCI***  Beta offset for CG-UCI in CG-PUSCH, see TS 38.213 [13], clause 9.3 |
| ***cg-COT-SharingOffset***  Indicates the number of symbols from the end of the slot where the COT sharing indication in UCI is enabled. Applicable when *ULtoDL-COT-SharingED-Threshold-r16* is not configured (see 37.213 [XX], clause 4.1.3). |
| ***cg-DMRS-Configuration***  DMRS configuration (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-minDFIDelay***  Indicates the minimum duration (in unit of symbols) from the ending symbol of the CG-PUSCH to the starting symbol of the DFI carrying HARQ-ACK for that PUSCH. UE assumes HARQ-ACK is valid only for PUSCH transmissions ending before n-cg-DFIDelay-r16, where n is the time corresponding to the beginning of the start symbol of the DFI (see TS 38.213 [13], clause 10.3).. |
| ***cg-nrofPUSCH-InSlot***  Indicates the number of consecutive PUSCH configured to CG within a slot where the SLIV indicating the first PUSCH and additional PUSCH appended with the same length (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-nrofSlots***  Indicates the number of allocated slots in a configured grant periodicity following the time instance of configured grant offset (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-RetransmissionTimer***  Indicates the initial value of the configured retransmission timer (see TS 38.321 [3]) in multiples of *periodicity*. The value of *cg-RetransmissionTimer* is always less than the value of *configuredGrantTimer.* This IE is always configured for configured grants on operation with shared spectrum channel access. |
| ***cg-StartingFullBW-InsideCOT***  A set of configured grant PUSCH transmission starting offsets which indicates the length of a CP extension of the first symbol that is located before the configured resource when frequency domain resource allocation includes all interlaces in the allocated RB set(s) and the CG PUSCH resource is inside gNB COT (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-StartingFullBW-OutsideCOT***  A set of configured grant PUSCH transmission starting offsets which indicates the length of a CP extension of the first symbol that is located before the configured resource when frequency domain resource allocation includes all interlaces in the allocated RB set(s) and the CG PUSCH resource is outside gNB COT (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-StartingPartialBW-InsideCOT***  A set of configured grant PUSCH transmission starting offsets which indicates the length of a CP extension of the first symbol that is located before the configured resource when frequency domain resource allocation does not include all interlaces in the allocated RB set(s) and the CG PUSCH resource is inside gNB COT (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-StartingPartialBW-OutsideCOT***  A set of configured grant PUSCH transmission starting offsets which indicates the length of a CP extension of the first symbol that is located before the configured resource when frequency domain resource allocation does not include all interlaces in the allocated RB set(s) and the CG PUSCH resource is outside gNB COT (see TS 38.214 [19], clause 6.1.2.3). |
| ***cg-UCI-Multiplexing***  When configured, in the case of PUCCH overlapping with CG-PUSCH(s) within a PUCCH group, the CG-UCI and HARQ-ACK are jointly encoded (CG-UCI is treated as the same type as a HARQ-ACK). When not configured, In the case of PUCCH overlapping with CG-PUSCH(s) within a PUCCH group and PUCCH carries HARQ ACK feedback, configured grant PUSCH is skipped (see TS 38.214 [19], clause 6.3.2.1.4). |
| ***channelAccessPriority***  Indicates the Channel Access Priority Class that the gNB can assume when sharing the UE initiated COT (see 37.213 [XX], clause 4.1.3). |
| ***configuredGrantTimer***  Indicates the initial value of the configured grant timer (see TS 38.321 [3]) in multiples of periodicity. When *cg-RetransmissonTimer* is configured, if HARQ processes are shared among different configured grants on the same BWP, *configuredGrantTimer* is set to the same value for all of configurations on this BWP. |
| ***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***  For operation with shared spectrum channel access, this configures the range of HARQ process IDs which can be used for this configured grant where the UE can select a HARQ process ID within [*harq-procID-offset, ..,* (*harq-procID-offset + nrofHARQ-Processes* – 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} |
| ***powerControlLoopToUse***  Closed control loop to apply (see TS 38.213 [13], clause 7.1.1). |
| ***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. |
| ***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 SFN=0, 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.* |

|  |
| --- |
| *CG-COT-Sharing* field descriptions |
| ***duration***  Indicates the number of DL transmission slots within UE initiated COT (see 37.213 [XX], clause 4.1.3). |
| ***offset***  Indicates the number of DL transmission slots from the end of the slot where CG-UCI is detected after which COT sharing can be used (see 37.213 [XX], clause 4.1.3). |

>>Skipped unchanged parts

#### – *ControlResourceSet*

The IE *ControlResourceSet* is used to configure a time/frequency control resource set (CORESET) in which to search for downlink control information (see TS 38.213 [13], clause 10.1).

*ControlResourceSet* information element

-- ASN1START

-- TAG-CONTROLRESOURCESET-START

ControlResourceSet ::= SEQUENCE {

controlResourceSetId ControlResourceSetId,

frequencyDomainResources BIT STRING (SIZE (45)),

duration INTEGER (1..maxCoReSetDuration),

cce-REG-MappingType CHOICE {

interleaved SEQUENCE {

reg-BundleSize ENUMERATED {n2, n3, n6},

interleaverSize ENUMERATED {n2, n3, n6},

shiftIndex INTEGER(0..maxNrofPhysicalResourceBlocks-1) OPTIONAL -- Need S

},

nonInterleaved NULL

},

precoderGranularity ENUMERATED {sameAsREG-bundle, allContiguousRBs},

tci-StatesPDCCH-ToAddList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF TCI-StateId OPTIONAL, -- Cond NotSIB1-initialBWP

tci-StatesPDCCH-ToReleaseList SEQUENCE(SIZE (1..maxNrofTCI-StatesPDCCH)) OF TCI-StateId OPTIONAL, -- Cond NotSIB1-initialBWP

tci-PresentInDCI ENUMERATED {enabled} OPTIONAL, -- Need S

pdcch-DMRS-ScramblingID INTEGER (0..65535) OPTIONAL, -- Need S

...,

[[

rb-Offset-r16 INTEGER (0..5) OPTIONAL -- Need N

]]

}

-- TAG-CONTROLRESOURCESET-STOP

-- ASN1STOP

|  |
| --- |
| *ControlResourceSet* field descriptions |
| ***cce-REG-MappingType***  Mapping of Control Channel Elements (CCE) to Resource Element Groups (REG) (see TS 38.211 [16], clauses 7.3.2.2 and 7.4.1.3.2). |
| ***controlResourceSetId***  Value 0 identifies the common CORESET configured in *MIB* and in *ServingCellConfigCommon* (*controlResourceSetZero*) and is hence not used here in the *ControlResourceSet* IE. Values 1..*maxNrofControlResourceSets-1* identify CORESETs configured by dedicated signalling or in *SIB1*. The *controlResourceSetId* is unique among the BWPs of a serving cell. |
| ***duration***  Contiguous time duration of the CORESET in number of symbols (see TS 38.211 [16], clause 7.3.2.2). |
| ***frequencyDomainResources***  Frequency domain resources for the CORESET. Each bit corresponds a group of 6 RBs, with grouping starting from the first RB group (see TS 38.213 [13], clause 10.1) in the BWP. The first (left-most / most significant) bit corresponds to the first RB group in the BWP, and so on. A bit that is set to 1 indicates that this RB group belongs to the frequency domain resource of this CORESET. Bits corresponding to a group of RBs not fully contained in the bandwidth part within which the CORESET is configured are set to zero (see TS 38.211 [16], clause 7.3.2.2). |
| ***interleaverSize***  Interleaver-size (see TS 38.211 [16], clause 7.3.2.2). |
| ***pdcch-DMRS-ScramblingID***  PDCCH DMRS scrambling initialization (see TS 38.211 [16], clause 7.4.1.3.1). When the field is absent the UE applies the value of the *physCellId* configured for this serving cell. |
| ***precoderGranularity***  Precoder granularity in frequency domain (see TS 38.211 [16], clauses 7.3.2.2 and 7.4.1.3.2). |
| ***rb-Offset***  Indicates the RB level offset in units of RB from the first RB of the first 6RB group to the first RB of BWP (see 38.213 [13], clause 10.1). When the field is absent, the UE applies the value 0. |
| ***reg-BundleSize***  Resource Element Groups (REGs) can be bundled to create REG bundles. This parameter defines the size of such bundles (see TS 38.211 [16], clause 7.3.2.2). |
| ***shiftIndex***  When the field is absent the UE applies the value of the *physCellId*configured for this serving cell (see TS 38.211 [16], clause 7.3.2.2). |
| ***tci-PresentInDCI***  This field indicates if TCI field is present or absent in DL-related DCI. When the field is absent the UE considers the TCI to be absent/disabled. In case of cross carrier scheduling, the network sets this field to enabled for the *ControlResourceSet* used for cross carrier scheduling in the scheduling cell (see TS 38.214 [19], clause 5.1.5). |
| ***tci-StatesPDCCH-ToAddList***  A subset of the TCI states defined in pdsch-Config included in the *BWP-DownlinkDedicated* corresponding to the serving cell and to the DL BWP to which the *ControlResourceSet* belong to. They are used for providing QCL relationships between the DL RS(s) in one RS Set (TCI-State) and the PDCCH DMRS ports (see TS 38.213 [13], clause 6.). The network configures at most *maxNrofTCI-StatesPDCCH* entries. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *NotSIB1-initialBWP* | The field is absent in *SIB1* and in the *PDCCH-ConfigCommon* of the initial BWP in *ServingCellConfigCommon*, if *SIB1* is broadcasted. Otherwise, it is optionally present, Need N. |

>>Skipped unchanged parts

#### – *DownlinkConfigCommonSIB*

The IE *DownlinkConfigCommonSIB* provides common downlink parameters of a cell.

*DownlinkConfigCommonSIB* information element

-- ASN1START

-- TAG-DOWNLINKCONFIGCOMMONSIB-START

DownlinkConfigCommonSIB ::= SEQUENCE {

frequencyInfoDL FrequencyInfoDL-SIB,

initialDownlinkBWP BWP-DownlinkCommon,

bcch-Config BCCH-Config,

pcch-Config PCCH-Config,

...

}

BCCH-Config ::= SEQUENCE {

modificationPeriodCoeff ENUMERATED {n2, n4, n8, n16},

...

}

PCCH-Config ::= SEQUENCE {

defaultPagingCycle PagingCycle,

nAndPagingFrameOffset CHOICE {

oneT NULL,

halfT INTEGER (0..1),

quarterT INTEGER (0..3),

oneEighthT INTEGER (0..7),

oneSixteenthT INTEGER (0..15)

},

ns ENUMERATED {four, two, one},

firstPDCCH-MonitoringOccasionOfPO CHOICE {

sCS15KHZoneT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..139),

sCS30KHZoneT-SCS15KHZhalfT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..279),

sCS60KHZoneT-SCS30KHZhalfT-SCS15KHZquarterT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..559),

sCS120KHZoneT-SCS60KHZhalfT-SCS30KHZquarterT-SCS15KHZoneEighthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..1119),

sCS120KHZhalfT-SCS60KHZquarterT-SCS30KHZoneEighthT-SCS15KHZoneSixteenthT

SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..2239),

sCS120KHZquarterT-SCS60KHZoneEighthT-SCS30KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..4479),

sCS120KHZoneEighthT-SCS60KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..8959),

sCS120KHZoneSixteenthT SEQUENCE (SIZE (1..maxPO-perPF)) OF INTEGER (0..17919)

} OPTIONAL, -- Need R

...,

[[

nrofPDCCHMonitoringOccasionPerSSB-InPO-r16  INTEGER (2..4) OPTIONAL -- Need R

]]

}

-- TAG-DOWNLINKCONFIGCOMMONSIB-STOP

-- ASN1STOP

|  |
| --- |
| *DownlinkConfigCommonSIB* field descriptions |
| ***frequencyInfoDL-SIB***  Basic parameters of a downlink carrier and transmission thereon. |
| ***initialDownlinkBWP***  The initial downlink BWP configuration for a SpCell (PCell of MCG or SCG). The network configures the *locationAndBandwidth* so that the initial downlink BWP contains the entire CORESET#0 of this serving cell in the frequency domain. The UE applies the *locationAndBandwidth* upon reception of this field (e.g. to determine the frequency position of signals described in relation to this *locationAndBandwidth*) but it keeps CORESET#0 until after reception of *RRCSetup*/*RRCResume/RRCReestablishment*. |
| ***bcch-Config***  The modification period related configuration. |
| ***nrofPDCCHMonitoringOccasionPerSSB-InPO***  The number of PDCCH monitoring occasions corresponding to an SSB for paging, see TS 38.304 [20], clause 7.1. |
| ***pcch-Config***  The paging related configuration. |

|  |
| --- |
| *BCCH-Config* field descriptions |
| ***modificationPeriodCoeff***  Actual modification period, expressed in number of radio frames m = *modificationPeriodCoeff* \* *defaultPagingCycle*, see clause 5.2.2.2.2. *n2* corresponds to value 2, *n4* corresponds to value 4, and so on. |

|  |
| --- |
| *PCCH-Config* field descriptions |
| ***defaultPagingCycle***  Default paging cycle, used to derive 'T' in TS 38.304 [20]. Value *rf32* corresponds to 32 radio frames, value *rf64* corresponds to 64 radio frames and so on. |
| ***firstPDCCH-MonitoringOccasionOfPO***  Points out the first PDCCH monitoring occasion for paging of each PO of the PF, see TS 38.304 [20]. |
| ***nAndPagingFrameOffset***  Used to derive the number of total paging frames in T (corresponding to parameter N in TS 38.304 [20]) and paging frame offset (corresponding to parameter PF\_offset in TS 38.304 [20]). A value of *oneSixteenthT* corresponds to T / 16, a value of oneEighthT corresponds to T / 8, and so on.  If *pagingSearchSpace* is set to zero and if SS/PBCH block and CORESET multiplexing pattern is 2 or 3 (as specified in TS 38.213 [13]):  - for *ssb-periodicityServingCell* of 5 or 10 ms, N can be set to one of {*oneT, halfT, quarterT, oneEighthT, oneSixteenthT*}  - for *ssb-periodicityServingCell* of 20 ms, N can be set to one of {*halfT, quarterT, oneEighthT, oneSixteenthT*}  - for *ssb-periodicityServingCell* of 40 ms, N can be set to one of {*quarterT, oneEighthT, oneSixteenthT*}  - for *ssb-periodicityServingCell* of 80 ms, N can be set to one of {*oneEighthT, oneSixteenthT*}  - for *ssb-periodicityServingCell* of 160 ms, N can be set to *oneSixteenthT*  If *pagingSearchSpace* is set to zero and if SS/PBCH block and CORESET multiplexing pattern is 1 (as specified in TS 38.213 [13]), N can be set to one of {*halfT, quarterT, oneEighthT, oneSixteenthT*}  If *pagingSearchSpace* is not set to zero, N can be configured to one of {*oneT, halfT, quarterT, oneEighthT, oneSixteenthT*} |
| ***ns***  Number of paging occasions per paging frame. |

Editor’s Note: Additional values for *nrofPDCCHMonitoringOccasionPerSSB-r16* are FFS.

>>Skipped unchanged parts

#### – *LBT-FailureRecoveryConfig*

The IE *LBT-FailureRecoveryConfig-r16* is used to configure the parameters used for detection of consistent uplink LBT failures for operation with shared spectrum channel access, as specified in TS 38.321 [3].

*LBT-FailureRecoveryConfig* information element

-- ASN1START

-- TAG-LBT-FAILURERECOVERYCONFIG-START

LBT-FailureRecoveryConfig-r16 ::= SEQUENCE {

lbt-FailureInstanceMaxCount ENUMERATED {n4, n8, n16, n32} OPTIONAL, -- Need R

lbt-FailureDetectionTimer ENUMERATED {ms10, ms20, ms40, ms80, ms160, ms320} OPTIONAL, -- Need R

...

}

-- TAG-LBT-FAILURERECOVERYCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *LBT-FailureRecoveryConfig* field descriptions |
| ***lbt-FailureDetectionTimert***  Timer for consistent uplink LBT failure detection (see TS 38.321 [3]). Value *ms10* corresponds to 10 ms, value *ms20* corresponds to 20 ms, and so on. |
| ***lbt-FailureInstanceMaxCount***  This field determines after how many consistent uplink LBT failure events the UE triggers uplink LBT failure recovery (see TS 38.321 [3]). |

Editor’s Note: Additional values for *lbt-FailureDetectionTimer* and *lbt-FailureInstanceMaxCount* are FFS.

>>Skipped unchanged parts

#### – *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

} OPTIONAL, -- Cond UL

...,

[[

channelAccessPriority-r16 INTEGER (1..4) OPTIONAL -- Need R

]]

}

-- TAG-LOGICALCHANNELCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *LogicalChannelConfig* field descriptions |
| ***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. |
| ***channellAccessPriority***  Indicates the Channel Access Priority Class (CAPC), as specified in TS 38.300 [2] and TS 38.321 [3], to be used on transmission using configured grants on shared spectrum. The network configures this field only for SRB2 and DRBs. |
| ***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. |

>>Skipped unchanged parts

#### – *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

]],

[[

lbt-FailureRecoveryConfig-r16 LBT-FailureRecoveryConfig-r16 OPTIONAL, -- Need M

schedulingRequestID-LBT-SCell-r16 SchedulingRequestId OPTIONAL -- Need M

]]

}

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]. |
| ***schedulingRequestID-LBT-SCell***  Indicates the scheduling request configuration applicable for consistent uplink LBT recovery on SCell, as specified in TS 38.321 [3]. |
| ***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. |

>>Skipped unchanged parts

#### *– MeasObjectNR*

The IE *MeasObjectNR* specifies information applicable for SS/PBCH block(s) intra/inter-frequency measurements and/or CSI-RS intra/inter-frequency measurements.

*MeasObjectNR* information element

-- ASN1START

-- TAG-MEASOBJECTNR-START

MeasObjectNR ::= SEQUENCE {

ssbFrequency ARFCN-ValueNR OPTIONAL, -- Cond SSBorAssociatedSSB

ssbSubcarrierSpacing SubcarrierSpacing OPTIONAL, -- Cond SSBorAssociatedSSB

smtc1 SSB-MTC OPTIONAL, -- Cond SSBorAssociatedSSB

smtc2 SSB-MTC2 OPTIONAL, -- Cond IntraFreqConnected

refFreqCSI-RS ARFCN-ValueNR OPTIONAL, -- Cond CSI-RS

referenceSignalConfig ReferenceSignalConfig,

absThreshSS-BlocksConsolidation ThresholdNR OPTIONAL, -- Need R

absThreshCSI-RS-Consolidation ThresholdNR OPTIONAL, -- Need R

nrofSS-BlocksToAverage INTEGER (2..maxNrofSS-BlocksToAverage) OPTIONAL, -- Need R

nrofCSI-RS-ResourcesToAverage INTEGER (2..maxNrofCSI-RS-ResourcesToAverage) OPTIONAL, -- Need R

quantityConfigIndex INTEGER (1..maxNrofQuantityConfig),

offsetMO Q-OffsetRangeList,

cellsToRemoveList PCI-List OPTIONAL, -- Need N

cellsToAddModList CellsToAddModList OPTIONAL, -- Need N

blackCellsToRemoveList PCI-RangeIndexList OPTIONAL, -- Need N

blackCellsToAddModList SEQUENCE (SIZE (1..maxNrofPCI-Ranges)) OF PCI-RangeElement OPTIONAL, -- Need N

whiteCellsToRemoveList PCI-RangeIndexList OPTIONAL, -- Need N

whiteCellsToAddModList SEQUENCE (SIZE (1..maxNrofPCI-Ranges)) OF PCI-RangeElement OPTIONAL, -- Need N

...,

[[

freqBandIndicatorNR FreqBandIndicatorNR OPTIONAL, -- Need R

measCycleSCell ENUMERATED {sf160, sf256, sf320, sf512, sf640, sf1024, sf1280} OPTIONAL -- Need R

]],

[[

rmtc-Config-r16 SetupRelease {RMTC-Config-r16} OPTIONAL, -- Need M

ssb-PositionQCL-Common-r16 SSB-PositionQCL-Relationship-r16 OPTIONAL, -- Need M

ssb-PositionQCL-CellsToAddModList-r16 SSB-PositionQCL-CellsToAddModList-r16 OPTIONAL, -- Need N

ssb-PositionQCL-CellsToRemoveList-r16 PCI-List OPTIONAL -- Need N

]]

}

ReferenceSignalConfig::= SEQUENCE {

ssb-ConfigMobility SSB-ConfigMobility OPTIONAL, -- Need M

csi-rs-ResourceConfigMobility SetupRelease { CSI-RS-ResourceConfigMobility } OPTIONAL -- Need M

}

SSB-ConfigMobility::= SEQUENCE {

ssb-ToMeasure SetupRelease { SSB-ToMeasure } OPTIONAL, -- Need M

deriveSSB-IndexFromCell BOOLEAN,

ss-RSSI-Measurement SS-RSSI-Measurement OPTIONAL, -- Need M

...

}

Q-OffsetRangeList ::= SEQUENCE {

rsrpOffsetSSB Q-OffsetRange DEFAULT dB0,

rsrqOffsetSSB Q-OffsetRange DEFAULT dB0,

sinrOffsetSSB Q-OffsetRange DEFAULT dB0,

rsrpOffsetCSI-RS Q-OffsetRange DEFAULT dB0,

rsrqOffsetCSI-RS Q-OffsetRange DEFAULT dB0,

sinrOffsetCSI-RS Q-OffsetRange DEFAULT dB0

}

ThresholdNR ::= SEQUENCE{

thresholdRSRP RSRP-Range OPTIONAL, -- Need R

thresholdRSRQ RSRQ-Range OPTIONAL, -- Need R

thresholdSINR SINR-Range OPTIONAL -- Need R

}

CellsToAddModList ::= SEQUENCE (SIZE (1..maxNrofCellMeas)) OF CellsToAddMod

CellsToAddMod ::= SEQUENCE {

physCellId PhysCellId,

cellIndividualOffset Q-OffsetRangeList

}

RMTC-Config-r16 ::= SEQUENCE {

rmtc-Periodicity-r16 ENUMERATED {ms40, ms80, ms160, ms320, ms640},

rmtc-SubframeOffset-r16 INTEGER(0..639) OPTIONAL, -- Need M

measDuration-r16 ENUMERATED {sym1, sym14, sym28, sym42, sym70},

rmtc-MeasARFCN-r16 ARFCN-ValueNR,

...

}

SSB-PositionQCL-CellsToAddModList-r16 ::= SEQUENCE (SIZE (1..maxNrofCellMeas)) OF SSB-PositionQCL-CellsToAdd-r16

SSB-PositionQCL-CellsToAdd-r16 ::= SEQUENCE {

physCellId-r16 PhysCellId,

ssb-PositionQCL-r16 SSB-PositionQCL-Relationship-r16

}

-- TAG-MEASOBJECTNR-STOP

-- ASN1STOP

|  |
| --- |
| *CellsToAddMod* field descriptions |
| ***cellIndividualOffset***  Cell individual offsets applicable to a specific cell. |
| ***physCellId***  Physical cell identity of a cell in the cell list. |

|  |
| --- |
| *MeasObjectNR* field descriptions |
| ***absThreshCSI-RS-Consolidation***  Absolute threshold for the consolidation of measurement results per CSI-RS resource(s) from L1 filter(s). The field is used for the derivation of cell measurement results as described in 5.5.3.3 and the reporting of beam measurement information per CSI-RS resource as described in 5.5.5.2. |
| ***absThreshSS-BlocksConsolidation***  Absolute threshold for the consolidation of measurement results per SS/PBCH block(s) from L1 filter(s). The field is used for the derivation of cell measurement results as described in 5.5.3.3 and the reporting of beam measurement information per SS/PBCH block index as described in 5.5.5.2. |
| ***blackCellsToAddModList***  List of cells to add/modify in the black list of cells. It applies only to SSB resources. |
| ***blackCellsToRemoveList***  List of cells to remove from the black list of cells. |
| ***cellsToAddModList***  List of cells to add/modify in the cell list. |
| ***cellsToRemoveList***  List of cells to remove from the cell list. |
| ***freqBandIndicatorNR***  The frequency band in which the SSB and/or CSI-RS indicated in this *MeasObjectNR* are located and according to which the UE shall perform the RRM measurements. This field is always provided when the network configures measurements with this *MeasObjectNR*. |
| ***measCycleSCell***  The parameter is used only when an SCell is configured on the frequency indicated by the measObjectNR and is in deactivated state, see TS 38.133 [14]. gNB configures the parameter whenever an SCell is configured on the frequency indicated by the *measObjectNR*, but the field may also be signalled when an SCell is not configured. Value *sf160* corresponds to 160 sub-frames, value *sf256* corresponds to 256 sub-frames and so on. |
| ***nrofCSInrofCSI-RS-ResourcesToAverage***  Indicates the maximum number of measurement results per beam based on CSI-RS resources to be averaged. The same value applies for each detected cell associated with this *MeasObjectNR*. |
| ***nrofSS-BlocksToAverage***  Indicates the maximum number of measurement results per beam based on SS/PBCH blocks to be averaged. The same value applies for each detected cell associated with this *MeasObject*. |
| ***offsetMO***  Offset values applicable to all measured cells with reference signal(s) indicated in this *MeasObjectNR*. |
| ***quantityConfigIndex***  Indicates the n-*th* element of *quantityConfigNR-List* provided in *MeasConfig*. |
| ***referenceSignalConfig***  RS configuration for SS/PBCH block and CSI-RS. |
| ***refFreqCSI-RS***  Point A which is used for mapping of CSI-RS to physical resources according to TS 38.211 [16] clause 7.4.1.5.3. |
| ***smtc1***  Primary measurement timing configuration. (see clause 5.5.2.10). |
| ***smtc2***  Secondary measurement timing configuration for SS corresponding to this *MeasObjectNR* with PCI listed in *pci-List*. For these SS, the periodicity is indicated by *periodicity* in *smtc2* and the timing offset is equal to the offset indicated in *periodicityAndOffset* modulo *periodicity*. *periodicity* in smtc2 can only be set to a value strictly shorter than the periodicity indicated by *periodicityAndOffset* in *smtc1* (e.g. if *periodicityAndOffset* indicates *sf10*, *periodicity* can only be set of *sf5*, if *periodicityAndOffset* indicates *sf5*, *smtc2* cannot be configured). |
| ***ssbFrequency*** Indicates the frequency of the SS associated to this *MeasObjectNR*. |
| ***ssbSubcarrierSpacing***  Subcarrier spacing of SSB. Only the values 15 kHz or 30 kHz (FR1), and 120 kHz or 240 kHz (FR2) are applicable. |
| ***whiteCellsToAddModList***  List of cells to add/modify in the white list of cells. It applies only to SSB resources. |
| ***whiteCellsToRemoveList***  List of cells to remove from the white list of cells. |

|  |
| --- |
| *RMTC-Config* field descriptions |
| ***measDuration***  Number of consecutive symbols for which the Physical Layer reports samples of RSSI (see TS 38.215 [9]). Value *sym1* corresponds to one symbol, *sym14* corresponds to 14 symbols, and so on. |
| ***rmtc-MeasARFCN***  Indicates the center frequency of the measured bandwidth (see TS 38.xx, clause X.X). |
| ***rmtc-Periodicity***  Indicates the RSSI measurement timing configuration (RMTC) periodicity for this frequency (see TS 38.21 [9]). |
| ***rmtc-SubframeOffset***  Indicates the RSSI measurement timing configuration (RMTC) subframe offset for this frequency (see TS 38.215 [9)). |

|  |
| --- |
| *ReferenceSignalConfig* field descriptions |
| ***csi-rs-ResourceConfigMobility***  CSI-RS resources to be used for CSI-RS based RRM measurements. |
| ***ssb-ConfigMobility***  SSB configuration for mobility (nominal SSBs, timing configuration). |

|  |
| --- |
| *SSB-ConfigMobility* field descriptions |
| ***deriveSSB-IndexFromCell***  If this field is set to *true*, UE assumes SFN and frame boundary alignment across cells on the same frequency carrier as specified in TS 38.133 [14]. Hence, if the UE is configured with a serving cell for which (*absoluteFrequencySSB*, *subcarrierSpacing*) in *ServingCellConfigCommon* is equal to (*ssbFrequency*, *ssbSubcarrierSpacing*) in this *MeasObjectNR*, this field indicates whether the UE can utilize the timing of this serving cell to derive the index of SS block transmitted by neighbour cell. Otherwise, this field indicates whether the UE may use the timing of any detected cell on that target frequency to derive the SSB index of all neighbour cells on that frequency. |
| ***ssb-ToMeasure***  The set of SS blocks to be measured within the SMTC measurement duration. The first/leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not to be measured while value 1 indicates that the corresponding SS/PBCH block is to be measured (see TS 38.215 [9]). When the field is not configured the UE measures on all SS blocks. Regardless of the value of this field, SS/PBCH blocks outside of the applicable *smtc* are not to be measured. See TS 38.215 [9] clause 5.1.1. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *CSI-RS* | This field is mandatory present if *csi-rs-ResourceConfigMobility* is configured, otherwise, it is absent. |
| *SSBorAssociatedSSB* | This field is mandatory present if *ssb-ConfigMobility* is configured or *associatedSSB* is configured in at least one cell. Otherwise, it is absent, Need R. |
| *IntraFreqConnected* | This field is optionally present, Need R if the UE is configured with a serving cell for which (absoluteFrequencySSB, subcarrierSpacing) in ServingCellConfigCommon is equal to (*ssbFrequency*, *ssbSubcarrierSpacing*) in this *MeasObjectNR*, otherwise, it is absent. |

>>Skipped unchanged parts

#### – *MeasResults*

The IE *MeasResults* covers measured results for intra-frequency, inter-frequency, and inter-RAT mobility.

*MeasResults* information element

-- ASN1START

-- TAG-MEASRESULTS-START

MeasResults ::= SEQUENCE {

measId MeasId,

measResultServingMOList MeasResultServMOList,

measResultNeighCells CHOICE {

measResultListNR MeasResultListNR,

...,

measResultListEUTRA MeasResultListEUTRA

} OPTIONAL,

...,

[[

measResultServFreqListEUTRA-SCG MeasResultServFreqListEUTRA-SCG OPTIONAL,

measResultServFreqListNR-SCG MeasResultServFreqListNR-SCG OPTIONAL,

measResultSFTD-EUTRA MeasResultSFTD-EUTRA OPTIONAL,

measResultSFTD-NR MeasResultCellSFTD-NR OPTIONAL

]],

[[

measResultCellListSFTD-NR MeasResultCellListSFTD-NR OPTIONAL

]],

[[

measResultForRSSI-r16 MeasResultForRSSI-r16 OPTIONAL

]]

}

MeasResultServMOList ::= SEQUENCE (SIZE (1..maxNrofServingCells)) OF MeasResultServMO

MeasResultServMO ::= SEQUENCE {

servCellId ServCellIndex,

measResultServingCell MeasResultNR,

measResultBestNeighCell MeasResultNR OPTIONAL,

...

}

MeasResultListNR ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultNR

MeasResultNR ::= SEQUENCE {

physCellId PhysCellId OPTIONAL,

measResult SEQUENCE {

cellResults SEQUENCE{

resultsSSB-Cell MeasQuantityResults OPTIONAL,

resultsCSI-RS-Cell MeasQuantityResults OPTIONAL

},

rsIndexResults SEQUENCE{

resultsSSB-Indexes ResultsPerSSB-IndexList OPTIONAL,

resultsCSI-RS-Indexes ResultsPerCSI-RS-IndexList OPTIONAL

} OPTIONAL

},

...,

[[

cgi-Info CGI-InfoNR OPTIONAL

]]

}

MeasResultListEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA

MeasResultEUTRA ::= SEQUENCE {

eutra-PhysCellId PhysCellId,

measResult MeasQuantityResultsEUTRA,

cgi-Info CGI-InfoEUTRA OPTIONAL,

...

}

MultiBandInfoListEUTRA ::= SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicatorEUTRA

MeasQuantityResults ::= SEQUENCE {

rsrp RSRP-Range OPTIONAL,

rsrq RSRQ-Range OPTIONAL,

sinr SINR-Range OPTIONAL

}

MeasQuantityResultsEUTRA ::= SEQUENCE {

rsrp RSRP-RangeEUTRA OPTIONAL,

rsrq RSRQ-RangeEUTRA OPTIONAL,

sinr SINR-RangeEUTRA OPTIONAL

}

ResultsPerSSB-IndexList::= SEQUENCE (SIZE (1..maxNrofIndexesToReport2)) OF ResultsPerSSB-Index

ResultsPerSSB-Index ::= SEQUENCE {

ssb-Index SSB-Index,

ssb-Results MeasQuantityResults OPTIONAL

}

ResultsPerCSI-RS-IndexList::= SEQUENCE (SIZE (1..maxNrofIndexesToReport2)) OF ResultsPerCSI-RS-Index

ResultsPerCSI-RS-Index ::= SEQUENCE {

csi-RS-Index CSI-RS-Index,

csi-RS-Results MeasQuantityResults OPTIONAL

}

MeasResultServFreqListEUTRA-SCG ::= SEQUENCE (SIZE (1..maxNrofServingCellsEUTRA)) OF MeasResult2EUTRA

MeasResultServFreqListNR-SCG ::= SEQUENCE (SIZE (1..maxNrofServingCells)) OF MeasResult2NR

MeasResultForRSSI-r16 ::= SEQUENCE {

rssi-Result-r16 ENUMERATED(ffs),

channelOccupancy-r16 INTEGER (0..100)

}

-- TAG-MEASRESULTS-STOP

-- ASN1STOP

|  |
| --- |
| *MeasResultEUTRA* field descriptions |
| ***eutra-PhysCellId***  Identifies the physical cell identity of the E-UTRA cell for which the reporting is being performed. The UE reports a value in the range 0..503, other values are reserved. |

|  |
| --- |
| *MeasResultNR* field descriptions |
| ***cellResults***  Cell level measurement results. |
| ***physCellId***  The physical cell identity of the NR cell for which the reporting is being performed. |
| ***resultsSSB-Cell***  Cell level measurement results based on SS/PBCH related measurements. |
| ***resultsSSB-Indexes***  Beam level measurement results based on SS/PBCH related measurements. |
| ***resultsCSI-RS-Cell***  Cell level measurement results based on CSI-RS related measurements. |
| ***resultsCSI-RS-Indexes***  Beam level measurement results based on CSI-RS related measurements. |
| ***rsIndexResults***  Beam level measurement results. |

| *MeasResults* field descriptions |
| --- |
| ***measId***  Identifies the measurement identity for which the reporting is being performed. |
| ***measResultCellListSFTD-NR***  SFTD measurement results between the PCell and the NR neighbour cell(s) in NR standalone. |
| ***measResultEUTRA***  Measured results of an E-UTRA cell. |
| ***measResultForRSSI***  Includes measured RSSI result in dBm (see TS 38.215 [9]) and *channelOccupancy* which is the percentage of samples when the RSSI was above the configured *channelOccupancyThreshold* for the associated *reportConfig*. |
| ***measResultListEUTRA***  List of measured results for the maximum number of reported best cells for an E-UTRA measurement identity. |
| ***measResultListNR***  List of measured results for the maximum number of reported best cells for an NR measurement identity. |
| ***measResultNR***  Measured results of an NR cell. |
| ***measResultServFreqListEUTRA-SCG***  Measured results of the E-UTRA SCG serving frequencies: the measurement result of PSCell and each SCell, if any, and of the best neighbouring cell on each E-UTRA SCG serving frequency. |
| ***measResultServFreqListNR-SCG***  Measured results of the NR SCG serving frequencies: the measurement result of PSCell and each SCell, if any, and of the best neighbouring cell on each NR SCG serving frequency. |
| ***measResultServingMOList***  Measured results of measured cells with reference signals indicated in the serving cell measurement objects including measurement results of SpCell, configured SCell(s) and best neighbouring cell within measured cells with reference signals indicated in on each serving cell measurement object. |
| ***measResultSFTD-EUTRA***  SFTD measurement results between the PCell and the E-UTRA PScell in NE-DC. |
| ***measResultSFTD-NR***  SFTD measurement results between the PCell and the NR PScell in NR-DC. |

>>Skipped unchanged parts

#### – *PDCCH-Config*

The IE *PDCCH-Config* is used to configure UE specific PDCCH parameters such as control resource sets (CORESET), search spaces and additional parameters for acquiring the PDCCH. If this IE is used for the scheduled cell in case of cross carrier scheduling, the fields other than *searchSpacesToAddModList* and *searchSpacesToReleaseList* are absent.

*PDCCH-Config* information element

-- ASN1START

-- TAG-PDCCH-CONFIG-START

PDCCH-Config ::= SEQUENCE {

controlResourceSetToAddModList SEQUENCE(SIZE (1..3)) OF ControlResourceSet OPTIONAL, -- Need N

controlResourceSetToReleaseList SEQUENCE(SIZE (1..3)) OF ControlResourceSetId OPTIONAL, -- Need N

searchSpacesToAddModList SEQUENCE(SIZE (1..10)) OF SearchSpace OPTIONAL, -- Need N

searchSpacesToReleaseList SEQUENCE(SIZE (1..10)) OF SearchSpaceId OPTIONAL, -- Need N

downlinkPreemption SetupRelease { DownlinkPreemption } OPTIONAL, -- Need M

tpc-PUSCH SetupRelease { PUSCH-TPC-CommandConfig } OPTIONAL, -- Need M

tpc-PUCCH SetupRelease { PUCCH-TPC-CommandConfig } OPTIONAL, -- Need M

tpc-SRS SetupRelease { SRS-TPC-CommandConfig} OPTIONAL, -- Need M

...,

[[

searchSpaceSwitchingTimer-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

searchSpaceSwitchingGroupList-r16 SEQUENCE(SIZE (1..ffsValue2)) OF SearchSpaceSwitchingGroup-r16 OPTIONAL -- Need R

]]

}

SearchSpaceSwitchingGroup-r16 ::= SEQUENCE(SIZE (1..16)) OF ServingCellIndex

-- TAG-PDCCH-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PDCCH-Config* field descriptions |
| ***controlResourceSetToAddModList***  List of UE specifically configured Control Resource Sets (CORESETs) to be used by the UE. The network configures at most 3 CORESETs per BWP per cell (including UE-specific and common CORESETs). In case network reconfigures control resource set with the same *ControlResourceSetId* as used for *commonControlResourceSet* configured via *PDCCH-ConfigCommon*, the configuration from *PDCCH-Config* always takes precedence and should not be updated by the UE based on *servingCellConfigCommon*. |
| ***downlinkPreemption***  Configuration of downlink preemption indications to be monitored in this cell (see TS 38.213 [13], clause 11.2). |
| ***searchSpacesToAddModList***  List of UE specifically configured Search Spaces. The network configures at most 10 Search Spaces per BWP per cell (including UE-specific and common Search Spaces). |
| ***searchSpaceSwitchingGroupList***  The list of serving cells which are bundled for the search space group switching purpose (see TS 38.213 [13], clause 11.5.2). |
| ***searchSpaceSwitchingTimer***  The timer in slots for monitoring PDCCH in the active DL BWP of the serving cell before moving to the default search space group (see TS 38.213 [13], clause 11.5.2). |
| ***tpc-PUCCH***  Enable and configure reception of group TPC commands for PUCCH. |
| ***tpc-PUSCH***  Enable and configure reception of group TPC commands for PUSCH. |
| ***tpc-SRS***  Enable and configure reception of group TPC commands for SRS. |

>>Skipped unchanged parts

#### – *PhysicalCellGroupConfig*

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

*PhysicalCellGroupConfig* information element

-- ASN1START

-- TAG-PHYSICALCELLGROUPCONFIG-START

PhysicalCellGroupConfig ::= SEQUENCE {

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

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

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

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

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

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

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

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

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

...,

[[

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

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

]],

[[

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

]],

[[

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

]],

[[

pdsch-HARQ-ACK-Codebook-r16 ENUMERATED {enhancedDynamic, spare1} OPTIONAL, -- Need R

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

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

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

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

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

]]

}

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

-- TAG-PHYSICALCELLGROUPCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PhysicalCellGroupConfig* field descriptions |
| ***cs-RNTI***  RNTI value for downlink SPS (see *SPS-Config*) and uplink configured grant (see *ConfiguredGrantConfig*). |
| ***harq-ACK-SpatialBundlingPUCCH***  Enables spatial bundling of HARQ ACKs. It is configured per cell group (i.e. for all the cells within the cell group) for PUCCH reporting of HARQ-ACK. It is only applicable when more than 4 layers are possible to schedule. When the field is absent, the spatial bundling is disabled (see TS 38.213 [13], clause 9.1.2.1). |
| ***harq-ACK-SpatialBundlingPUSCH***  Enables spatial bundling of HARQ ACKs. It is configured per cell group (i.e. for all the cells within the cell group) for PUSCH reporting of HARQ-ACK. It is only applicable when more than 4 layers are possible to schedule. When the field is absent, the spatial bundling is disabled (see TS 38.213 [13], clauses 9.1.2.2 and 9.1.3.2). |
| ***mcs-C-RNTI***  RNTI to indicate use of *qam64LowSE* for grant-based transmissions. When the *mcs*-*C-RNT*I is configured, RNTI scrambling of DCI CRC is used to choose the corresponding MCS table. |
| ***nfi-TotalDAI-Included***  Indicates whether the NFI and total DAI fields of the non-scheduled PDSCH group is included in the non-fallback DL grant DCI (see TS 38.212 [17], clause 7.3.1). The network configures this only when enhanced dynamic codebook is configured (*pdsch-HARQ-ACK-Codebook* is set to *enhancedDynamic*). |
| ***pdcch-BlindDetection***  Indicates the reference number of cells for PDCCH blind detection for the CG. Network configures the field for each CG when the UE is in NR DC and sets the value in accordance with the constraints specified in TS 38.213 [13]. The network configures *pdcch-BlindDetection* only if the UE is in NR-DC. |
| ***p-NR-FR1***  The maximum total transmit power to be used by the UE in this NR cell group across all serving cells in frequency range 1 (FR1). The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-UE-FR1* (configured total for all serving cells operating on FR1). |
| ***p-UE-FR1***  The maximum total transmit power to be used by the UE across all serving cells in frequency range 1 (FR1) across all cell groups. The maximum transmit power that the UE may use may be additionally limited by *p-Max* (configured in *FrequencyInfoUL*) and by *p-NR-FR1* (configured for the cell group). |
| ***pdsch-HARQ-ACK-Codebook***  The PDSCH HARQ-ACK codebook is either semi-static or dynamic. This is applicable to both CA and none CA operation (see TS 38.213 [13], clauses 9.1.2 and 9.1.3). If *pdsch-HARQ-ACK-Codebook -r16* is signalled, UE shall ignore the *pdsch-HARQ-ACK-Codebook* (without suffix). |
| ***pdsch-HARQ-ACK- OneShotFeedback***  When configured, the DCI\_format 1\_1 can request the UE to report A/N for all HARQ processes and all CCs configured in the PUCCH group (see TS 38.212 [17], clause 7.3.1). |
| ***pdsch-HARQ-ACK- OneShotFeedbackCBG***  When configured, the DCI\_format 1\_1 can request the UE to include CBG level A/N for each CC with CBG level transmission configured. When not configured, the UE will report TB level A/N even if CBG level transmission is configured for a CC.The network configures this only when *pdsch-HARQ-ACK-OneShotFeedback* is configured. |
| ***pdsch-HARQ-ACK- OneShotFeedbackNDI***  When configured, the DCI\_format 1\_1 can request the UE to include NDI for each A/N reported.The network configures this only when *pdsch-HARQ-ACK-OneShotFeedback* is configured. |
| ***sp-CSI-RNTI***  RNTI for Semi-Persistent CSI reporting on PUSCH (see *CSI-ReportConfig*) (see TS 38.214 [19], clause 5.2.1.5.2). Network always configures the UE with a value for this field when at least one *CSI-ReportConfig* with *reportConfigType* set to *semiPersistentOnPUSCH* is configured. |
| ***tpc-PUCCH-RNTI***  RNTI used for PUCCH TPC commands on DCI (see TS 38.213 [13], clause 10.1). |
| ***tpc-PUSCH-RNTI***  RNTI used for PUSCH TPC commands on DCI (see TS 38.213 [13], clause 10.1). |
| ***tpc-SRS-RNTI***  RNTI used for SRS TPC commands on DCI (see TS 38.213 [13], clause 10.1). |
| ***ul-TotalDAI-Included***  Indicaes whether the total DAI fields of the additonal PDSCH group is included in the non-fallback UL grant DCI (see TS 38.212 [17], clause 7.3.1). The network configures this only when enhanced dynamic codebook is configured (*pdsch-HARQ-ACK-Codebook* is set to *enhancedDynamic*). |
| ***xScale***  The UE is allowed to drop NR only if the power scaling applied to NR results in a difference between scaled and unscaled NR UL of more than *xScale* dB (see TS 38.213 [13]). If the value is not configured for dynamic power sharing, the UE assumes default value of 6 dB. |

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

>>Skipped unchanged parts

#### – *PUCCH-Config*

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

*PUCCH-Config* information element

-- ASN1START

-- TAG-PUCCH-CONFIG-START

PUCCH-Config ::= SEQUENCE {

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

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

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

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

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

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

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

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

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

OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

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

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

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

OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

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

...,

[[

resourceToAddModList-r16 SEQUENCE (SIZE (1..maxNrofPUCCH-Resources)) OF PUCCH-Resource-r16 OPTIONAL, -- Need N

dl-DataToUL-ACK-r16 SEQUENCE (SIZE (1..8)) OF INTEGER (-1..15) OPTIONAL, -- Need M

dl-DCI-triggered-UL-ChannelAccess-CPext-r16 SEQUENCE (SIZE (1..16)) OF INTEGER (0..15) OPTIONAL -- Need M

]]

}

PUCCH-FormatConfig ::= SEQUENCE {

interslotFrequencyHopping ENUMERATED {enabled} OPTIONAL, -- Need R

additionalDMRS ENUMERATED {true} OPTIONAL, -- Need R

maxCodeRate PUCCH-MaxCodeRate OPTIONAL, -- Need R

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

pi2BPSK ENUMERATED {enabled} OPTIONAL, -- Need R

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

}

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

-- A set with one or more PUCCH resources

PUCCH-ResourceSet ::= SEQUENCE {

pucch-ResourceSetId PUCCH-ResourceSetId,

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

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

}

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

PUCCH-Resource ::= SEQUENCE {

pucch-ResourceId PUCCH-ResourceId,

startingPRB PRB-Id,

intraSlotFrequencyHopping ENUMERATED { enabled } OPTIONAL, -- Need R

secondHopPRB PRB-Id OPTIONAL, -- Need R

format CHOICE {

format0 PUCCH-format0,

format1 PUCCH-format1,

format2 PUCCH-format2,

format3 PUCCH-format3,

format4 PUCCH-format4

}

}

PUCCH-Resource-r16 ::= SEQUENCE {

pucch-ResourceId PUCCH-ResourceId,

interlaceAllocation-r16 SEQUENCE {

rb-SetIndex INTEGER (0..4),

interlace0 CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..4)

}

},

format CHOICE {

format0 PUCCH-format0,

format1 PUCCH-format1,

format2 PUCCH-format2-r16,

format3 PUCCH-format3-r16,

format4 PUCCH-format4

}

}

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

PUCCH-format0 ::= SEQUENCE {

initialCyclicShift INTEGER(0..11),

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER(0..13)

}

PUCCH-format1 ::= SEQUENCE {

initialCyclicShift INTEGER(0..11),

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER(0..10),

timeDomainOCC INTEGER(0..6)

}

PUCCH-format2 ::= SEQUENCE {

nrofPRBs INTEGER (1..16),

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER(0..13)

}

PUCCH-format2-r16 ::= SEQUENCE {

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER (0..13),

interlace1-r16 INTEGER (0..9) OPTIONAL, -- Need M

occ-Length-r16 OCC-Length-r16 OPTIONAL, -- Need M

occ-Index-r16 OCC-Index-r16 OPTIONAL -- Need M

}

PUCCH-format3 ::= SEQUENCE {

nrofPRBs INTEGER (1..16),

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER(0..10)

}

PUCCH-format3-r16 ::= SEQUENCE {

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER (0..10),

interlace1-r16 INTEGER (0..9) OPTIONAL, -- Need M

occ-Length-r16 OCC-Length-r16 OPTIONAL, -- Need M

occ-Index-r16 OCC-Index-r16 OPTIONAL -- Need M

}

PUCCH-format4 ::= SEQUENCE {

nrofSymbols INTEGER (4..14),

occ-Length ENUMERATED {n2,n4},

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

startingSymbolIndex INTEGER(0..10)

}

OCC-Length-r16 ::= ENUMERATED {n2,n4}

OCC-Index-r16 ::= ENUMERATED {n0,n1,n2,n3}

-- TAG-PUCCH-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PUCCH-Config* field descriptions |
| ***dl-DataToUL-ACK***  List of timing for given PDSCH to the DL ACK (see TS 38.213 [13], clause 9.1.2). |
| ***dl-dci-triggered-UL-ChannelAccess-CPext***  List of the combinations of CP extension and UL channel access type (See TS 38.212 [17], Clause 7.3.1). |
| ***format1***  Parameters that are common for all PUCCH resources of format 1. |
| ***format2***  Parameters that are common for all PUCCH resources of format 2. |
| ***format3***  Parameters that are common for all PUCCH resources of format 3. |
| ***format4.***  Parameters that are common for all PUCCH resources of format 4 |
| ***resourceSetToAddModList, resourceSetToReleaseList***  Lists for adding and releasing PUCCH resource sets (see TS 38.213 [13], clause 9.2). |
| ***resourceToAddModList, resourceToReleaseList***  Lists for adding and releasing PUCCH resources applicable for the UL BWP and serving cell in which the *PUCCH-Config* is defined. The resources defined herein are referred to from other parts of the configuration to determine which resource the UE shall use for which report. |
| ***spatialRelationInfoToAddModList***  Configuration of the spatial relation between a reference RS and PUCCH. Reference RS can be SSB/CSI-RS/SRS. If the list has more than one element, MAC-CE selects a single element (see TS 38.321 [3], clause 5.18.8 and TS 38.213 [13], clause 9.2.2). |

|  |
| --- |
| *PUCCH-format3* field descriptions |
| ***interlace1***  A second interlace, in addition to interlace 0, as specified in TS 38.213 [13], clause 9.2.1. For 15KHz SCS, values {0..9} are applicable; for 30Khz SCS, values {0..4} are applicable. For 15kHz SCS, the values of *interlace1* shall satisfy *interlace1*=mod(*interlace0*+X,10) where X=1, -1, or 5. |
| ***nrofPRBs***  The supported values are 1,2,3,4,5,6,8,9,10,12,15 and 16. |
| ***occ-Index***  Indicates the orthogonal cover code index (see TS 38.213 [13], clause 9.2.1). Applicable when *useInterlacePUCCH-Dedicated-r16* is configured and *interlace1* is not configured. |
| ***occ-Length***  Indicates the orthogonal cover code length (see TS 38.213 [13], clause 9.2.1). Applicable when *useInterlacePUCCH-Dedicated-r16* is configured and *interlace1* is not configured. |

|  |
| --- |
| *PUCCH-FormatConfig* field descriptions |
| ***additionalDMRS***  If the field is present, the UE enables 2 DMRS symbols per hop of a PUCCH Format 3 or 4 if both hops are more than X symbols when FH is enabled (X=4). And it enables 4 DMRS symbols for a PUCCH Format 3 or 4 with more than 2X+1 symbols when FH is disabled (X=4). The field is not applicable for format 1 and 2. See TS 38.213 [13], clause 9.2.2. |
| ***interlace0***  This is the only interlace of interlaced PUCCH Format 0 and 1 and the first interlace for interlaced PUCCH Format 2 and 3. |
| ***interslotFrequencyHopping***  If the field is present, the UE enables inter-slot frequency hopping when PUCCH Format 1, 3 or 4 is repeated over multiple slots. For long PUCCH over multiple slots, the intra and inter slot frequency hopping cannot be enabled at the same time for a UE. The field is not applicable for format 2. See TS 38.213 [13], clause 9.2.6. |
| ***maxCodeRate***  Max coding rate to determine how to feedback UCI on PUCCH for format 2, 3 or 4. The field is not applicable for format 1. See TS 38.213 [13], clause 9.2.5. |
| ***nrofSlots***  Number of slots with the same PUCCH F1, F3 or F4. When the field is absent the UE applies the value *n1*. The field is not applicable for format 2. See TS 38.213 [13], clause 9.2.6. |
| ***pi2BPSK***  If the field is present, the UE uses pi/2 BPSK for UCI symbols instead of QPSK for PUCCH. The field is not applicable for format 1 and 2. See TS 38.213 [13], clause 9.2.5. |
| ***rb-SetIndex***  Indicates the RB set where the first interlace allocated for a PUCCH resource. |
| ***simultaneousHARQ-ACK-CSI***  If the field is present, the UE uses simultaneous transmission of CSI and HARQ-ACK feedback with or without SR with PUCCH Format 2, 3 or 4. See TS 38.213 [13], clause 9.2.5. When the field is absent the UE applies the value *off.* The field is not applicable for format 1. |

|  |
| --- |
| *PUCCH-Resource* field descriptions |
| ***format***  Selection of the PUCCH format (format 0 – 4) and format-specific parameters, see TS 38.213 [13], clause 9.2. *format0* and *format1* are only allowed for a resource in a first PUCCH resource set. *format2*, *format3* and *format4* are only allowed for a resource in non-first PUCCH resource set. |
| ***intraSlotFrequencyHopping***  Enabling intra-slot frequency hopping, applicable for all types of PUCCH formats. For long PUCCH over multiple slots, the intra and inter slot frequency hopping cannot be enabled at the same time for a UE. See TS 38.213 [13], clause 9.2.1. |
| ***pucch-ResourceId***  Identifier of the PUCCH resource. |
| ***secondHopPRB***  Index of first PRB after frequency hopping of PUCCH. This value is applicable for intra-slot frequency hopping (see TS 38.213 [13], clause 9.2.1) or inter-slot frequency hopping (see TS 38.213 [13], clause 9.2.6). |

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

>>Skipped unchanged parts

#### – *PUSCH-Config*

The IE *PUSCH-Config* is used to configure the UE specific PUSCH parameters applicable to a particular BWP.

*PUSCH-Config* information element

-- ASN1START

-- TAG-PUSCH-CONFIG-START

PUSCH-Config ::= SEQUENCE {

dataScramblingIdentityPUSCH INTEGER (0..1023) OPTIONAL, -- Need S

txConfig ENUMERATED {codebook, nonCodebook} OPTIONAL, -- Need S

dmrs-UplinkForPUSCH-MappingTypeA SetupRelease { DMRS-UplinkConfig } OPTIONAL, -- Need M

dmrs-UplinkForPUSCH-MappingTypeB SetupRelease { DMRS-UplinkConfig } OPTIONAL, -- Need M

pusch-PowerControl PUSCH-PowerControl OPTIONAL, -- Need M

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

frequencyHoppingOffsetLists SEQUENCE (SIZE (1..4)) OF INTEGER (1.. maxNrofPhysicalResourceBlocks-1)

OPTIONAL, -- Need M

resourceAllocation ENUMERATED { resourceAllocationType0, resourceAllocationType1, dynamicSwitch},

pusch-TimeDomainAllocationList SetupRelease { PUSCH-TimeDomainResourceAllocationList } OPTIONAL, -- Need M

pusch-AggregationFactor ENUMERATED { n2, n4, n8 } OPTIONAL, -- Need S

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

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

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

codebookSubset ENUMERATED {fullyAndPartialAndNonCoherent, partialAndNonCoherent,nonCoherent}

OPTIONAL, -- Cond codebookBased

maxRank INTEGER (1..4) OPTIONAL, -- Cond codebookBased

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

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

tp-pi2BPSK ENUMERATED {enabled} OPTIONAL, -- Need S

...,

[[

ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16 SEQUENCE (SIZE (1..64)) OF INTEGER (0..63) OPTIONAL -- Need M

]]

}

UCI-OnPUSCH ::= SEQUENCE {

betaOffsets CHOICE {

dynamic SEQUENCE (SIZE (4)) OF BetaOffsets,

semiStatic BetaOffsets

} OPTIONAL, -- Need M

scaling ENUMERATED { f0p5, f0p65, f0p8, f1 }

}

-- TAG-PUSCH-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PUSCH-Config* field descriptions |
| ***codebookSubset***  Subset of PMIs addressed by TPMI, where PMIs are those supported by UEs with maximum coherence capabilities (see TS 38.214 [19], clause 6.1.1.1). |
| ***dataScramblingIdentityPUSCH***  Identifier used to initalite data scrambling (c\_init) for PUSCH. If the field is absent, the UE applies the physical cell ID. (see TS 38.211 [16], clause 6.3.1.1). |
| ***dmrs-UplinkForPUSCH-MappingTypeA***  DMRS configuration for PUSCH transmissions using PUSCH mapping type A (chosen dynamically via *PUSCH-TimeDomainResourceAllocation*). Only the fields *dmrs-Type*, *dmrs-AdditionalPosition* and *maxLength* may be set differently for mapping type A and B. |
| ***dmrs-UplinkForPUSCH-MappingTypeB***  DMRS configuration for PUSCH transmissions using PUSCH mapping type B (chosen dynamically via *PUSCH-TimeDomainResourceAllocation*). Only the fields *dmrs-Type*, *dmrs-AdditionalPosition* and *maxLength* may be set differently for mapping type A and B. |
| ***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 (see TS 38.214 [19], clause 6.3). |
| ***frequencyHoppingOffsetLists***  Set of frequency hopping offsets used when frequency hopping is enabled for granted transmission (not msg3) and type 2 configured grant activation (see TS 38.214 [19], clause 6.3). |
| ***maxRank***  Subset of PMIs addressed by TRIs from 1 to ULmaxRank (see TS 38.214 [19], clause 6.1.1.1). |
| ***mcs-Table***  Indicates which MCS table the UE shall use for PUSCH without transform precoder (see TS 38.214 [19], clause 6.1.4.1). If the field is absent the UE applies the value 64QAM |
| ***mcs-TableTransformPrecoder***  Indicates which MCS table the UE shall use for PUSCH with transform precoding (see TS 38.214 [19], clause 6.1.4.1) If the field is absent the UE applies the value 64QAM |
| ***pusch-AggregationFactor***  Number of repetitions for data (see TS 38.214 [19], clause 6.1.2.1). If the field is absent the UE applies the value 1. |
| ***pusch-TimeDomainAllocationList***  List of time domain allocations for timing of UL assignment to UL data (see TS 38.214 [19], table 6.1.2.1.1-1). |
| ***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 (see TS 38.214 [19], clause 6.1.2.2.1). |
| ***resourceAllocation***  Configuration of resource allocation type 0 and resource allocation type 1 for non-fallback DCI (see TS 38.214 [19], clause 6.1.2). |
| ***tp-pi2BPSK***  Enables pi/2-BPSK modulation with transform precoding if the field is present and disables it otherwise. |
| ***transformPrecoder***  The UE specific selection of transformer precoder for PUSCH (see TS 38.214 [19], clause 6.1.3). When the field is absent the UE applies the value of the field *msg3-transformPrecoder*. |
| ***txConfig***  Whether UE uses codebook based or non-codebook based transmission (see TS 38.214 [19], clause 6.1.1). If the field is absent, the UE transmits PUSCH on one antenna port, see TS 38.214 [19], clause 6.1.1. |
| ***ul-dci-triggered-UL-ChannelAccess-CPext-CAPC***  List of the combinations of CP extension and UL channel access mode (See TS 38.212 [17], Table 7.3.1-2-35). |

|  |
| --- |
| *UCI-OnPUSCH* field descriptions |
| ***betaOffsets***  Selection between and configuration of dynamic and semi-static beta-offset. If the field is not configured, the UE applies the value 'semiStatic' (see TS 38.213 [13], clause 9.3). |
| ***scaling***  Indicates a scaling factor to limit the number of resource elements assigned to UCI on PUSCH. Value *f0p5* corresponds to 0.5, value *f0p65* corresponds to 0.65, and so on. The value configured herein is applicable for PUSCH with configured grant (see TS 38.212 [17], clause 6.3). |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *codebookBased* | The field is mandatory present if *txConfig* is set to codebook and absent otherwise. |

>>Skipped unchanged parts

#### – *RACH-ConfigCommon*

The IE *RACH-ConfigCommon* is used to specify the cell specific random-access parameters.

*RACH-ConfigCommon* information element

-- ASN1START

-- TAG-RACH-CONFIGCOMMON-START

RACH-ConfigCommon ::= SEQUENCE {

rach-ConfigGeneric RACH-ConfigGeneric,

totalNumberOfRA-Preambles INTEGER (1..63) OPTIONAL, -- Need S

ssb-perRACH-OccasionAndCB-PreamblesPerSSB CHOICE {

oneEighth ENUMERATED {n4,n8,n12,n16,n20,n24,n28,n32,n36,n40,n44,n48,n52,n56,n60,n64},

oneFourth ENUMERATED {n4,n8,n12,n16,n20,n24,n28,n32,n36,n40,n44,n48,n52,n56,n60,n64},

oneHalf ENUMERATED {n4,n8,n12,n16,n20,n24,n28,n32,n36,n40,n44,n48,n52,n56,n60,n64},

one ENUMERATED {n4,n8,n12,n16,n20,n24,n28,n32,n36,n40,n44,n48,n52,n56,n60,n64},

two ENUMERATED {n4,n8,n12,n16,n20,n24,n28,n32},

four INTEGER (1..16),

eight INTEGER (1..8),

sixteen INTEGER (1..4)

} OPTIONAL, -- Need M

groupBconfigured SEQUENCE {

ra-Msg3SizeGroupA ENUMERATED {b56, b144, b208, b256, b282, b480, b640,

b800, b1000, b72, spare6, spare5,spare4, spare3, spare2, spare1},

messagePowerOffsetGroupB ENUMERATED { minusinfinity, dB0, dB5, dB8, dB10, dB12, dB15, dB18},

numberOfRA-PreamblesGroupA INTEGER (1..64)

} OPTIONAL, -- Need R

ra-ContentionResolutionTimer ENUMERATED { sf8, sf16, sf24, sf32, sf40, sf48, sf56, sf64},

rsrp-ThresholdSSB RSRP-Range OPTIONAL, -- Need R

rsrp-ThresholdSSB-SUL RSRP-Range OPTIONAL, -- Cond SUL

prach-RootSequenceIndex CHOICE {

l839 INTEGER (0..837),

l139 INTEGER (0..137)

},

msg1-SubcarrierSpacing SubcarrierSpacing OPTIONAL, -- Cond L139

restrictedSetConfig ENUMERATED {unrestrictedSet, restrictedSetTypeA, restrictedSetTypeB},

msg3-transformPrecoder ENUMERATED {enabled} OPTIONAL, -- Need R

...,

[[

prach-RootSequenceIndex-r16 CHOICE {

l571 INTEGER (0..569),

l1151 INTEGER (0..1149)

} OPTIONAL -- Need R

]]

}

-- TAG-RACH-CONFIGCOMMON-STOP

-- ASN1STOP

|  |
| --- |
| *RACH-ConfigCommon* field descriptions |
| ***messagePowerOffsetGroupB***  Threshold for preamble selection. Value is in dB. Value *minusinfinity* corresponds to –infinity. Value *dB0* corresponds to 0 dB, *dB5* corresponds to 5 dB and so on. (see TS 38.321 [3], clause 5.1.2) |
| ***msg1-SubcarrierSpacing***  Subcarrier spacing of PRACH (see TS 38.211 [16], clause 5.3.2). Only the values 15 or 30 kHz (FR1), and 60 or 120 kHz (FR2) are applicable. If absent, the UE applies the SCS as derived from the *prach-ConfigurationIndex* in *RACH-ConfigGeneric* (see tables Table 6.3.3.1-1 and Table 6.3.3.2-2, TS 38.211 [16]). The value also applies to contention free random access (*RACH-ConfigDedicated*), to SI-request and to contention-based beam failure recovery (CB-BFR). But it does not apply for contention free beam failure recovery (CF-BFR) (see *BeamFailureRecoveryConfig*). |
| ***msg3-transformPrecoder***  Enables the transform precoder for Msg3 transmission according to clause 6.1.3 of TS 38.214 [19]. If the field is absent, the UE disables the transformer precoder (see TS 38.213 [13], clause 8.3). |
| ***numberOfRA-PreamblesGroupA***  The number of CB preambles per SSB in group A. This determines implicitly the number of CB preambles per SSB available in group B. (see TS 38.321 [3], clause 5.1.1). The setting should be consistent with the setting of *ssb-perRACH-OccasionAndCB-PreamblesPerSSB*. |
| ***prach-RootSequenceIndex***  PRACH root sequence index (see TS 38.211 [16], clause 6.3.3.1). The value range depends on whether L=839 or L=139. The short/long preamble format indicated in this IE should be consistent with the one indicated in *prach-ConfigurationIndex* in the *RACH-ConfigDedicated* (if configured). If *prach-RootSequenceIndex-r16* is signalled, UE shall ignore the *prach-RootSequenceIndex* (without suffix). |
| ***ra-ContentionResolutionTimer***  The initial value for the contention resolution timer (see TS 38.321 [3], clause 5.1.5). Value *sf8* corresponds to 8 subframes, value *sf16* corresponds to 16 subframes, and so on. |
| ***ra-Msg3SizeGroupA***  Transport Blocks size threshold in bits below which the UE shall use a contention-based RA preamble of group A. (see TS 38.321 [3], clause 5.1.2). |
| ***rach-ConfigGeneric***  RACH parameters for both regular random access and beam failure recovery. |
| ***restrictedSetConfig***  Configuration of an unrestricted set or one of two types of restricted sets, see TS 38.211 [16], clause 6.3.3.1. |
| ***rsrp-ThresholdSSB***  UE may select the SS block and corresponding PRACH resource for path-loss estimation and (re)transmission based on SS blocks that satisfy the threshold (see TS 38.213 [13]). |
| ***rsrp-ThresholdSSB-SUL***  The UE selects SUL carrier to perform random access based on this threshold (see TS 38.321 [3], clause 5.1.1). The value applies to all the BWPs. |
| ***ssb-perRACH-OccasionAndCB-PreamblesPerSSB***  The meaning of this field is twofold: the CHOICE conveys the information about the number of SSBs per RACH occasion. Value *oneEight* corresponds to one SSB associated with 8 RACH occasions, value *oneFourth* corresponds to one SSB associated with 4 RACH occasions, and so on. The ENUMERATED part indicates the number of Contention Based preambles per SSB. Value *n4* corresponds to 4 Contention Based preambles per SSB, value *n8* corresponds to 8 Contention Based preambles per SSB, and so on. The total number of CB preambles in a RACH occasion is given by *CB-preambles-per-SSB* \* max(1, *SSB-per-rach-occasion*). See TS 38.213 [13]. |
| ***totalNumberOfRA-Preambles***  Total number of preambles used for contention based and contention free random access in the RACH resources defined in *RACH-ConfigCommon*, excluding preambles used for other purposes (e.g. for SI request). If the field is absent, all 64 preambles are available for RA. The setting should be consistent with the setting of *ssb-perRACH-OccasionAndCB-PreamblesPerSSB*, i.e. it should be a multiple of the number of SSBs per RACH occasion. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *L139* | The field is mandatory present if *prach-RootSequenceIndex* L=139, otherwise the field is absent, Need S. |
| *SUL* | The field is mandatory present in *initialUplinkBWP* in *supplementaryUplink*; otherwise, the field is absent. |

>>Skipped unchanged parts

#### – *RACH-ConfigGeneric*

The IE *RACH-ConfigGeneric* is used to specify the random-access parameters both for regular random access as well as for beam failure recovery.

*RACH-ConfigGeneric* information element

-- ASN1START

-- TAG-RACH-CONFIGGENERIC-START

RACH-ConfigGeneric ::= SEQUENCE {

prach-ConfigurationIndex INTEGER (0..255),

msg1-FDM ENUMERATED {one, two, four, eight},

msg1-FrequencyStart INTEGER (0..maxNrofPhysicalResourceBlocks-1),

zeroCorrelationZoneConfig INTEGER(0..15),

preambleReceivedTargetPower INTEGER (-202..-60),

preambleTransMax ENUMERATED {n3, n4, n5, n6, n7, n8, n10, n20, n50, n100, n200},

powerRampingStep ENUMERATED {dB0, dB2, dB4, dB6},

ra-ResponseWindow ENUMERATED {sl1, sl2, sl4, sl8, sl10, sl20, sl40, sl80},

...,

[[

ra-ResponseWindow-r16 ENUMERATED {sl1, sl2, sl4, sl8, sl10, sl20, sl40, sl60, sl80, sl160} OPTIONAL -- Need R

]]

}

-- TAG-RACH-CONFIGGENERIC-STOP

-- ASN1STOP

|  |
| --- |
| *RACH-ConfigGeneric* field descriptions |
| ***msg1-FDM***  The number of PRACH transmission occasions FDMed in one time instance. (see TS 38.211 [16], clause 6.3.3.2). |
| ***msg1-FrequencyStart***  Offset of lowest PRACH transmission occasion in frequency domain with respective to PRB 0. The value is configured so that the corresponding RACH resource is entirely within the bandwidth of the UL BWP. (see TS 38.211 [16], clause 6.3.3.2). |
| ***powerRampingStep***  Power ramping steps for PRACH (see TS 38.321 [3],5.1.3). |
| ***prach-ConfigurationIndex***  PRACH configuration index. For *prach-ConfigurationIndex* configured under *beamFailureRecovery-Config*, the *prach-ConfigurationIndex* can only correspond to the short preamble format, (see TS 38.211 [16], clause 6.3.3.2). |
| ***preambleReceivedTargetPower***  The target power level at the network receiver side (see TS 38.213 [13], clause 7.4, TS 38.321 [3], clauses 5.1.2, 5.1.3). Only multiples of 2 dBm may be chosen (e.g. -202, -200, -198, ...). |
| ***preambleTransMax***  Max number of RA preamble transmission performed before declaring a failure (see TS 38.321 [3], clauses 5.1.4, 5.1.5). |
| ***ra-ResponseWindow***  Msg2 (RAR) window length in number of slots. The network configures a value lower than or equal to 10 ms when Msg2 is transmitted with licensed spectrum channel access and 40 ms when Msg2 is transmitted with shared spectrum channel access (see TS 38.321 [3], clause 5.1.4). UE ignores the field if included in *SCellConfig*. If *ra-ResponseWindow-r16* is signalled, UE shall ignore the *ra-ResponseWindow* (without suffix). |
| ***zeroCorrelationZoneConfig***  N-CS configuration, see Table 6.3.3.1-5 in TS 38.211 [16]. |

>>Skipped unchanged parts

#### – *ReportConfigNR*

The IE *ReportConfigNR* specifies criteria for triggering of an NR measurement reporting event. Measurement reporting events are based on cell measurement results, which can either be derived based on SS/PBCH block or CSI-RS. These events are labelled AN with N equal to 1, 2 and so on.

Event A1: Serving becomes better than absolute threshold;

Event A2: Serving becomes worse than absolute threshold;

Event A3: Neighbour becomes amount of offset better than PCell/PSCell;

Event A4: Neighbour becomes better than absolute threshold;

Event A5: PCell/PSCell becomes worse than absolute threshold1 AND Neighbour/SCell becomes better than another absolute threshold2;

Event A6: Neighbour becomes amount of offset better than SCell.

*ReportConfigNR* information element

-- ASN1START

-- TAG-REPORTCONFIGNR-START

ReportConfigNR ::= SEQUENCE {

reportType CHOICE {

periodical PeriodicalReportConfig,

eventTriggered EventTriggerConfig,

...,

reportCGI ReportCGI,

reportSFTD ReportSFTD-NR

}

}

ReportCGI ::= SEQUENCE {

cellForWhichToReportCGI PhysCellId,

...

}

ReportSFTD-NR ::= SEQUENCE {

reportSFTD-Meas BOOLEAN,

reportRSRP BOOLEAN,

...,

[[

reportSFTD-NeighMeas ENUMERATED {true} OPTIONAL, -- Need R

drx-SFTD-NeighMeas ENUMERATED {true} OPTIONAL, -- Need R

cellsForWhichToReportSFTD SEQUENCE (SIZE (1..maxCellSFTD)) OF PhysCellId OPTIONAL -- Need R

]]

}

EventTriggerConfig::= SEQUENCE {

eventId CHOICE {

eventA1 SEQUENCE {

a1-Threshold MeasTriggerQuantity,

reportOnLeave BOOLEAN,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger

},

eventA2 SEQUENCE {

a2-Threshold MeasTriggerQuantity,

reportOnLeave BOOLEAN,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger

},

eventA3 SEQUENCE {

a3-Offset MeasTriggerQuantityOffset,

reportOnLeave BOOLEAN,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger,

useWhiteCellList BOOLEAN

},

eventA4 SEQUENCE {

a4-Threshold MeasTriggerQuantity,

reportOnLeave BOOLEAN,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger,

useWhiteCellList BOOLEAN

},

eventA5 SEQUENCE {

a5-Threshold1 MeasTriggerQuantity,

a5-Threshold2 MeasTriggerQuantity,

reportOnLeave BOOLEAN,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger,

useWhiteCellList BOOLEAN

},

eventA6 SEQUENCE {

a6-Offset MeasTriggerQuantityOffset,

reportOnLeave BOOLEAN,

hysteresis Hysteresis,

timeToTrigger TimeToTrigger,

useWhiteCellList BOOLEAN

},

...

},

rsType NR-RS-Type,

reportInterval ReportInterval,

reportAmount ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},

reportQuantityCell MeasReportQuantity,

maxReportCells INTEGER (1..maxCellReport),

reportQuantityRS-Indexes MeasReportQuantity OPTIONAL, -- Need R

maxNrofRS-IndexesToReport INTEGER (1..maxNrofIndexesToReport) OPTIONAL, -- Need R

includeBeamMeasurements BOOLEAN,

reportAddNeighMeas ENUMERATED {setup} OPTIONAL, -- Need R

...,

[[

measRSSI-ReportConfig-r16 MeasRSSI-ReportConfig-r16 OPTIONAL -- Need R

]]

}

PeriodicalReportConfig ::= SEQUENCE {

rsType NR-RS-Type,

reportInterval ReportInterval,

reportAmount ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},

reportQuantityCell MeasReportQuantity,

maxReportCells INTEGER (1..maxCellReport),

reportQuantityRS-Indexes MeasReportQuantity OPTIONAL, -- Need R

maxNrofRS-IndexesToReport INTEGER (1..maxNrofIndexesToReport) OPTIONAL, -- Need R

includeBeamMeasurements BOOLEAN,

useWhiteCellList BOOLEAN,

...,

[[

measRSSI-ReportConfig-r16 MeasRSSI-ReportConfig-r16 OPTIONAL -- Need R

]]

}

NR-RS-Type ::= ENUMERATED {ssb, csi-rs}

MeasTriggerQuantity ::= CHOICE {

rsrp RSRP-Range,

rsrq RSRQ-Range,

sinr SINR-Range

}

MeasTriggerQuantityOffset ::= CHOICE {

rsrp INTEGER (-30..30),

rsrq INTEGER (-30..30),

sinr INTEGER (-30..30)

}

MeasReportQuantity ::= SEQUENCE {

rsrp BOOLEAN,

rsrq BOOLEAN,

sinr BOOLEAN

}

MeasRSSI-ReportConfig-r16 ::= SEQUENCE {

channelOccupancyThreshold-r16 ffsValue OPTIONAL, -- Need R

...

}

-- TAG-REPORTCONFIGNR-STOP

-- ASN1STOP

|  |
| --- |
| *ReportConfigNR* field descriptions |
| ***reportType***  Type of the configured measurement report. In EN-DC, network does not configure report of type *reportCGI* using SRB3. |

|  |
| --- |
| *EventTriggerConfig* field descriptions |
| ***a3-Offset/a6-Offset***  Offset value(s) to be used in NR measurement report triggering condition for event a3/a6. The actual value is field value \* 0.5 dB. |
| ***aN-ThresholdM***  Threshold value associated to the selected trigger quantity (e.g. RSRP, RSRQ, SINR) per RS Type (e.g. SS/PBCH block, CSI-RS) to be used in NR measurement report triggering condition for event number aN. If multiple thresholds are defined for event number aN, the thresholds are differentiated by M. The network configures aN-Threshold1 only for events A1, A2, A4, A5 and a5-Threshold2 only for event A5. In the same *eventA5*, the network configures the same quantity for the *MeasTriggerQuantity* of the *a5-Threshold1* and for the *MeasTriggerQuantity* of the *a5-Threshold2*. |
| ***channelOccupancyThreshold***  RSSI threshold which is used for channel occupancy evaluation. |
| ***eventId***  Choice of NR event triggered reporting criteria. |
| ***maxNrofRS-IndexesToReport***  Max number of RS indexes to include in the measurement report for A1-A6 events. |
| ***maxReportCells***  Max number of non-serving cells to include in the measurement report. |
| ***reportAddNeighMeas***  Indicates that the UE shall include the best neighbour cells per serving frequency. |
| ***reportAmount***  *Number* of measurement reports applicable for *eventTriggered* as well as for *periodical* report types. |
| ***reportOnLeave***  Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a cell in *cellsTriggeredList*, as specified in 5.5.4.1. |
| ***reportQuantityCell***  The cell measurement quantities to be included in the measurement report. |
| ***reportQuantityRS-Indexes***  Indicates which measurement information per RS index the UE shall include in the measurement report. |
| ***timeToTrigger***  Time during which specific criteria for the event needs to be met in order to trigger a measurement report. |
| ***useWhiteCellList***  Indicates whether only the cells included in the white-list of the associated measObject are applicable as specified in 5.5.4.1. |

|  |
| --- |
| *PeriodicalReportConfig* field descriptions |
| ***maxNrofRS-IndexesToReport***  Max number of RS indexes to include in the measurement report. |
| ***maxReportCells***  Max number of non-serving cells to include in the measurement report. |
| ***reportAmount***  *Number* of measurement reports applicable for *eventTriggered* as well as for *periodical* report types |
| ***reportQuantityCell***  The cell measurement quantities to be included in the measurement report. |
| ***reportQuantityRS-Indexes***  Indicates which measurement information per RS index the UE shall include in the measurement report. |
| ***useWhiteCellList***  Indicates whether only the cells included in the white-list of the associated measObject are applicable as specified in 5.5.4.1. |

|  |
| --- |
| *ReportSFTD-NR* field descriptions |
| ***cellForWhichToReportSFTD***  Indicates the target NR neighbour cells for SFTD measurement between PCell and NR neighbour cells. |
| ***drx-SFTD-NeighMeas***  Indicates that the UE shall use available idle periods (i.e. DRX off periods) for the SFTD measurement in NR standalone. The network only includes *drx-SFTD-NeighMeas* field when *reprtSFTD-NeighMeas* is set to true. |
| ***reportSFTD-Meas***  Indicates whether UE is required to perform SFTD measurement between PCell and NR PSCell in NR-DC. |
| ***reportSFTD-NeighMeas***  Indicates whether UE is required to perform SFTD measurement between PCell and NR neighbour cells in NR standalone. The network does not include this field if *reportSFTD-Meas* is set to *true*. |
| ***reportRSRP***  Indicates whether UE is required to include RSRP result of NR PSCell in SFTD measurement result, derived based on SSB. If it is set to true, the network should ensure that *ssb-ConfigMobility* is included in the measurement object for NR PSCell. |

>>Skipped unchanged parts

#### – *SemiStaticChannelAccessConfig*

The IE *SemiStaticChannelAccessConfig* is used to configure channel access parameters when the network is operating in semi-static channel accces mode mode (see clause 4.3 TS 37.213 [XX).

*SemiStaticChannelAccessConfig* information element

-- ASN1START

-- TAG-SEMISTATICCHANNELACCESSCONFIG-START

SemiStaticChannelAccessConfig ::= SEQUENCE {

period ENUMERATED {ms1, ms2, ms2dot5, ms4, ms5, ms10}

}

-- TAG-SEMISTATICCHANNELACCESSCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *SemiStaticChannelAccessConfig* field descriptions |
| ***period***  Indicates the periodicity of the semi-static channel access mode (see TS 37.213 [XX). |

>>Skipped unchanged parts

#### – *SearchSpace*

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

*SearchSpace* information element

-- ASN1START

-- TAG-SEARCHSPACE-START

SearchSpace ::= SEQUENCE {

searchSpaceId SearchSpaceId,

controlResourceSetId ControlResourceSetId OPTIONAL, -- Cond SetupOnly

monitoringSlotPeriodicityAndOffset CHOICE {

sl1 NULL,

sl2 INTEGER (0..1),

sl4 INTEGER (0..3),

sl5 INTEGER (0..4),

sl8 INTEGER (0..7),

sl10 INTEGER (0..9),

sl16 INTEGER (0..15),

sl20 INTEGER (0..19),

sl40 INTEGER (0..39),

sl80 INTEGER (0..79),

sl160 INTEGER (0..159),

sl320 INTEGER (0..319),

sl640 INTEGER (0..639),

sl1280 INTEGER (0..1279),

sl2560 INTEGER (0..2559)

} OPTIONAL, -- Cond Setup

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

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

nrofCandidates SEQUENCE {

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

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

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

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

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

} OPTIONAL, -- Cond Setup

searchSpaceType CHOICE {

common SEQUENCE {

dci-Format0-0-AndFormat1-0 SEQUENCE {

...

} OPTIONAL, -- Need R

dci-Format2-0 SEQUENCE {

nrofCandidates-SFI SEQUENCE {

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

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

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

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

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

},

...

} OPTIONAL, -- Need R

dci-Format2-1 SEQUENCE {

...

} OPTIONAL, -- Need R

dci-Format2-2 SEQUENCE {

...

} OPTIONAL, -- Need R

dci-Format2-3 SEQUENCE {

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

dummy2 ENUMERATED {n1, n2},

...

} OPTIONAL -- Need R

},

ue-Specific SEQUENCE {

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

...,

[[

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

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

]]

}

} OPTIONAL -- Cond Setup

}

-- TAG-SEARCHSPACE-STOP

-- ASN1STOP

|  |
| --- |
| *SearchSpace* field descriptions |
| ***common***  Configures this search space as common search space (CSS) and DCI formats to monitor. |
| ***controlResourceSetId***  The CORESET applicable for this SearchSpace. Value 0 identifies the common CORESET#0 configured in MIB and in *ServingCellConfigCommon*. Values 1..*maxNrofControlResourceSets-1* identify CORESETs configured in System Information or by dedicated signalling. The CORESETs with *non-zero controlResourceSetId* are configured in the same BWP as this *SearchSpace*. |
| ***dummy1, dummy2***  This field is not used in the specification. If received it shall be ignored by the UE. |
| ***dci-Format0-0-AndFormat1-0***  If configured, the UE monitors the DCI formats 0\_0 and 1\_0 according to TS 38.213 [13], clause 10.1. |
| ***dci-Format2-0***  If configured, UE monitors the DCI format 2\_0 according to TS 38.213 [13], clause 10.1, 11.1.1. |
| ***dci-Format2-1***  If configured, UE monitors the DCI format 2\_1 according to TS 38.213 [13], clause 10.1, 11.2. |
| ***dci-Format2-2***  If configured, UE monitors the DCI format 2\_2 according to TS 38.213 [13], clause 10.1, 11.3. |
| ***dci-Format2-3***  If configured, UE monitors the DCI format 2\_3 according to TS 38.213 [13], clause 10.1, 11.4 |
| ***dci-Formats***  Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1. |
| ***duration***  Number of consecutive slots that a SearchSpace lasts in every occasion, i.e., upon every period as given in the *periodicityAndOffset*. If the field is absent, the UE applies the value 1 slot, except for DCI format 2\_0. The UE ignores this field for DCI format 2\_0. The maximum valid duration is periodicity-1 (periodicity as given in the *monitoringSlotPeriodicityAndOffset*). |
| ***freqMonitorLocations***  1 implies a frequency domain resource allocation replicated from the pattern configured in the associated CORESET is mapped to the RB set. LSB corresponds to lowest RB set in the BWP. For a RB set indicated in the bitmap, the first PRB of the frequency domain monitoring location confined within the RB set is aligned with {the first PRB of the RB set + *rb-Offset* provided by the associated CORESET. |
| ***monitoringSlotPeriodicityAndOffset***  Slots for PDCCH Monitoring configured as periodicity and offset. If the UE is configured to monitor DCI format 2\_1, only the values 'sl1', 'sl2' or 'sl4' are applicable. If the UE is configured to monitor DCI format 2\_0, only the values ′sl1′, ′sl2′, ′sl4′, ′sl5′, ′sl8′, ′sl10′, ′sl16′, and ′sl20′ are applicable (see TS 38.213 [13], clause 10). |
| ***monitoringSymbolsWithinSlot***  The first symbol(s) for PDCCH monitoring in the slots configured for PDCCH monitoring (see *monitoringSlotPeriodicityAndOffset* and *duration*). The most significant (left) bit represents the first OFDM in a slot, and the second most significant (left) bit represents the second OFDM symbol in a slot and so on. The bit(s) set to one identify the first OFDM symbol(s) of the control resource set within a slot. If the cyclic prefix of the BWP is set to extended CP, the last two bits within the bit string shall be ignored by the UE .  For DCI format 2\_0, the first one symbol applies if the *duration* of CORESET (in the IE *ControlResourceSet*) identified by *controlResourceSetId* indicates 3 symbols, the first two symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 2 symbols, and the first three symbols apply if the *duration* of CORESET identified by *controlResourceSetId* indicates 1 symbol.  See TS 38.213 [13], clause 10. |
| ***nrofCandidates-SFI***  The number of PDCCH candidates specifically for format 2-0 for the configured aggregation level. If an aggregation level is absent, the UE does not search for any candidates with that aggregation level. The network configures only one aggregationLevel and the corresponding number of candidates (see TS 38.213 [13], clause 11.1.1). |
| ***nrofCandidates***  Number of PDCCH candidates per aggregation level. The number of candidates and aggregation levels configured here applies to all formats unless a particular value is specified or a format-specific value is provided (see inside *searchSpaceType*). If configured in the *SearchSpace* of a cross carrier scheduled cell, this field determines the number of candidates and aggregation levels to be used on the linked scheduling cell (see TS 38.213 [13], clause 10). |
| ***searchSpaceGroupIdList***  List of search space group IDs which the search space set is associated with. |
| ***searchSpaceId***  Identity of the search space. SearchSpaceId = 0 identifies the *searchSpaceZero* configured via PBCH (MIB) or *ServingCellConfigCommon* and may hence not be used in the *SearchSpace* IE. The *searchSpaceId* is unique among the BWPs of a Serving Cell. In case of cross carrier scheduling, search spaces with the same *searchSpaceId* in scheduled cell and scheduling cell are linked to each other. The UE applies the search space for the scheduled cell only if the DL BWPs in which the linked search spaces are configured in scheduling cell and scheduled cell are both active. |
| ***searchSpaceType***  Indicates whether this is a common search space (present) or a UE specific search space as well as DCI formats to monitor for. |
| ***ue-Specific***  Configures this search space as UE specific search space (USS). The UE monitors the DCI format with CRC scrambled by C-RNTI, CS-RNTI (if configured), and SP-CSI-RNTI (if configured) |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *Setup* | This field is mandatory present upon creation of a new *SearchSpace*. It is optionally present, Need M, otherwise. |
| *SetupOnly* | This field is mandatory present upon creation of a new *SearchSpace*. It is absent, Need M, otherwise. |

>>Skipped unchanged parts

#### – *ServingCellConfig*

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

*ServingCellConfig* information element

-- ASN1START

-- TAG-SERVINGCELLCONFIG-START

ServingCellConfig ::= SEQUENCE {

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

initialDownlinkBWP BWP-DownlinkDedicated OPTIONAL, -- Need M

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

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

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

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

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

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

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

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

uplinkConfig UplinkConfig OPTIONAL, -- Need M

supplementaryUplink UplinkConfig OPTIONAL, -- Need M

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

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

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

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

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

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

crossCarrierSchedulingConfig CrossCarrierSchedulingConfig OPTIONAL, -- Need M

tag-Id TAG-Id,

dummy ENUMERATED {enabled} OPTIONAL, -- Need R

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

servingCellMO MeasObjectId OPTIONAL, -- Cond MeasObject

...,

[[

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

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

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

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

]],

[[

channelAccessConfig-r16 ChannelAccessConfig-r16 OPTIONAL -- Need M

]]

}

UplinkConfig ::= SEQUENCE {

initialUplinkBWP BWP-UplinkDedicated OPTIONAL, -- Need M

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

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

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

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

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

...,

[[

powerBoostPi2BPSK BOOLEAN OPTIONAL, -- Need M

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

]]

}

ChannelAccessConfig-r16 ::= SEQUENCE {

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

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

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

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

}

-- TAG-SERVINGCELLCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *ServingCellConfig* field descriptions |
| ***absenceOfAnyOtherTechnology***  Presence of this field indicates absence on a long term basis (e.g. by level of regulation) of any other technology sharing the carrier; absence of this field indicates the potential presence of any other technology sharing the carrier, as specified in TS 37.213 [XX} Section Y. |
| ***bwp-InactivityTimer***  The duration in ms after which the UE falls back to the default Bandwidth Part (see TS 38.321 [3], clause 5.15). When the network releases the timer configuration, the UE stops the timer without switching to the default BWP. |
| ***channelAccessConfig***  List of parameters used for access procedures of operation with shared spectrum channel access (see TS 37.213 [XX). |
| ***crossCarrierSchedulingConfig***  Indicates whether this serving cell is cross-carrier scheduled by another serving cell or whether it cross-carrier schedules another serving cell. |
| ***defaultDownlinkBWP-Id***  The initial bandwidth part is referred to by BWP-Id = 0. ID of the downlink bandwidth part to be used upon expiry of the BWP inactivity timer. This field is UE specific. When the field is absent the UE uses the initial BWP as default BWP. (see TS 38.213 [13], clause 12 and TS 38.321 [3], clause 5.15). |
| ***downlinkBWP-ToAddModList***  List of additional downlink bandwidth parts to be added or modified. (see TS 38.213 [13], clause 12). |
| ***downlinkBWP-ToReleaseList***  List of additional downlink bandwidth parts to be released. (see TS 38.213 [13], clause 12). |
| ***downlinkChannelBW-PerSCS-List***  A set of UE specific channel bandwidth and location configurations for different subcarrier spacings (numerologies). Defined in relation to Point A. The UE uses the configuration provided in this field only for the purpose of channel bandwidth and location determination. If absent, UE uses the configuration indicated in *scs-SpecificCarrierList* in *DownlinkConfigCommon* / *DownlinkConfigCommonSIB*. Network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 [15] and TS 38.101-2 [39]. |
| ***energyDetectionThresholdOffset***  Indicates the offset to the default maximum energy detection threshold value. Unit in dB. Value -13 corresponds to -13dB, value -12 corresponds to -12dB, and so on (i.e. in steps of 1dB) as specified in TS 37.213 [XX). |
| ***firstActiveDownlinkBWP-Id***  If configured for an SpCell, this field contains the ID of the DL BWP to be activated upon performing the RRC (re-)configuration. If the field is absent, the RRC (re-)configuration does not impose a BWP switch.  If configured for an SCell, this field contains the ID of the downlink bandwidth part to be used upon MAC-activation of an SCell. The initial bandwidth part is referred to by BWP-Id = 0.  Upon PCell change and PSCell addition/change, the network sets the *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* to the same value. |
| ***initialDownlinkBWP***  The dedicated (UE-specific) configuration for the initial downlink bandwidth-part (i.e. DL BWP#0). If any of the optional IEs are configured within this IE, the UE considers the BWP#0 to be an RRC configured BWP (from UE capability viewpoint). Otherwise, the UE does not consider the BWP#0 as an RRC configured BWP (from UE capability viewpoint). Network always configures the UE with a value for this field if no other BWPs are configured. NOTE1 |
| ***lte-CRS-ToMatchAround***  Parameters to determine an LTE CRS pattern that the UE shall rate match around. |
| ***maxEnergyDetectionThreshold***  Indicates the absolute maximum energy detection threshold value. Unit in dBm. Value -85 corresponds to -85 dBm, value -84 corresponds to -84 dBm, and so on (i.e. in steps of 1dBm) as specified in TS 37.213 [XX]. If the field is not configured, the UE shall use a default maximum energy detection threshold value as specified in TS 37.213 [XX]. |
| ***pathlossReferenceLinking***  Indicates whether UE shall apply as pathloss reference either the downlink of SpCell (PCell for MCG or PSCell for SCG) or of SCell that corresponds with this uplink (see TS 38.213 [13], clause 7). |
| ***pdsch-ServingCellConfig***  PDSCH related parameters that are not BWP-specific. |
| ***rateMatchPatternToAddModList***  Resources patterns which the UE should rate match PDSCH around. The UE rate matches around the union of all resources indicated in the rate match patterns. Rate match patterns defined here on cell level apply only to PDSCH of the same numerology. See TS 38.214 [19], clause 5.1.2.2.3. |
| ***sCellDeactivationTimer***  SCell deactivation timer in TS 38.321 [3]. If the field is absent, the UE applies the value infinity. |
| ***servingCellMO***  *measObjectId* of the *MeasObjectNR* in *MeasConfig* which is associated to the serving cell. For this *MeasObjectNR*, the following relationship applies between this MeasObjectNR and *frequencyInfoDL* in *ServingCellConfigCommon* of the serving cell: if *ssbFrequency* is configured, its value is the same as the *absoluteFrequencySSB* and if *csi-rs-ResourceConfigMobility* is configured, the value of its *subcarrierSpacing* is present in one entry of the *scs-SpecificCarrierList*, *csi-RS-CellListMobility* includes an entry corresponding to the serving cell (with *cellId* equal to *physCellId* in *ServingCellConfigCommon*) and the frequency range indicated by the *csi-rs-MeasurementBW* of the entry in *csi-RS-CellListMobility* is included in the frequency range indicated by in the entry of the *scs-SpecificCarrierList*. |
| ***supplementaryUplink***  Network may configure this field only when *supplementaryUplinkConfig* is configured in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*. |
| ***tag-Id***  Timing Advance Group ID, as specified in TS 38.321 [3], which this cell belongs to. |
| ***ul-toDL-COT-SharingED-Threshold***  Maximum energy detection threshold that the UE should use to share channel occupancy with gNB for DL transmission with length no longer than 2, 4, and 8 OFDM symbols for 15Khz, 30Khz, 60KHz SCS respectively, as specified in TS 37.213 [XX]. |
| ***uplinkConfig***  Network may configure this field only when *uplinkConfigCommon* is configured in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*. |

|  |
| --- |
| *UplinkConfig* field descriptions |
| ***carrierSwitching***  Includes parameters for configuration of carrier based SRS switching (see TS 38.214 [19], clause 6.2.1.3. |
| ***firstActiveUplinkBWP-Id***  If configured for an SpCell, this field contains the ID of the UL BWP to be activated upon performing the RRC (re-)configuration. If the field is absent, the RRC (re-)configuration does not impose a BWP switch.  If configured for an SCell, this field contains the ID of the uplink bandwidth part to be used upon MAC-activation of an SCell. The initial bandwidth part is referred to by BandiwdthPartId = 0. |
| ***initialUplinkBWP***  The dedicated (UE-specific) configuration for the initial uplink bandwidth-part (i.e. UL BWP#0). If any of the optional IEs are configured within this IE as part of the IE *uplinkConfig*, the UE considers the BWP#0 to be an RRC configured BWP (from UE capability viewpoint). Otherwise, the UE does not consider the BWP#0 as an RRC configured BWP (from UE capability viewpoint). Network always configures the UE with a value for this field if no other BWPs are configured. NOTE1 |
| ***powerBoostPi2BPSK***  If this field is set to *true*, the UE determines the maximum output power for PUCCH/PUSCH transmissions that use pi/2 BPSK modulation according to TS 38.101-1 [15], clause 6.2.4. |
| ***pusch-ServingCellConfig***  PUSCH related parameters that are not BWP-specific. |
| ***uplinkBWP-ToAddModList***  The additional bandwidth parts for uplink to be added or modified. In case of TDD uplink- and downlink BWP with the same *bandwidthPartId* are considered as a BWP pair and must have the same center frequency. |
| ***uplinkBWP-ToReleaseList***  The additional bandwidth parts for uplink to be released. |
| ***uplinkChannelBW-PerSCS-List***  A set of UE specific channel bandwidth and location configurations for different subcarrier spacings (numerologies). Defined in relation to Point A. The UE uses the configuration provided in this field only for the purpose of channel bandwidth and location determination. If absent, UE uses the configuration indicated in *scs-SpecificCarrierList* in *UplinkConfigCommon* / *UplinkConfigCommonSIB*. Network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 [15] and TS 38.101-2 [39]. |

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

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *MeasObject* | This field is mandatory present for the SpCell if the UE has a *measConfig*, and it is optionally present, Need M, for SCells. |
| *SCellOnly* | This field is optionally present, Need R, for SCells. It is absent otherwise. |
| *ServingCellWithoutPUCCH* | This field is optionally present, Need S, for SCells except PUCCH SCells. It is absent otherwise. |
| *SyncAndCellAdd* | This field is mandatory present for a SpCell upon PCell change and PSCell addition/change and upon *RRCSetup*/*RRCResume*.  The field is mandatory present for an SCell upon addition.  For SpCell, the field is optionally present, Need N, upon reconfiguration without *reconfigurationWithSync*.  In all other cases the field is absent. |
| *TDD* | This field is optionally present, Need R, for TDD cells. It is absent otherwise. |

#### – *ServingCellConfigCommon*

The IE *ServingCellConfigCommon* is used to configure cell specific parameters of a UE's serving cell. The IE contains parameters which a UE would typically acquire from SSB, MIB or SIBs when accessing the cell from IDLE. With this IE, the network provides this information in dedicated signalling when configuring a UE with a SCells or with an additional cell group (SCG). It also provides it for SpCells (MCG and SCG) upon reconfiguration with sync.

*ServingCellConfigCommon* information element

-- ASN1START

-- TAG-SERVINGCELLCONFIGCOMMON-START

ServingCellConfigCommon ::= SEQUENCE {

physCellId PhysCellId OPTIONAL, -- Cond HOAndServCellAdd,

downlinkConfigCommon DownlinkConfigCommon OPTIONAL, -- Cond HOAndServCellAdd

uplinkConfigCommon UplinkConfigCommon OPTIONAL, -- Need M

supplementaryUplinkConfig UplinkConfigCommon OPTIONAL, -- Need S

n-TimingAdvanceOffset ENUMERATED { n0, n25600, n39936 } OPTIONAL, -- Need S

ssb-PositionsInBurst CHOICE {

shortBitmap BIT STRING (SIZE (4)),

mediumBitmap BIT STRING (SIZE (8)),

longBitmap BIT STRING (SIZE (64))

} OPTIONAL, -- Cond AbsFreqSSB

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

dmrs-TypeA-Position ENUMERATED {pos2, pos3},

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

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

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

ssbSubcarrierSpacing SubcarrierSpacing OPTIONAL, -- Cond HOAndServCellWithSSB

tdd-UL-DL-ConfigurationCommon TDD-UL-DL-ConfigCommon OPTIONAL, -- Cond TDD

ss-PBCH-BlockPower INTEGER (-60..50),

...,

[[

channelAccessMode-r16 CHOICE {

dynamic NULL,

semistatic SemiStaticChannelAccessConfig

} OPTIONAL, -- Need M

discoveryBurst-WindowLength-r16 ENUMERATED {s0dot5, s1, s2, s3, s4, s5} OPTIONAL, -- Need M

ssb-PositionQCL-r16 SSB-PositionQCL-Relationship OPTIONAL, -- Need M

intraCellGuardBandUL-r16 IntraCellGuardBand-r16 OPTIONAL, -- Need M

intraCellGuardBandDL-r16 IntraCellGuardBand-r16 OPTIONAL -- Need M

]]

}

IntraCellGuardBand-r16 ::= SEQUENCE (SIZE (1..ffsValue)) OF GuardBand-r16 -- FFS upper size 4, assuming 100Mhz cell

GuardBand-r16 ::= SEQUENCE {

startCRB-r16 INTEGER (0..ffsValue), --FFS upper range 275

nrofCRBs-r16 INTEGER (1..ffsValue)

}

-- TAG-SERVINGCELLCONFIGCOMMON-STOP

-- ASN1STOP

|  |
| --- |
| *ServingCellConfigCommon* field descriptions |
| ***channelAccessMode***  If the field is configured as “semistatic”, the channel access procedures for semi-static channel occupancy as described in subclause 4.3 in TS 37.213 are applied. Otherwise, if the field is configured as “dynamic” or if the field is absent, the channel access procedures in TS 37.213, with exception of subclause 4.3 of TS 37.213, are applied. |
| ***dmrs-TypeA-Position***  Position of (first) DM-RS for downlink (see TS 38.211 [16], clause 7.4.1.1.1) and uplink (TS 38.211 [16], clause 6.4.1.1.3). |
| ***downlinkConfigCommon***  The common downlink configuration of the serving cell, including the frequency information configuration and the initial downlink BWP common configuration. The parameters provided herein should match the parameters configured by MIB and SIB1 (if provided) of the serving cell, with the exception of *controlResourceSetZero* and *searchSpaceZero* which can be configured in *ServingCellConfigCommon* even if MIB indicates that they are absent. |
| ***discoveryBurst-WindowLength***  Indicates the window length of the discovery burst in ms (see TS 37.213 [XX]). |
| ***intraCellGuardBandDL***  Each value is a CRB index. For every two values, the first/second is the lowest/highest CRB of a guard band between two RB sets. If not configured, the guard bands are according to the TS 38.101-X). |
| ***intraCellGuardBandUL***  Each value is a CRB index. For every two values, the first/second is the lowest/highest CRB of a guard band between two RB sets. If not configured, the guard bands are according to the TS 38.101-X). |
| ***longBitmap***  Bitmap when maximum number of SS/PBCH blocks per half frame equals to 64 as defined in TS 38.213 [13], clause 4.1. |
| ***lte-CRS-ToMatchAround***  Parameters to determine an LTE CRS pattern that the UE shall rate match around. |
| ***mediumBitmap***  Bitmap when maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [13], clause 4.1. |
| ***n-TimingAdvanceOffset***  The N\_TA-Offset to be applied for all uplink transmissions on this serving cell. If the field is absent, the UE applies the value defined for the duplex mode and frequency range of this serving cell. See TS 38.133 [14], table 7.1.2-2. |
| ***rateMatchPatternToAddModList***  Resources patterns which the UE should rate match PDSCH around. The UE rate matches around the union of all resources indicated in the rate match patterns. Rate match patterns defined here on cell level apply only to PDSCH of the same numerology (see TS 38.214 [19], clause 5.1.4,1). |
| ***semiStaticChannelAccessConfig***  The parameters for semi-static channel access. The network configures this only when *channelAccessMode* is set to *semistatic*. |
| ***shortBitmap***  Bitmap when maximum number of SS/PBCH blocks per half frame equals to 4 as defined in TS 38.213 [13], clause 4.1. |
| ***ss-PBCH-BlockPower***  Average EPRE of the resources elements that carry secondary synchronization signals in dBm that the NW used for SSB transmission, see TS 38.213 [13], clause 7. |
| ***ssb-periodicityServingCell***  The SSB periodicity in ms for the rate matching purpose. If the field is absent, the UE applies the value ms5. (see TS 38.213 [13], clause 4.1) |
| ***ssb-PositionQCL***  Indicates the QCL relationship between SSB positions for a neighbor cell as specified in TS 38.213 [13], clause 4.1. |
| ***ssb-PositionsInBurst***  Indicates the time domain positions of the transmitted SS-blocks in a half frame with SS/PBCH blocks as defined in TS 38.213 [13], clause 4.1. The first/ leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not transmitted while value 1 indicates that the corresponding SS/PBCH block is transmitted. The network configures the same pattern in this field as in the corresponding field in ServingCellConfigCommonSIB. For operation with shared spectrum channel access, only *mediumBitmap* is used. The UE assumes that a bit at position k > *ssb-PositionQCL* is 0. |
| ***ssbSubcarrierSpacing***  Subcarrier spacing of SSB. Only the values 15 kHz or 30 kHz (FR1), and 120 kHz or 240 kHz (FR2) are applicable. |
| ***supplementaryUplinkConfig***  The network configures this field only if *uplinkConfigCommon* is configured. If this field is absent, the UE shall release the *supplementaryUplinkConfig* and the *supplementaryUplink* configured in *ServingCellConfig* of this serving cell, if configured. |
| ***tdd-UL-DL-ConfigurationCommon***  A cell-specific TDD UL/DL configuration, see TS 38.213 [13], clause 11.1. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *AbsFreqSSB* | The field is absent when *absoluteFrequencySSB* in frequencyInfoDL is absent, otherwise the field is mandatory present. |
| *HOAndServCellAdd* | This field is mandatory present upon SpCell change and upon serving cell (PSCell/SCell) addition. Otherwise, the field is absent. |
| *HOAndServCellWithSSB* | This field is mandatory present upon SpCell change and upon serving cell (SCell with SSB or PSCell) addition. Otherwise, the field is absent. |
| *TDD* | The field is optionally present, Need R, for TDD cells; otherwise it is absent. |

Editor’s Note: Optimization of the signalling of intra-cell guard bands is FFS. The field descriptions will be updated after the signalling of guard bands is finalized.

#### – *ServingCellConfigCommonSIB*

The IE *ServingCellConfigCommonSIB* is used to configure cell specific parameters of a UE's serving cell in SIB1.

*ServingCellConfigCommonSIB* information element

-- ASN1START

-- TAG-SERVINGCELLCONFIGCOMMONSIB-START

ServingCellConfigCommonSIB ::= SEQUENCE {

downlinkConfigCommon DownlinkConfigCommonSIB,

uplinkConfigCommon UplinkConfigCommonSIB OPTIONAL, -- Need R

supplementaryUplink UplinkConfigCommonSIB OPTIONAL, -- Need R

n-TimingAdvanceOffset ENUMERATED { n0, n25600, n39936 } OPTIONAL, -- Need S

ssb-PositionsInBurst SEQUENCE {

inOneGroup BIT STRING (SIZE (8)),

groupPresence BIT STRING (SIZE (8)) OPTIONAL -- Cond FR2-Only

},

ssb-PeriodicityServingCell ENUMERATED {ms5, ms10, ms20, ms40, ms80, ms160},

tdd-UL-DL-ConfigurationCommon TDD-UL-DL-ConfigCommon OPTIONAL, -- Cond TDD

ss-PBCH-BlockPower INTEGER (-60..50),

...,

[[

channelAccessMode-r16 CHOICE {

dynamic NULL,

semistatic SemiStaticChannelAccessConfig

} OPTIONAL, -- Need M

discoveryBurstWindowLength-r16 ENUMERATED {s0dot5, s1, s2, s3, s4, s5} OPTIONAL -- Need M

]]

}

-- TAG-SERVINGCELLCONFIGCOMMONSIB-STOP

-- ASN1STOP

|  |
| --- |
| *ServingCellConfigCommonSIB* field descriptions |
| ***channelAccessMode***  If the field is configured as “semistatic”, the channel access procedures for semi-static channel occupancy as described in subclause 4.3 in TS 37.213 are applied. Otherwise, if the field is configured as “dynamic” or if the field is absent, the channel access procedures in TS 37.213, with exception of subclause 4.3 of TS 37.213, are applied. |
| ***discoveryBurstWindowLength***  Indicates the window length of the discovery burst in ms (see TS 37.213 [XX]). |
| ***groupPresence***  This field is present when maximum number of SS/PBCH blocks per half frame equals to 64 as defined in TS 38.213 [13], clause 4.1. The first/leftmost bit corresponds to the SS/PBCH index 0-7, the second bit corresponds to SS/PBCH block 8-15, and so on. Value 0 in the bitmap indicates that the SSBs according to *inOneGroup* are absent. Value 1 indicates that the SS/PBCH blocks are transmitted in accordance with *inOneGroup*. |
| ***inOneGroup***  When maximum number of SS/PBCH blocks per half frame equals to 4 as defined in TS 38.213 [13], clause 4.1, only the 4 leftmost bits are valid; the UE ignores the 4 rightmost bits. When maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [13], clause 4.1, all 8 bits are valid. The first/ leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. When maximum number of SS/PBCH blocks per half frame equals to 64 as defined in TS 38.213 [13], clause 4.1, all 8 bit are valid; The first/ leftmost bit corresponds to the first SS/PBCH block index in the group (i.e., to SSB index 0, 8, and so on); the second bit corresponds to the second SS/PBCH block index in the group (i.e., to SSB index 1, 9, and so on), and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not transmitted while value 1 indicates that the corresponding SS/PBCH block is transmitted. |
| ***n-TimingAdvanceOffset***  The N\_TA-Offset to be applied for random access on this serving cell. If the field is absent, the UE applies the value defined for the duplex mode and frequency range of this serving cell. See TS 38.133 [14], table 7.1.2-2. |
| ***semiStaticChannelAccessConfig***  The parameters for semi-static channel access. The network configures this only when *channelAccessMode* is set to *semistatic*. |
| ***ssb-PositionsInBurst***  Time domain positions of the transmitted SS-blocks in an SS-burst as defined in TS 38.213 [13], clause 4.1. For operation with shared spectrum channel access, only *mediumBitmap* is used. The UE assumes that a bit at position k > *ssb-PositionQCL* is 0. |
| ***ss-PBCH-BlockPower***  Average EPRE of the resources elements that carry secondary synchronization signals in dBm that the NW used for SSB transmission, see TS 38.213 [13], clause 7. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *FR2-Only* | This field is mandatory present for an FR2 carrier frequency. It is absent otherwise and UE releases any configured value. |
| *TDD* | The field is optionally present, Need R, for TDD cells; otherwise it is absent. |

>>Skipped unchanged parts

#### – *SlotFormatCombinationsPerCell*

The IE *SlotFormatCombinationsPerCell* is used to configure the SlotFormatCombinations applicable for one serving cell (see TS 38.213 [13], clause 11.1.1).

*SlotFormatCombinationsPerCell* information element

-- ASN1START

-- TAG-SLOTFORMATCOMBINATIONSPERCELL-START

SlotFormatCombinationsPerCell ::= SEQUENCE {

servingCellId ServCellIndex,

subcarrierSpacing SubcarrierSpacing,

subcarrierSpacing2 SubcarrierSpacing OPTIONAL, -- Need R

slotFormatCombinations SEQUENCE (SIZE (1..maxNrofSlotFormatCombinationsPerSet)) OF SlotFormatCombination

OPTIONAL, -- Need M

positionInDCI INTEGER(0..maxSFI-DCI-PayloadSize-1) OPTIONAL, -- Need M

...,

[[

enableConfiguredUL-r16 ENUMERATED {enabled} OPTIONAL -- Need N

]]

}

SlotFormatCombination ::= SEQUENCE {

slotFormatCombinationId SlotFormatCombinationId,

slotFormats SEQUENCE (SIZE (1..maxNrofSlotFormatsPerCombination)) OF INTEGER (0..255)

}

SlotFormatCombinationId ::= INTEGER (0..maxNrofSlotFormatCombinationsPerSet-1)

-- TAG-SLOTFORMATCOMBINATIONSPERCELL-STOP

-- ASN1STOP

|  |
| --- |
| *SlotFormatCombination* field descriptions |
| ***slotFormatCombinationId***  This ID is used in the DCI payload to dynamically select this *SlotFormatCombination*, see TS 38.213 [13], clause 11.1.1. |
| ***slotFormats***  Slot formats that occur in consecutive slots in time domain order as listed here (see TS 38.213 [13], clause 11.1.1). |

|  |
| --- |
| *SlotFormatCombinationsPerCell* field descriptions |
| ***positionInDCI***  The (starting) position (bit) of the slotFormatCombinationId (SFI-Index) for this serving cell (servingCellId) within the DCI payload (see TS 38.213 [13], clause 11.1.1). |
| ***servingCellId***  The ID of the serving cell for which the slotFormatCombinations are applicable. |
| ***slotFormatCombinations***  A list with *SlotFormatCombinations*. Each *SlotFormatCombination* comprises of one or more *SlotFormats* (see TS 38.211 [16], clause 4.3.2). The total number of *slotFormats* in the *slotFormatCombinations* list does not exceed 512. |
| ***subcarrierSpacing2***  Reference subcarrier spacing for a Slot Format Combination on an FDD or SUL cell (see TS 38.213 [13], clause 11.1.1). For FDD, subcarrierSpacing (SFI-scs) is the reference SCS for DL BWP and subcarrierSpacing2 (SFI-scs2) is the reference SCS for UL BWP. For SUL, *subcarrierSpacing* (SFI-scs) is the reference SCS for non-SUL carrier and *subcarrierSpacing2* (SFI-scs2) is the reference SCS for SUL carrier. The network configures a value that is smaller than or equal to any SCS of configured BWPs of the serving cell that the command applies to. And the network configures a value that is smaller than or equal to the SCS of the serving cell which the UE monitors for SFI indications. |
| ***subcarrierSpacing***  Reference subcarrier spacing for this Slot Format Combination. The network configures a value that is smaller than or equal to any SCS of configured BWPs of the serving cell that the command applies to. And the network configures a value that is smaller than or equal to the SCS of the serving cell which the UE monitors for SFI indications (see TS 38.213 [13], clause 11.1.1). |

#### – *SlotFormatIndicator*

The IE *SlotFormatIndicator* is used to configure monitoring a Group-Common-PDCCH for Slot-Format-Indicators (SFI).

*SlotFormatIndicator* information element

-- ASN1START

-- TAG-SLOTFORMATINDICATOR-START

SlotFormatIndicator ::= SEQUENCE {

sfi-RNTI RNTI-Value,

dci-PayloadSize INTEGER (1..maxSFI-DCI-PayloadSize),

slotFormatCombToAddModList SEQUENCE (SIZE(1..maxNrofAggregatedCellsPerCellGroup)) OF SlotFormatCombinationsPerCell

OPTIONAL, -- Need N

slotFormatCombToReleaseList SEQUENCE (SIZE(1..maxNrofAggregatedCellsPerCellGroup)) OF ServCellIndex OPTIONAL, -- Need N

...,

[[

availableRB-SetToAddModList-r16 SEQUENCE (SIZE(1..maxNrofAggregatedCellsPerCellGroup)) OF AvailableRB-SetPerCell-r16 OPTIONAL, -- Need N

availableRB-SetToRelease-r16 SEQUENCE (SIZE(1..maxNrofAggregatedCellsPerCellGroup)) OF ServCellIndex OPTIONAL, -- Need N

searchSpaceSwitchTrigger-r16 SEQUENCE {

positionInDCI INTEGER(0..maxSFI-DCI-PayloadSize-1),

id CHOICE {

servingCellId ServCellIndex,

groupId INTEGER (0..1)

}

} OPTIONAL, -- Need N

co-DurationPerCell-r16 CO-DurationPerCell-r16 OPTIONAL -- Need N

]]

}

CO-DurationPerCell-r16 ::= SEQUENCE {

servingCellId ServCellIndex,

positionInDCI INTEGER(0..maxSFI-DCI-PayloadSize-1) OPTIONAL, -- Need M

subcarrierSpacing SubcarrierSpacing,

co-DurationList-r16 SEQUENCE (SIZE(1..ffsValue)) OF CO-Duration-r16 -- FFS size upper limit 64

}

CO-Duration-r16 ::= INTEGER (0..ffsValue) -- FFS upper limit 560

-- TAG-SLOTFORMATINDICATOR-STOP

-- ASN1STOP

|  |
| --- |
| *SlotFormatIndicator* field descriptions |
| ***availableRB-SetPerCell***  position in DCI of the bit(s) indicating the availability of RB sets for UE’s serving cells (see TS 38.213 [13], clause 11.1.1). |
| ***co-DurationPerCell***  Position in DCI of the bit field indicating Channal Occupancy duration for UE’s serving cells (see TS 38.213 [13], clause 11.1.1). If not configured, the UE uses SFI indication to determine the channel occupancy duration (if SFI is available). |
| ***dci-PayloadSize***  Total length of the DCI payload scrambled with SFI-RNTI (see TS 38.213 [13], clause 11.1.1). |
| ***searchSpaceSwitchTrigger***  If configured, provides position in DCI of the bit field indicating search space switching flag for a group of serving cells in *searchSpaceSwitchingGroup-r16* (see TS 38.213 [13], clause 11.5.2). |
| ***sfi-RNTI***  RNTI used for SFI on the given cell (see TS 38.213 [13], clause 11.1.1). |
| ***slotFormatCombToAddModList***  A list of SlotFormatCombinations for the UE's serving cells (see TS 38.213 [13], clause 11.1.1). |

>>Skipped unchanged parts

#### – *SRS-Config*

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

*SRS-Config* information element

-- ASN1START

-- TAG-SRS-CONFIG-START

SRS-Config ::= SEQUENCE {

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

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

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

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

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

...

}

SRS-ResourceSet ::= SEQUENCE {

srs-ResourceSetId SRS-ResourceSetId,

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

resourceType CHOICE {

aperiodic SEQUENCE {

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

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

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

...,

[[

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

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

]]

},

semi-persistent SEQUENCE {

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

...

},

periodic SEQUENCE {

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

...

}

},

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

alpha Alpha OPTIONAL, -- Need S

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

pathlossReferenceRS CHOICE {

ssb-Index SSB-Index,

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

} OPTIONAL, -- Need M

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

...

}

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

SRS-Resource ::= SEQUENCE {

srs-ResourceId SRS-ResourceId,

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

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

transmissionComb CHOICE {

n2 SEQUENCE {

combOffset-n2 INTEGER (0..1),

cyclicShift-n2 INTEGER (0..7)

},

n4 SEQUENCE {

combOffset-n4 INTEGER (0..3),

cyclicShift-n4 INTEGER (0..11)

}

},

resourceMapping SEQUENCE {

startPosition INTEGER (0..5),

nrofSymbols ENUMERATED {n1, n2, n4},

repetitionFactor ENUMERATED {n1, n2, n4}

},

freqDomainPosition INTEGER (0..67),

freqDomainShift INTEGER (0..268),

freqHopping SEQUENCE {

c-SRS INTEGER (0..63),

b-SRS INTEGER (0..3),

b-hop INTEGER (0..3)

},

groupOrSequenceHopping ENUMERATED { neither, groupHopping, sequenceHopping },

resourceType CHOICE {

aperiodic SEQUENCE {

...

},

semi-persistent SEQUENCE {

periodicityAndOffset-sp SRS-PeriodicityAndOffset,

...

},

periodic SEQUENCE {

periodicityAndOffset-p SRS-PeriodicityAndOffset,

...

}

},

sequenceId INTEGER (0..1023),

spatialRelationInfo SRS-SpatialRelationInfo OPTIONAL, -- Need R

...,

[[

resourceMapping-r16 SEQUENCE {

startPosition-r16 INTEGER (0..13),

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

repetitionFactor-r16 ENUMERATED {n1, n2, n4}

} OPTIONAL -- Need R

]]

}

SRS-SpatialRelationInfo ::= SEQUENCE {

servingCellId ServCellIndex OPTIONAL, -- Need S

referenceSignal CHOICE {

ssb-Index SSB-Index,

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

srs SEQUENCE {

resourceId SRS-ResourceId,

uplinkBWP BWP-Id

}

}

}

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

SRS-PeriodicityAndOffset ::= CHOICE {

sl1 NULL,

sl2 INTEGER(0..1),

sl4 INTEGER(0..3),

sl5 INTEGER(0..4),

sl8 INTEGER(0..7),

sl10 INTEGER(0..9),

sl16 INTEGER(0..15),

sl20 INTEGER(0..19),

sl32 INTEGER(0..31),

sl40 INTEGER(0..39),

sl64 INTEGER(0..63),

sl80 INTEGER(0..79),

sl160 INTEGER(0..159),

sl320 INTEGER(0..319),

sl640 INTEGER(0..639),

sl1280 INTEGER(0..1279),

sl2560 INTEGER(0..2559)

}

-- TAG-SRS-CONFIG-STOP

-- ASN1STOP

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

|  |
| --- |
| *SRS-Resource* field descriptions |
| ***cyclicShift-n2***  Cyclic shift configuration (see TS 38.214 [19], clause 6.2.1). |
| ***cyclicShift-n4***  Cyclic shift configuration (see TS 38.214 [19], clause 6.2.1). |
| ***freqHopping***  Includes parameters capturing SRS frequency hopping (see TS 38.214 [19], clause 6.2.1). |
| ***groupOrSequenceHopping***  Parameter(s) for configuring group or sequence hopping (see TS 38.211 [16], clause 6.4.1.4.2). |
| ***periodicityAndOffset-p***  Periodicity and slot offset for this SRS resource. All values are in "number of slots". Value *sl1* corresponds to a periodicity of 1 slot, value *sl2* corresponds to a periodicity of 2 slots, and so on. For each periodicity the corresponding offset is given in number of slots. For periodicity *sl1* the offset is 0 slots (see TS 38.214 [19], clause 6.2.1). |
| ***periodicityAndOffset-sp***  Periodicity and slot offset for this SRS resource. All values are in "number of slots". Value *sl1* corresponds to a periodicity of 1 slot, value *sl2* corresponds to a periodicity of 2 slots, and so on. For each periodicity the corresponding offset is given in number of slots. For periodicity *sl1* the offset is 0 slots (see TS 38.214 [19], clause 6.2.1). |
| ***ptrs-PortIndex***  The PTRS port index for this SRS resource for non-codebook based UL MIMO. This is only applicable when the corresponding *PTRS-UplinkConfig* is set to CP-OFDM. The *ptrs-PortIndex* configured here must be smaller than the *maxNrofPorts* configured in the *PTRS-UplinkConfig* (see TS 38.214 [19], clause 6.2.3.1). |
| ***resourceMapping***  OFDM symbol location of the SRS resource within a slot including *nrofSymbols* (number of OFDM symbols), *startPosition* (value 0 refers to the last symbol, value 1 refers to the second last symbol, and so on) and *repetitionFactor* (see TS 38.214 [19], clause 6.2.1 and TS 38.211 [16], clause 6.4.1.4). The configured SRS resource does not exceed the slot boundary. If *resourceMapping-r16* is signalled, UE shall ignore the *resourceMapping* (without suffix). |
| ***resourceType***  Periodicity and offset for semi-persistent and periodic SRS resource (see TS 38.214 [19], clause 6.2.1). |
| ***sequenceId***  Sequence ID used to initialize pseudo random group and sequence hopping (see TS 38.214 [19], clause 6.2.1). |
| ***spatialRelationInfo***  Configuration of the spatial relation between a reference RS and the target SRS. Reference RS can be SSB/CSI-RS/SRS (see TS 38.214 [19], clause 6.2.1). |
| ***transmissionComb***  Comb value (2 or 4) and comb offset (0..combValue-1) (see TS 38.214 [19], clause 6.2.1). |

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

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *Setup* | This field is mandatory present upon configuration of *SRS-ResourceSet* or *SRS-Resource* and optionally present, Need M, otherwise. |
| *NonCodebook* | This field is optionally present, Need M, in case of non-codebook based transmission, otherwise the field is absent. |

>>Skipped unchanged parts

#### – *SSB-PositionQCL-Relationship*

The IE *SSB-PositionQCL-Relationship* is used to indicate the QCL relationship between SSB positions on the frequency indicated by *ssbFrequency* (see TS 38.213 [13], clause 4.1). Value n1 corresponds to 1, value n2 corresponds to 2 and so on.

-- ASN1START

-- TAG-SSB-POSITIONQCL-RELATIONSHIP-START

SSB-PositionQCL-Relationship-r16 ::= ENUMERATED {n1,n2,n4,n8}

-- TAG-SSB-POSITIONQCL-RELATIONSHIP-STOP

-- ASN1STOP

*Next Change*

### 6.3.3 UE capability information elements

#### – *UE-NR-Capability*

The IE *UE-NR-Capability* is used to convey the NR UE Radio Access Capability Parameters, see TS 38.306 [26].

*UE-NR-Capability* information element

-- ASN1START

-- TAG-UE-NR-CAPABILITY-START

UE-NR-Capability ::= SEQUENCE {

accessStratumRelease AccessStratumRelease,

pdcp-Parameters PDCP-Parameters,

rlc-Parameters RLC-Parameters OPTIONAL,

mac-Parameters MAC-Parameters OPTIONAL,

phy-Parameters Phy-Parameters,

rf-Parameters RF-Parameters,

measAndMobParameters MeasAndMobParameters OPTIONAL,

fdd-Add-UE-NR-Capabilities UE-NR-CapabilityAddXDD-Mode OPTIONAL,

tdd-Add-UE-NR-Capabilities UE-NR-CapabilityAddXDD-Mode OPTIONAL,

fr1-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

fr2-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

featureSets FeatureSets OPTIONAL,

featureSetCombinations SEQUENCE (SIZE (1..maxFeatureSetCombinations)) OF FeatureSetCombination OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1530 OPTIONAL

}

UE-NR-Capability-v1530 ::= SEQUENCE {

fdd-Add-UE-NR-Capabilities-v1530 UE-NR-CapabilityAddXDD-Mode-v1530 OPTIONAL,

tdd-Add-UE-NR-Capabilities-v1530 UE-NR-CapabilityAddXDD-Mode-v1530 OPTIONAL,

dummy ENUMERATED {supported} OPTIONAL,

interRAT-Parameters InterRAT-Parameters OPTIONAL,

inactiveState ENUMERATED {supported} OPTIONAL,

delayBudgetReporting ENUMERATED {supported} OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1540 OPTIONAL

}

UE-NR-Capability-v1540 ::= SEQUENCE {

sdap-Parameters SDAP-Parameters OPTIONAL,

overheatingInd ENUMERATED {supported} OPTIONAL,

ims-Parameters IMS-Parameters OPTIONAL,

fr1-Add-UE-NR-Capabilities-v1540 UE-NR-CapabilityAddFRX-Mode-v1540 OPTIONAL,

fr2-Add-UE-NR-Capabilities-v1540 UE-NR-CapabilityAddFRX-Mode-v1540 OPTIONAL,

fr1-fr2-Add-UE-NR-Capabilities UE-NR-CapabilityAddFRX-Mode OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1550 OPTIONAL

}

UE-NR-Capability-v1550 ::= SEQUENCE {

reducedCP-Latency ENUMERATED {supported} OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1560 OPTIONAL

}

UE-NR-Capability-v1560 ::= SEQUENCE {

nrdc-Parameters NRDC-Parameters OPTIONAL,

receivedFilters OCTET STRING (CONTAINING UECapabilityEnquiry-v1560-IEs) OPTIONAL,

nonCriticalExtension UE-NR-Capability-v1570 OPTIONAL

}

UE-NR-Capability-v1570 ::= SEQUENCE {

nrdc-Parameters-v1570 NRDC-Parameters-v1570 OPTIONAL,

nonCriticalExtension UE-NR-Capability-v16xy OPTIONAL

}

UE-NR-Capability-v16xy ::= SEQUENCE {

nru-Parameters-r16 NRU-Parameters-r16 OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

UE-NR-CapabilityAddXDD-Mode ::= SEQUENCE {

phy-ParametersXDD-Diff Phy-ParametersXDD-Diff OPTIONAL,

mac-ParametersXDD-Diff MAC-ParametersXDD-Diff OPTIONAL,

measAndMobParametersXDD-Diff MeasAndMobParametersXDD-Diff OPTIONAL

}

UE-NR-CapabilityAddXDD-Mode-v1530 ::= SEQUENCE {

eutra-ParametersXDD-Diff EUTRA-ParametersXDD-Diff

}

UE-NR-CapabilityAddFRX-Mode ::= SEQUENCE {

phy-ParametersFRX-Diff Phy-ParametersFRX-Diff OPTIONAL,

measAndMobParametersFRX-Diff MeasAndMobParametersFRX-Diff OPTIONAL

}

UE-NR-CapabilityAddFRX-Mode-v1540 ::= SEQUENCE {

ims-ParametersFRX-Diff IMS-ParametersFRX-Diff OPTIONAL

}

NRU-Parameters-r16 ::= SEQUENCE {

rssi-CO-Measurements-r16 ENUMERATED {supported} OPTIONAL

}

-- TAG-UE-NR-CAPABILITY-STOP

-- ASN1STOP

|  |
| --- |
| *UE-NR-Capability* field descriptions |
| ***featureSetCombinations***  A list of *FeatureSetCombination:s* for *supportedBandCombinationList* in *UE-NR-Capability*. The *FeatureSetDownlink:s* and *FeatureSetUplink:s* referred to from these *FeatureSetCombination:s* are defined in the *featureSets* list in *UE-NR-Capability*. |
| ***rssi-CO-Measurements***  Indicates whether the UE supports performing RSSI and Channel Occupancy (CO) measurements for operation with shared spectrum channel access. |

## Editor’s Note: The structure for NR-U capabilities, e.g. whether they should all be in physical parameters, will be revisited after PHY related parameters and the applicability of NR-U features to licensed are decided

*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

maxCellWhite INTEGER ::= 16 -- Maximum number of NR whitelisted cell ranges in SIB3, SIB4

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

maxNrofSearchSpaceGroup-1 INTEGER ::= 1 -- Maximum number of Search Space Groups 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

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

-- ASN1STOP

*Next Change*

## 6.5 Short Message

Short Messages can be transmitted on PDCCH using P-RNTI with or without associated *Paging* message using Short Message field in DCI format 1\_0 (see TS 38.212 [17], clause 7.3.1.2.1).

Table 6.5-1 defines Short Messages. Bit 1 is the most significant bit.

Table 6.5-1: Short Messages

|  |  |
| --- | --- |
| Bit | Short Message |
| 1 | ***systemInfoModification***  If set to 1: indication of a BCCH modification other than SIB6, SIB7 and SIB8. |
| 2 | ***etwsAndCmasIndication***  If set to 1: indication of an ETWS primary notification and/or an ETWS secondary notification and/or a CMAS notification. |
| 3 | ***stopPagingMonitoring***  If set to 1: stop monitoring PDCCH occasions(s) for paging in this PO. |
| 4 – 8 | Not used in this release of the specification, and shall be ignored by UE if received. |

*End of changes*