**3GPP TSG-RAN WG2 Meeting#110-e R2-200xxxx**

**Electronic, 1 - 12 June 2020**

**Agenda Item:**  **6.0.3**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT110-e][065][NR16] NR ASN1 1 (Huawei)**

**Document for:** **Discussion and Decision**

1 Introduction

This document is the summary of the following discussion:

* [AT110-e][065][NR16] NR ASN1 1 (Huawei)

Scope: R2-2005260 [38.331][H232] Extension to the contents of items of a list using ToAddMostList in absence of extension markers, R2-2004709 Extension of SearchSpace IE [Z106][I657][I658][I659], [H232][I657][658][I659] SearchSpace: contents, no markers, [I648] resourceToAddModList PUCCH-Resource: contents, no markers, [I656] ControlResourceSet : contents and size, markers, [I649][E266] spatialRelationInfo, PUCCH-SpatialRelationInfo vs PUCCH-SpatialRelationInfoList, [E132] pathlossReferenceRSToAddModList in PUSCH-PowerControl-v16xy, R2-2005626 [H241] Correction to PDCCH configuration Huawei, HiSilicon, R2-2005627 [H242] Correction to DCI formats in SearchSpace Huawei, HiSilicon

Deadline: Wed June 10 0500 UTC

This discussion includes the following:

[R2-2005260](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_110-e\Docs\R2-2005260.zip) [38.331][H232] Extension to the contents of items of a list using ToAddMostList in absence of extension markers Huawei, HiSilicon discussion Rel-16 NR\_eMIMO-Core Late

DISCUSSION

- MTK think the search space is exceptional as we can configure both legacy and R16 lists which should not be broken. There are also other papers on this

- Huawei: Search space is used also not in addmodlist, and extended differently depending on how it is used.

- Nokia assumes that when we do critical extension, we only further maintain the last ext. Nokia think critical extensions increases the risk for full config

- Intel think critical extensions brings more work and think it should ony be used when non-critial extensions are not possible. Samsung agrees and think it should be possible here. Vivo agrees.

- Huawei think it is possible to do a TP with non-critical extension. Think it may be difficult when size and contens is changed.

- Ericsson agress and think critical extensions can be considered when Field descriptions get too complex.

- Huawei wonder if this should apply also to cases when List size changes I.e. when ID range changes.

- Nokia think in legacy we had rules that the old was used when the old range was applicable and the new one used when new range need to be used. Chair think then we need to maintain both, Samsung confirm this was default approach in LTE and we then need to maintain both.

- Huawei think that a difference is that in NR we used the (addmod) list a lot more.

- Huawei think there are at least two lists for which we increase the size in R16.

- Ericsson comments that this list extension is mainly in current spec for SI, have instead used so far the “…” a lot more in NR than in LTE. Intel agrees and think NR is not very efficient.

**Assumption: In general try to avoid critical ext = non-use/replacement of old IEs (as before)**

**Assumption: For list size changes, assume same approach as in LTE (new parallel list, use the new list only for the new indexes in the extended list).**

- Huawei will provide a TP and discuss on [065]

[R2-2005626](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_110-e\Docs\R2-2005626.zip) [H241] Correction to PDCCH configuration Huawei, HiSilicon draftCR Rel-16 38.331 16.0.0 F NR\_IAB-Core, NR\_UE\_pow\_sav-Core Late

- Nokia think we don’t need to optimize so strongly for size

- The intention is to save corset ID and optionality bits.

- Ericsson wonder if we need these extensions to be available in SI.

- Huawei explains that we need to support more DCI formats.

- Vivo think the specifc optimization is not needed. We should wait for R1. Huawei think it ir celar that at least updated 2-5 is required.

- Nokia think the extension without using ID may have the oppsite effect than desired.

- Vivo think we can go with Option 2

- MTK think we should keep a common way to extend, leaning towards option 1

- Intel think majority want to go with option 1. Samsung agrees, the reuse is more and there is no real problem with it. Nokia agrees as well.

**Go with Option 1**

[R2-2004709](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_110-e\Docs\R2-2004709.zip) Extension of SearchSpace IE [Z106][I657][I658][I659] MediaTek Inc. discussion Rel-16

[R2-2005627](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_110-e\Docs\R2-2005627.zip) [H242] Correction to DCI formats in SearchSpace Huawei, HiSilicon draftCR Rel-16 38.331 16.0.0 F NR\_IAB-Core, 5G\_V2X\_NRSL-Core Late

# 2 Discussion

## 2.1 Search spaces

In order to take into account the discussion of R2-2005260 and R2-2005626, the following changes are proposed.

- *SearchSpace* IE

- Remame of *SearchSpace-v16xy* to *SearchSpaceExt-v16xy*

- Remove *searchSpaceId* from *SearchSpaceExt-v16xy* (duplicate with the same field in *SearchSpace*)

- Update the presence condition of *controlResourceSetId-r16*, to capute that is absent in commonSearchSpace (which is added as indicated bellow acc

- *PDCCH-ConfigCommon* IE

- Addition of *commonSearhSpaceListExt-v16xy*, update of the fied description of *commonSearchSpace*

- *PDCCH-Config* IE

- Renaming of *searchSpacesToAddModList-r16* to *searchSpacesToAddModListExt-v16xy*

- Update the field description of *searchSpacesToAddModList*

**Q1: Companies are invited to comment on the text proposal according to the above**

|  |  |
| --- | --- |
| Company | Comments |
| MediaTek | We understand the intention is to:   1. have parallel lists instead of associating them by ID, i.e. when searchSpacesToAddModListExt-v16xy is provided, every search space to be added/modified must appear in both searchSpacesToAddModList (even if it has no associated Rel-15 DCI format) and searchSpacesToAddModListExt-v16xy (even if it has no associated Rel-16 DCI format); 2. keep the Setup2 condition, i.e. not address issue I659; 3. make the parallel changes to PDCCH-ConfigCommon.   The parallel list structure is OK, but we think issue I659 was correct and something should be done to make the wording of the condition applicable to the IE it actually appears in. We think the changes made to the conditions in R2-2004709 are still valid in principle, with the addition of the field names for PDCCH-ConfigCommon and an adjustment of wording to describe the parallel list structure, e.g.:   * Change the condition on *searchSpaceType-r16* to “Setup3” * Setup2: This field is mandatory present when a new search space is set up, if the corresponding entry of *searchSpacesToAddModListExt-r16* or *commonSearchSpaceListExt-v16xy* of the parent IE does not have the field *searchSpaceType-r16* included. Otherwise it is optionally present, Need M. * Setup3: This field is mandatory present when a new search space is set up, if the corresponding entry of *searchSpacesToAddModList* (without suffix) or *commonSearchSpaceList* (without suffix) of the parent IE does not have the field *searchSpaceType* (without suffix) included. Otherwise it is optionally present, need M.   There is also a typo in the new field name commonSearchSpaceListExt-v16xy.  [Huawei] Agree with the problem, but this TP is not addressing simultaneous configuration of both fields. Please see a revision trying to address both aspects in the field description (seems more compact and more readable). |
| Ericson | First we would like to share some general views on extending “toAddMod lists”, different cases and how to solve them, after having again considered the options we have.  Case A: The max size of the list is increased, but no new fields are added to the list items   * Introduce a new toAddModList-r16, with new max list size   Case B: The max size of the list remains, but new fields are added to the list items   * Use EAG of the list item, if exists. Otherwise introduce parallel list with the new list item fields   Case C: The max size of the list increases and new fields are added to the list items   * Use EAG, if exists, otherwise introduce rel-16 version of the list item to replace the legacy list item. introduce new toAddModList-r16, with new max list size. * Using non-critical extension and “parallel list” introduces odd and complex description to concatenate 2 toAddMod lists (UE can be assumed to have internal representation that is not a concatenation of toAddModList), and yet a 3rd “parallel list”.   [Huawei] As you observed, in this TP, in case C without extension markers (e.g. list of spatialRelationInfo in PUCCH-Config), the UE can receive:  - the legacy ToAddModList with entries of the legacy item  - a ToAddModList2 with additional entries of the legacy item  - a ToAddModListExt with fields to be added to each of the entries of the two previous lists  Supposing there is another size extension, there will be:  - a ToAddModList3, with yet additional entries for the legacy item  - a ToAddModListExt3, with fields to be added to each of the entries in ToAddModList3  If UEs take entries one by one, the "concatenation" just means processing one list after the other, so no additional complexity. Of course, this could be pointed out to UE vendors.  That said, we are ok with any solution provided the expected UE behaviour is clearly described and extensions are done in the same way in the same situation.  If we replace the ToAddModList when the list size changes (your proposal), we would sugest doing the same when the list size is not changed (like in R2-2005262), so that there is a single way to extend all ToAddModLists.  The SearchSpace IE is of case B, and extension markers are missing in SearchSpace, so we are fine to introduce a “parallel list” with non-critical extension *SearchSpaceExt-v16xy.*  We tend to agree with Mediatek on the conditions Setup2/Setup3. |
| ZTE | 1. We are fine to have the parallel list structure. 2. The field description of controlResourceSetId under SearchSpace should be updated to cover the enlarged value range.   *controlResourceSetId*  *The CORESET applicable for this SearchSpace. Value 0 identifies the common CORESET#0 configured in MIB and in ServingCellConfigCommon. Values 1..maxNrofControlResourceSets-1-r16 identify CORESETs configured in System Information or by dedicated signalling. The CORESETs with non-zero controlResourceSetId are configured in the same BWP as this SearchSpace. If the field controlResourceSetId-r16 is present, UE shall ignore the controlResourceSetId (without suffix ).*   1. The field name should be updated as follows:   - *SearchSpace* IE  - Remame of *SearchSpace-v16xy* to *SearchSpaceExt-r16*  - Remove *searchSpaceId* from *SearchSpaceExt-r16* (duplicate with the same field in *SearchSpace*)  - Update the presence condition of *controlResourceSetId-r16*, to capute that is absent in commonSearchSpace (which is added as indicated bellow acc  - *PDCCH-ConfigCommon* IE  - Addition of *commonSearhSpaceListExt-r16*, update of the fied description of *commonSearchSpace*  - *PDCCH-Config* IE  - Renaming of *searchSpacesToAddModList-r16* to *searchSpacesToAddModListExt-r16*  - Update the field description of *searchSpacesToAddModList*  [Ok] |
| Intel | We discuss case C in Ericsson scenarios later.  For this list (case B), parallel list is OK.  Agree with MediaTeck comments on Setup2 and Setup3. |

On the contents of *SearchSpaceExt-v16xy*, R2-2005627 is observing that for UE specific search spaces, there is a single field *dci-Formats* in *SearchSpace* (legacy structure), but there are 3 different extensions for the same field.

ue-Specific SEQUENCE {

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

...,

[[

dci-FormatsSL-r16 ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1, formats3-0, formats3-1, formats3-0-And-3-1} OPTIONAL, -- Need R

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

OPTIONAL, -- Need R

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

]]

}

These 3 extensions are for new DCI formats from 3 different WIs, 3\_0 and 3\_1 for V2X, 0\_2 and 1\_2 for URLLC, 2\_5 for IAB. Some fields are repeating the values of the legacy field (dci-FormatsSL-r16

According to R2-2005627, new DCI formats introduced in different WIs will not be configured in the same search space, i.e. at most one of the three fields dci-FormatsSL-r16, dciFormatsExt-r16 and dci-Formats-MT-r16 can be configured in the same search space.

**Q2: Do companies agree that out of the 3 fields dci-FormatsSL-r16, dciFormatsExt-r16 and dci-Formats-MT-r16, at most one can be configured in the same search space?**

|  |  |  |
| --- | --- | --- |
| Company | Agree (Yes/No) | Comments |
| MediaTek | Yes |  |
| Ericsson | Yes | At least in this release. |
| ZTE | - | Should be discussed and decided in RAN1.  Although we have the following description in 38.213 which seems to show that among all the newly introduced formats0-2-And-1-2, formats0-1-And-1-1And-0-2-And-1-2, formats3-0, formats3-1, formats3-0-And-3-1, at most one can be configured in the same search space.  - if search space set  is a USS set, an indication by *dci-Formats* to monitor PDCCH candidates either for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or an indication by *dci-Formats-Rel16* to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 0\_2 and DCI format 1\_2, or, if a UE indicates a corresponding capability, for DCI format 0\_1, DCI format 1\_1, DCI format 0\_2, and DCI format 1\_2, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1  But it is not clear whether RAN1 had discussion on it and wrote those sentence to emphasize this. |

According to R2-2005627, format2-5 can be configured together with the legacy DCI formats (i.e. formats0-0-And-1-0 or formats0-1-And-1-1) in the same search space.

**Q3: Do companies agree that format2-5 can be configured together with the legacy DCI formats (i.e. formats0-0-And-1-0 or formats0-1-And-1-1) in the same search space?**

|  |  |  |
| --- | --- | --- |
| Company | Agree (Yes/No) | Comments |
| Ericsson | Yes | We assume that Q3 is related to MT-specific searchspace, not common searchspace (for which we disagree). Also, there is no RAN1 related agreement on this issue, however, if it is technically possible to configure both MT-specific searchspace and UE-specific searchspace in the same search space then we agree. |
| ZTE | - | Should be discussed and decided in RAN1. |

R2-2005627 proposes to replace the 3 dci-FormatsSL-r16, dciFormatsExt-r16 and dci-Formats-MT-r16 with a single field, dci-Formats-r16 and when dci-Formats-r16 is configured, the UE ignores dci-Formats (without suffix). The definition would be as follows:

dci-Formats-r16 ENUMERATED {formats0-2-And-1-2, formats0-1-And-1-1And-0-2-And-1-2, formats3-0, formats3-1,formats3-0-And-3-1, formats2-5, formats0-0-And-1-0-And-2-5, formats0-1-And-1-1-And-2-5} OPTIONAL, -- Need R

**Q4: Do companies agree with the replacement of dci-FormatsSL-r16, dciFormatsExt-r16 and dci-Formats-MT-r16 with a single field, dci-Formats-r16 and when dci-Formats-r16 is configured, the UE ignores dci-Formats (without suffix); with the definition above?**

|  |  |  |
| --- | --- | --- |
| Company | Agree (Yes/No) | Comments |
| MediaTek | OK, but see comment | An alternative approach would be to keep the UE-specific branch in searchSpaceType-r16 and put the new UE-specific DCI formats there—this would avoid the need to signal a Rel-15 DCI format that will be ignored, since the network can just omit the whole legacy searchSpaceType. Either approach works, and we would like to understand if companies have a preference. |
| Ericsson | Ok | We have a slight preference for Mediatek proposal. |
| ZTE | - | It depends on RAN1’s understanding on Q2 and Q3. |
| Intel |  | The original text provides also an association of the formats with SL, MT that is lost with the common ENUMERATION. Would a CHOICE structure for the three new fields (dci-FormatsSL-r16, dciFormatsExt-r16 and dci-Formats-MT-r16) work better? |

## 2.2 PUCCH resources

In order to take into account the discussion of R2-2005260, the following changes are proposed:

- *PUCCH-Config* IE

- Use *resourceToAddModListExt-v16xy* instead of *resourceToAddModListExt-r16*

- Update the field description of *resourceToAddModList*

- Define PUCCH-ResourceExt-v16xy instead of PUCCH-Resource-r16

In addition:

- field descriptions are moved to the correct table

- occ-Index and occ-Length are placed in a CHOICE, as an alterntive to interlace1, since it was captured that these were mutually exclusive options

**Q5: Companies are invited to comment on the text proposal according to the above**

|  |  |
| --- | --- |
| Company | Comments |
| MediaTek | PUCCH-Resource-v16xy (in resourceToAddModListExt-v16xy) needs to be corrected to PUCCH-ResourceExt-v16xy. |
| Ericsson | PUCCH Resouces belong to Case B in our response to Q1.  TP is fine. |
| ZTE | - *PUCCH-Config* IE  - Use *resourceToAddModListExt-r16* instead of *resourceToAddModList-r16*  - Update the field description of *resourceToAddModList*  - Define *PUCCH-ResourceExt-r16* instead of *PUCCH-Resource-r16*  [Huawei]: Ok. |
| Intel | OK. There seems to an additional } and OPTIONAL? |

## 2.3 Control resource sets

In order to take into account the discussion of R2-2005260, the following changes are proposed:

- *ControlResourceSet* IE

- Move Rel-16 extensions to a separate type *ControlResourceSetExt-v16xy*

- *ControlResourceSetId* IE

- Define *ControlResourceSetId-v16xy* instead of *ControlResourceSetId-r16* , with range not overlapping with R15 range

- *PDCCH-Config* IE

- Create *controlResourceSetToAddModList2*/*controlResourceSetToReleaseList2*, with 1 or 2 entries, to allow adding/deleting up to 5 control resources sets in one reconfiguration

- Change *controlResourceSetToAddModList-r16* to *controlResourceSetToAddModListExt-v16xy*

- Update field descriptions

**Q6: Companies are invited to comment on the text proposal according to the above**

|  |  |
| --- | --- |
| Company | Comments |
| MediaTek | There seems to be a bug in the new lists in PDCCH-Config: It’s not possible to remove a field that was added using ControlResourceSetId-v16xy, because the ToRelease lists use ControlResourceSetId.  [Huawei] Reverted to existing ToReleaseList with ControlResourceSetId-r16 covering the full ID range and created a ControlResourceSetIdExt-r16 to cover only the new values (used in ControlResourceSet).  The field name controlResourceSetId-v16xy is not updated in the field description table. This field is also Need S with no description of the behaviour on absence (issue Z281)—we think it would be good to clarify “if the field is absent, the UE uses the controlResourceSetId (without suffix)”.  [Huawei] No strong view but:  - a mandatory field is used unless specified otherwise  - controlResourceSetId and controlResourceSetId-v16xy share the same field description  - there is a statement "If the field *controlResourceSetId-r16* is present, the UE shall ignore the *controlResourceSetId* field (without suffix)."  Would the sentence clarify anything or is just proposed in order to formally comply with the definition of Need S? |
| Ericssin | For the control resource sets, we both extend the list max size (from 3 to 5) and add new fields. But the IE ControlResourceSet has extension markers, and the list sizes are rather small. The signalling overhead to use the EAG is acceptable.  So no need for “parallel” list, and no need for new IE *ControlResourceSetExt-v16xy, and no need for 3 different toAddModLists.*  [Huawei] Agree that we should use the EAG when available. This is reverted now.  In PDCCH-Config IE, should keep the *controlResourceSetToAddModList-r16 (size 1..5) and controlResourceSetToReleaseList-r16 (*size 1..5)  Add network restriction in field description “the network includes either *controlResourceSetToAddModList* (without suffix) *or controlResourceSetToAddModList-r16.*  Add network restriction in field description “the network includes either *controlResourceSetToReleaseList* (without suffix) *or controlResourceSetToReleaseList-r16.*  Add that “if controlResourceSetId-r16 is received, UE ignores controlResourceSetId (without suffix).  [Huawei] We need the ToReleaseList in order to release entries in the extended value range, but we only need to support adding two more entries in the list, so size 1..2 seems sufficient. |
| ZTE | (1)Agree with MTK’s comment that the ControlResourceSetId-v16xy cannot be released with the existing two release list.  *controlResourceSetToReleaseList SEQUENCE(SIZE (1..3)) OF ControlResourceSetId OPTIONAL, -- Need N*  *controlResourceSetToReleaseList2 SEQUENCE(SIZE (1..2)) OF ControlResourceSetId OPTIONAL, -- Need N*  We suggest to introduce the following release list instead of the controlResourceSetToReleaseList2.  controlResourceSetToReleaseList-r16 SEQUENCE(SIZE (1..5)) OF ControlResourceSetIdInfo-r16 OPTIONAL, -- Need N  ControlResourceSetIdInfo-r16 ::= CHOICE {  controlResourceSetId ControlResourceSetId,  controlResourceSetId-r16 ControlResourceSetId-r16  }  The whole structure would look like the following:  -- 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  ...,  [[  controlResourceSetToAddModList2 SEQUENCE(SIZE (1..2)) OF ControlResourceSet OPTIONAL, -- Need N  controlResourceSetToReleaseList-r16 SEQUENCE(SIZE (1..5)) OF ControlResourceSetIdInfo-r16 OPTIONAL, -- Need N  controlResourceSetToAddModListExt-v16xy SEQUENCE(SIZE (1..5)) OF ControlResourceSetExt-v16xy OPTIONAL, -- Need N  N  searchSpacesToAddModListExt-v16xy SEQUENCE(SIZE (1..10)) OF SearchSpaceExt-v16xy OPTIONAL, -- Need N  searchSpaceSwitchingTimer-r16 INTEGER (1..80) OPTIONAL, -- Need R  searchSpaceSwitchingGroupList-r16 SEQUENCE(SIZE (1..ffsValue)) OF SearchSpaceSwitchingGroup-r16 OPTIONAL, -- Need R  uplinkCancellation-r16 SetupRelease { UplinkCancellation-r16 } OPTIONAL, -- Need M  monitoringCapabilityConfig-r16 ENUMERATED { r15monitoringcapability,r16monitoringcapability } OPTIONAL  ]]  }  SearchSpaceSwitchingGroup-r16 ::= SEQUENCE(SIZE (1..16)) OF ServCellIndex  ControlResourceSetIdInfo-r16 ::= CHOICE {  controlResourceSetId ControlResourceSetId,  controlResourceSetId-r16 ControlResourceSetId-r16  }  -- TAG-PDCCH-CONFIG-STOP  -- ASN1STOP  (2) The field name should be updated as follows:  - *ControlResourceSet* IE  - Move Rel-16 extensions to a separate type *ControlResourceSetExt-r16*  - *ControlResourceSetId* IE  - Define *ControlResourceSetId-v16xy* instead of *ControlResourceSetId-r16* , with range not overlapping with R15 range  - *PDCCH-Config* IE  - Create *controlResourceSetToAddModList2-r16*/*controlResourceSetToReleaseList2-r16*, with 1 or 2 entries, to allow adding/deleting up to 5 control resources sets in one reconfiguration |
| Intel | On Ericsson comment to using the extension group (since we have the extension marker), that would be “cleaner” solution here at the expense of coding efficiency (we haven’t taken that into account in many other places). We don’t have a strong preference either way on this list.  If we keep the existing structure, regarding the missing release list, we have a small preference for following the pattern as in addMod list by creating a new release list ext rather than the ZTE suggestion (which results in a mix and match).  [Huawei] In principle, we could have a ToReleaseList with size (1..2) and the Rel-15 ID range, and a ToReleaseList (1..5) with the ID extension range. However, since the EAG allows to only have one new ToAddModList, maybe it is reasonable to add only one new ToReleaseList. No strong view. |

## 2.4 PUCCH spatial relation information

In order to take into account the discussion of R2-2005260, the following changes are proposed:

- *PUCCH-SpatialRelationInfo* IE

- Rename *PUCCH-SpatialRelationInfo-r16* to *PUCCH-SpatialRelationInfoExt-v16xy*

- Remove fields identical to fields in *PUCCH-SpatialRelationInfo*

- *PUCCH-SpatialRelationInfoId* IE

- Change *pucch-SpatialRelationInfoId-r16* to *pucch-SpatialRelationInfoId-v16xy*

- Change *pucch-PathLossReferenceId-r16* to *pucch-PathLossReferenceRSId-v16x*

*-* Capture that the legacy fields are ignored when the -v16xy fields are configured

- *PUCCH-PowerControl*

- Change *pathlossReferenceRSs-r16* to *pathlossReferenceRSs-v16xy*

- Modify the number of entries to provide the difference between the R16 maximum and the R15 maximum

- Update the field description

- *PUCCH-PathlossReferenceRS-Id*

- Modify the range to to not overlap with the legacy range

- *PUCCH-Config* IE

- Create *spatialRelationInfoToAddModList2*/*spatialRelationInfoToReleaseList2*, with 1 or 2 entries, to allow adding/deleting up to 5 control resources sets in one reconfiguration

- Change *spatialRelationInfoToAddModList-r16* to *spatialRelationInfoToAddModListExt-v16xy*

- Update field descriptions

**Q7: Companies are invited to comment on the text proposal according to the above**

|  |  |
| --- | --- |
| Company | Comments |
| MediaTek | Just a few syntax/formal details:   * spatialRelationInfoToAddModList2 should be spatialRelationInfoToAddModList2-r16 (similar for the release list) * Typo in spatialRelationInfoToAddModListExt-vr16xy: missing the last hyphen in PUCCH-SpatialRelationInfoExt-v16xy * In PUCCH-SpatialRelationInfoIdList-r16, the type needs to be changed from PUCCH-SpatialRelationInfoId-r16 to PUCCH-SpatialRelationInfoId-v16xy |
| Ericsson | Pathloss Reference RS: This is a max size extention of a non-toAddModList, so fine to add new list with the added list elements (difference between rel-16 size and Rel-15 size). But the max size of the rel-16 list should have another name than maxNrofPUCCH-PathlossReferenceRSs-r15-r16. E.g. maxNrofPUCCH-PathlossReferenceRSs2.  In the PUCCH-Config, we prefer to keep existing *spatialRelationInfoToAddModList-r16 and spatialRelationInfoToRleaseList-r16*  Add network restriction in field description “the network includes either *spatialRelationInfoToAddModList-r16* (without suffix) *or spatialRelationInfoToAddModList-r16”.*  Add network restriction in field description “the network includes either s*patialRelationInfoToReleaseList* (without suffix) *or spatialRelationInfoToReleaseList-r16.*  Add that “if controlResourceSetId-r16 is received, UE ignores controlResourceSetId (without suffix). |
| ZTE | - *PUCCH-SpatialRelationInfo* IE  - Rename *PUCCH-SpatialRelationInfo-r16* to *PUCCH-SpatialRelationInfoExt-r16*  - Remove fields identical to fields in *PUCCH-SpatialRelationInfo*  - *PUCCH-Config* IE  - Create *spatialRelationInfoToAddModList2-r16*/*spatialRelationInfoToReleaseList2-r16*, with 1 or 2 entries, to allow adding/deleting up to 5 control resources sets in one reconfiguration  - Change *spatialRelationInfoToAddModList-r16* to *spatialRelationInfoToAddModListExt-r16*  - Update field descriptions |
| Intel | For PUCCH-Config, we need to decide whether to use critical extension. Here we are doing both size extension and adding new fields the list items together without the extension marker. But we also need to consider what if we do these in different releases (size extension in one release and new fields for the item in another release) which could result in a different mix of solutions with the critical extension rules that Ericsson mentioned. True, even with non-critical extensions, at some point later if we use a critical extension, it will result in a mix.  We don’t have a strong opinion either way – the non-critical extension mechanism looks acceptable as proposed.  Agree with Ericsson comment about the name maxNrofPUCCH-PathlossReferenceRSs-r15-r16 (the “-r15-r16” looks odd). |

## 2.5 PUSCH pathloss reference RS

In PUSCH-PowerControl, there is also an extended ToAddModList, although this case was not identified so far.

The proposed changes are rather simple:

- in *PUSCH-PathlossReferenceRS-r16*

- change the type of *pusch-PathlossReferenceRS-Id-r16* to *pusch-PathlossReferenceRS-Id-v16xy* (which excludes values in the legacy range)

- in *PUSCH-PowerControl*

-- change the size of *pathlossReferenceRSToAddModList* to cover only the additional entries

- change the size and the value range of *pathlossReferenceRSToAddModList* to cover only entries of the new ToAddModList

**Q8: Companies are invited to comment on the text proposal according to the above**

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| --- | --- |
| Company | Comments |
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|  |  |

# 3 Principles

It may be good to discuss principles.

The first one is that, when Foo is a SEQUENCE OF {} that includes extension markers, and field are to be added to Foo the fields should be added after the extension markers in Foo, even if there is a fooToAddModList SEQUENCE (SIZE(1..maxSize)) OF Foo.

**Q9: Do companies agree that when the list item of a ToAddModList has extension markers (that allow adding fields), new fields of that list item should be added after the extension markers, i.e. no need for a new list (unless there is a very specific reason)?**

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| --- | --- |
| Company | Comments |
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There can be the following cases of extensions for ToAddModLists:

Case A: The max size of the list is increased, but no new fields are added to the list items

Case B: The max size of the list remains, but new fields are added to the list item

B1: It is possible to add the new fields directly in the list item

B2: It is not possible to add the fields directly in the list item

Case C: The max size of the list increases and new fields are added to the list items

C1: It is possible to add the new fields directly in the list item

C2: It is not possible to add the fields directly in the list item

According to the TP in the Annex, in case C2 (the most complex), the UE can receive:

1) the existing ToAddModList with entries of the existing item

2) a new ToAddModList2 with **additional entries** of the existing item

3) a new ToAddModListExt with **fields to be added to each of the entries** of the two previous lists

In cases A, B1 and C1, there is only 1) and 2). In case B2, there is only 1) and 3).

Another suggestion (Ericsson) is that the UE can receive either:

- in cases A and C1/2:

- a new ToAddMostList (-r16) with entries of the existing item

- if any entry was previously configured via the existing ToAddModList, it needs to be released explictly by the network and re-added in the new ToAddModList

- in case B1

- the existing ToAddModList with entries of the existing items

- in case B2

- the existing ToAddModList with entries of the existing item

- a new ToAddModList2 with **additional entries** of the existing item

The original suggestion called "critical extension" in R2-2005626 was

- in cases A, B2 and C1/2:

- a new ToAddMostList (-r16) with entries of the existing item

- if any entry was previously configured via the existing ToAddModList, it needs to be released explictly by the network and re-added in the new ToAddModList

- in case B1

- the existing ToAddModList with entries of the existing items

**Q10: Which solution(s) do companies prefer, i.e like in this TP, Ericsson's suggestion, the proposal in R2-2005626, or other solutions?**

|  |  |
| --- | --- |
| Company | Comments |
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# Annex TP

The text is based on ASN.1 review file v158, additional changes are shown with yellow highlights.

## 6.3 RRC information elements

### 6.3.2 Radio resource control information elements

#### – *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

tci-PresentInDCI-ForDCI-Format1-2-r16 INTEGER (1..3) OPTIONAL, -- Need S

coresetPoolIndex-r16 INTEGER (0..1) OPTIONAL, -- Need R

controlResourceSetId-v16xy ControlResourceSetId-v16xy OPTIONAL -- Need S

]]

}

-- 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***  Identifies the instance of the *ControlResourceSet* IE. Value 0 identifies the common CORESET configured in *MIB* and in *ServingCellConfigCommon* (*controlResourceSetZero*) and is hence not used here in the *ControlResourceSet* IE. Other values identify CORESETs configured by dedicated signalling or in *SIB1*. The *controlResourceSetId* is unique among the BWPs of a serving cell.  If the field *controlResourceSetId-v16xy* is present, the UE shall ignore the *controlResourceSetId* field (without suffix). |
| ***coresetPoolIndex***  The index of the CORESET pool for this CORESET as specified in TS 38.213 [13] (clauses 9 and 10) and TS 38.214 [19] (clauses 5.1 and 6.1). If the field is absent, the UE applies the value 0. |
| ***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 DCI format 1\_1. 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-PresentInDCI-ForDCI-Format1-2***  Configures the number of bits for "Transmission configuration indicator" in DCI format 1\_2. When the field is absent the UE applies the value of 0 bit for the "Transmission configuration indicator" in DCI format 1\_2 (see TS 38.212, clause 7.3.1 and TS 38.214, 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. |

#### – *ControlResourceSetId*

The *ControlResourceSetId* IE concerns a short identity, used to identify a control resource set within a serving cell. The *ControlResourceSetId* = 0 identifies the ControlResourceSet#0 configured via PBCH (*MIB*) and in *controlResourceSetZero* (*ServingCellConfigCommon*). The ID space is used across the BWPs of a Serving Cell. The number of CORESETs per BWP is limited to 3 (including common and UE-specific CORESETs) in Release 15.

*ControlResourceSetId* information element

-- ASN1START

-- TAG-CONTROLRESOURCESETID-START

ControlResourceSetId ::= INTEGER (0..maxNrofControlResourceSets-1)

ControlResourceSetId-r16 ::= INTEGER (0..maxNrofControlResourceSets-1-r16)

ControlResourceSetId-v16xy ::= INTEGER (maxNrofControlResourceSets..maxNrofControlResourceSets-1-r16)

-- TAG-CONTROLRESOURCESETID-STOP

-- ASN1STOP

#### – *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

...,

[[

controlResourceSetToAddModList2-r16 SEQUENCE(SIZE (1..2)) OF ControlResourceSet OPTIONAL, -- Need N

controlResourceSetToReleaseList-r16 SEQUENCE (SIZE (1..5)) OF ControlResourceSetId-r16 OPTIONAL, -- Need N

searchSpacesToAddModListExt-r16 SEQUENCE(SIZE (1..10)) OF SearchSpaceExt-r16 OPTIONAL, -- Need N

searchSpaceSwitchingTimer-r16 INTEGER (1..80) OPTIONAL, -- Need R

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

uplinkCancellation-r16 SetupRelease { UplinkCancellation-r16 } OPTIONAL, -- Need M

monitoringCapabilityConfig-r16 ENUMERATED { r15monitoringcapability,r16monitoringcapability } OPTIONAL

]]

}

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

-- TAG-PDCCH-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PDCCH-Config* field descriptions |
| ***controlResourceSetToAddModList, controlResourceSetToAddModList2***  List of UE specifically configured Control Resource Sets (CORESETs) to be used by the UE. The network configures at most 5 CORESETs per BWP per cell (including UE-specific and common CORESETs). The UE shall consider entries in c*ontrolResourceSetToAddModList* and in *controlResourceSetToAddModList2* as a single list, i.e. an entry created using c*ontrolResourceSetToAddModList* can be modifed using c*ontrolResourceSetToAddModList2* and vice-versa. 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). |
| ***monitoringCapabilityConfig***  Configures either Rel-15 PDCCH monitoring capability or Rel-16 PDCCH monitoring capability for PDCCH monitoring on a serving cell. Value *r15monitoringcapablity* enables the Rel-15 monitoring capability, and value *r16monitoringcapablity* enables the Rel-16 PDCCH monitoring capability (see TS 38.213 [13], clause 10.1). |
| ***searchSpacesToAddModList, searchSpacesToAddModListExt***  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). If the network includes *searchSpaceToAddModListExt*, it includes the same number of entries, and listed in the same order, as in *searchSpacesToAddModList*. |
| ***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 value of 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). For 15 kHz SCS, {1..20} are valid. For 30 kHz SCS, {1..40} are valid. For 60kHz SCS, {1..80} are valid. |
| ***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. |
| ***uplinkCancellation***  Configuration of uplink cancellation indications to be monitored in this cell (see TS 38.213 [13], clause 11.5). |

#### – *PDCCH-ConfigCommon*

The IE *PDCCH-ConfigCommon* is used to configure cell specific PDCCH parameters provided in SIB as well as in dedicated signalling.

*PDCCH-ConfigCommon* information element

-- ASN1START

-- TAG-PDCCH-CONFIGCOMMON-START

PDCCH-ConfigCommon ::= SEQUENCE {

controlResourceSetZero ControlResourceSetZero OPTIONAL, -- Cond InitialBWP-Only

commonControlResourceSet ControlResourceSet OPTIONAL, -- Need R

searchSpaceZero SearchSpaceZero OPTIONAL, -- Cond InitialBWP-Only

commonSearchSpaceList SEQUENCE (SIZE(1..4)) OF SearchSpace OPTIONAL, -- Need R

searchSpaceSIB1 SearchSpaceId OPTIONAL, -- Need S

searchSpaceOtherSystemInformation SearchSpaceId OPTIONAL, -- Need S

pagingSearchSpace SearchSpaceId OPTIONAL, -- Need S

ra-SearchSpace SearchSpaceId OPTIONAL, -- Need S

...,

[[

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, -- Cond OtherBWP

commonSearchSpaceListExt-r16 SEQUENCE (SIZE(1..4)) OF SearchSpaceExt-r16 OPTIONAL, -- Need R

]]

}

-- TAG-PDCCH-CONFIGCOMMON-STOP

-- ASN1STOP

|  |
| --- |
| *PDCCH-ConfigCommon* field descriptions |
| ***commonControlResourceSet***  An additional common control resource set which may be configured and used for any common or UE-specific search space. If the network configures this field, it uses a *ControlResourceSetId* other than 0 for this *ControlResourceSet*. The network configures the *commonControlResourceSet* in *SIB1* so that it is contained in the bandwidth of CORESET#0. |
| ***commonSearchSpaceList, commonSearchSpaceListExt***  A list of additional common search spaces. If the network configures this field, it uses the *SearchSpaceId*s other than 0. If the field is included, it replaces any previous list, i.e. all the entries of the list are replaced and each of the *SearchSpace* entries is considered to be newly created and the conditions and Need codes for setup of the entry apply. If the network includes *commonSearchSpaceListExt*, it includes the same number of entries, and listed in the same order, as in *commonSearchSpaceList*. |
| ***controlResourceSetZero***  Parameters of the common CORESET#0 which can be used in any common or UE-specific search spaces. The values are interpreted like the corresponding bits in *MIB* *pdcch-ConfigSIB1*. Even though this field is only configured in the initial BWP (BWP#0) *controlResourceSetZero* can be used in search spaces configured in other DL BWP(s) than the initial DL BWP if the conditions defined in TS 38.213 [13], clause 10 are satisfied. |
| ***firstPDCCH-MonitoringOccasionOfPO***  Indicates the first PDCCH monitoring occasion of each PO of the PF on this BWP, see TS 38.304 [20]. |
| ***pagingSearchSpace***  ID of the Search space for paging (see TS 38.213 [13], clause 10.1). If the field is absent, the UE does not receive paging in this BWP (see TS 38.213 [13], clause 10). |
| ***ra-SearchSpace***  ID of the Search space for random access procedure (see TS 38.213 [13], clause 10.1). If the field is absent, the UE does not receive RAR in this BWP. This field is mandatory present in the DL BWP(s) if the conditions described in TS 38.321 [3], subclause 5.15 are met. |
| ***searchSpaceOtherSystemInformation***  ID of the Search space for other system information, i.e., *SIB2* and beyond (see TS 38.213 [13], clause 10.1) If the field is absent, the UE does not receive other system information in this BWP. |
| ***searchSpaceSIB1***  ID of the search space for *SIB1* message. In the initial DL BWP of the UE′s PCell, the network sets this field to 0. If the field is absent, the UE does not receive *SIB1* in this BWP. (see TS 38.213 [13], clause 10) |
| ***searchSpaceZero***  Parameters of the common SearchSpace#0. The values are interpreted like the corresponding bits in *MIB* *pdcch-ConfigSIB1*. Even though this field is only configured in the initial BWP (BWP#0), *searchSpaceZero* can be used in search spaces configured in other DL BWP(s) than the initial DL BWP if the conditions described in TS 38.213 [13], clause 10, are satisfied. |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *InitialBWP-Only* | If *SIB1* is broadcast the field is mandatory present in the *PDCCH-ConfigCommon* of the initial BWP (BWP#0) in *ServingCellConfigCommon*; it is absent in other BWPs and when sent in system information. If SIB1 is not broadcast and there is an SSB associated to the cell, the field is optionally present, Need M, in the *PDCCH-ConfigCommon* of the initial BWP (BWP#0) in *ServingCellConfigCommon* (still with the same setting for all UEs). In other cases, the field is absent. |
| *OtherBWP* | This field is optionally present, Need R, if this BWP is not the initial DL BWP and *pagingSearchSpace* is configured in this BWP. Otherwise this field is absent. |

#### – *PUCCH-Config*

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

*PUCCH-Config* information element

-- ASN1START

-- TAG-PUCCH-CONFIG-START

PUCCH-Config ::= SEQUENCE {

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

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

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

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

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

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

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

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

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

OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

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

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

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

OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

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

...,

[[

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

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

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

subslotLengthForPUCCH-r16 ENUMERATED {n2,n7} OPTIONAL, -- Need M

dl-DataToUL-ACK-ForDCI-Format1-2-r16 SEQUENCE (SIZE (1..8)) OF INTEGER (0..15) OPTIONAL, -- Need M

numberOfBitsForPUCCH-ResourceIndicatorForDCI-Format1-2-r16 INTEGER (0..3) OPTIONAL, -- Need M

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

spatialRelationInfoToAddModList2-r16 SEQUENCE (SIZE (1..maxNrofSpatialRelationInfosDiff-r16)) OF PUCCH-SpatialRelationInfo

OPTIONAL, -- Need N

spatialRelationInfoToReleaseList2-r16 SEQUENCE (SIZE (1..maxNrofSpatialRelationInfosDiff-r16)) OF PUCCH-SpatialRelationInfoId

OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

spatialRelationInfoToReleaseList-r16 PUCCH-SpatialRelationInfoIdList-r16 OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

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

OPTIONAL, -- Need N

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

schedulingRequestResourceToAddModList-v16xy SEQUENCE (SIZE (1..maxNrofSR-Resources)) OF SchedulingRequestResourceConfig-v16xy

OPTIONAL -- Need N

]]

}

PUCCH-FormatConfig ::= SEQUENCE {

interslotFrequencyHopping ENUMERATED {enabled} OPTIONAL, -- Need R

additionalDMRS ENUMERATED {true} OPTIONAL, -- Need R

maxCodeRate PUCCH-MaxCodeRate OPTIONAL, -- Need R

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

pi2BPSK ENUMERATED {enabled} OPTIONAL, -- Need R

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

}

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

-- A set with one or more PUCCH resources

PUCCH-ResourceSet ::= SEQUENCE {

pucch-ResourceSetId PUCCH-ResourceSetId,

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

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

}

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

PUCCH-Resource ::= SEQUENCE {

pucch-ResourceId PUCCH-ResourceId,

startingPRB PRB-Id,

intraSlotFrequencyHopping ENUMERATED { enabled } OPTIONAL, -- Need R

secondHopPRB PRB-Id OPTIONAL, -- Need R

format CHOICE {

format0 PUCCH-format0,

format1 PUCCH-format1,

format2 PUCCH-format2,

format3 PUCCH-format3,

format4 PUCCH-format4

}

}

PUCCH-ResourceExt-r16 ::= SEQUENCE {

interlaceAllocation-r16 SEQUENCE {

rb-SetIndex INTEGER (0..4),

interlace0 CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..4)

}

} OPTIONAL, -- Need R,

formatExt-v16xy CHOICE {

interlace1-v16xy INTEGER (0..9),

occ-v16xy

SEQUENCE {

occ-Length-v16xy ENUMERATED {n2,n4} OPTIONAL, -- Need M

occ-Index-v16xy ENUMERATED {n0,n1,n2,n3} OPTIONAL -- Need M

}

} OPTIONAL -- Need R

} OPTIONAL, -- Need R

...

}

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

PUCCH-format0 ::= SEQUENCE {

initialCyclicShift INTEGER(0..11),

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER(0..13)

}

PUCCH-format1 ::= SEQUENCE {

initialCyclicShift INTEGER(0..11),

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER(0..10),

timeDomainOCC INTEGER(0..6)

}

PUCCH-format2 ::= SEQUENCE {

nrofPRBs INTEGER (1..16),

nrofSymbols INTEGER (1..2),

startingSymbolIndex INTEGER(0..13)

}

PUCCH-format3 ::= SEQUENCE {

nrofPRBs INTEGER (1..16),

nrofSymbols INTEGER (4..14),

startingSymbolIndex INTEGER(0..10)

}

PUCCH-format4 ::= SEQUENCE {

nrofSymbols INTEGER (4..14),

occ-Length ENUMERATED {n2,n4},

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

startingSymbolIndex INTEGER(0..10)

}

PUCCH-SpatialRelationInfoList-r16 ::= SEQUENCE (SIZE (1..maxNrofSpatialRelationInfos-r16)) OF PUCCH-SpatialRelationInfo-r16

PUCCH-SpatialRelationInfoIdList-r16 ::= SEQUENCE (SIZE (1..maxNrofSpatialRelationInfos-r16)) OF PUCCH-SpatialRelationInfoId-r16

PUCCH-ResourceGroup-r16 ::= SEQUENCE {

pucch-ResourceGroupId-r16 PUCCH-ResourceGroupId-r16,

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

}

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

-- TAG-PUCCH-CONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *PUCCH-Config* field descriptions |
| ***dl-DataToUL-ACK, dl-DataToUL-ACK-ForDCI-Format1-2***  List of timing for given PDSCH to the DL ACK (see TS 38.213 [13], clause 9.1.2). The field *dl-DataToUL-ACK* refers to DCI format 1\_1 and the field *dl-DataToUL-ACKForDCI-Format1-2* refers to DCI format 1\_2, respectively (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 9.2.3). If *dl-DataToUL-ACK-r16* is signalled, UE shall ignore the *dl-DataToUL-ACK* (without suffix). The value -1 corresponds to “non-numerical value” for the case where the A/N feedback timing is not explicitly included at the time of scheduling PDSCH. |
| ***dl-dci-triggered-UL-ChannelAccess-CPextList***  List of the combinations of CP extension and UL channel access type (See TS 38.212 [17], Clause 7.3.1). |
| ***dmrs-UplinkTransformPrecodingPUCCH***  This field is used for PUCCH formats 3 and 4 according to TS 38.211, Clause 6.4.1.3.3.1. |
| ***format1***  Parameters that are common for all PUCCH resources of format 1. |
| ***format2***  Parameters that are common for all PUCCH resources of format 2. |
| ***format3***  Parameters that are common for all PUCCH resources of format 3. |
| ***format4.***  Parameters that are common for all PUCCH resources of format 4 |
| ***numberOfBitsForPUCCH-ResourceIndicatorForDCI-Format1-2***  Configuration of the number of bits for "PUCCH resource indicator" in DCI format 1\_2 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 9.2.3). |
| ***resourceGroupToAddModList, resourceGroupToReleaseList***  Lists for adding and releasing groups of PUCCH resources that can be updated simultaneously for spatial relations with a MAC CE |
| ***resourceSetToAddModList, resourceSetToReleaseList***  Lists for adding and releasing PUCCH resource sets (see TS 38.213 [13], clause 9.2). |
| ***resourceToAddModList, resourceToAddModListExt, resourceToReleaseList***  Lists for adding and releasing PUCCH resources applicable for the UL BWP and serving cell in which the *PUCCH-Config* is defined. The resources defined herein are referred to from other parts of the configuration to determine which resource the UE shall use for which report. If the network includes of *resourceToAddModListExt*, it includes the same number of entries, and listed in the same order, as in *resourceToAddModList*. |
| ***spatialRelationInfoToAddModList, spatialRelationInfoToAddModList2*** , ***spatialRelationInfoToAddModListExt***  Configuration of the spatial relation between a reference RS and PUCCH. Reference RS can be SSB/CSI-RS/SRS. If the list has more than one element, MAC-CE selects a single element (see TS 38.321 [3], clause 5.18.8 and TS 38.213 [13], clause 9.2.2). The UE shall consider entries in *spatialRelationInfoToAddModList* and in *spatialRelationInfoToAddModList2* as a single list, i.e. an entry created using *spatialRelationInfoToAddModList* can be modifed using *spatialRelationInfoToAddModList2* (or deleted using *spatialRelationInfoToReleaseList2*) and vice-versa. If the network includes of *spatialRelationInfoToAddModListExt*, it includes the same number of entries, and listed in the same order, as in the concatenation of *spatialRelationInfoToAddModList* and of *spatialRelationInfoToAddModList2.* |
| ***sps-PUCCH-AN-List***  Indicates a list of PUCCH resources for DL SPS HARQ ACK. The field *maxPayloadSize* is absent for the first and the last *SPS-PUCCH-AN* in the list. If configured, this overrides *n1PUCCH-AN* in *SPS-config.*  IIoT Editor’s note: The change on moving *sps-PUCCH-AN-List* from *SPS-ConfigList* to *PUCCH-Config* may be revisited in RAN2#110e if RAN1 impacts are identified. |
| ***subslotLengthForPUCCH***  Indicate the sub-slot length for sub-slot based PUCCH feedback in number of symbols (see TS 38.213 [13], clause 9.1). Value *n2* corresponds to 2 symbols, value *n7* corresponds to 7 symbols. |

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

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

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

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

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

#### – *PUCCH-PathlossReferenceRS-Id*

The IE *PUCCH-PathlossReferenceRS-Id* is an ID for a reference signal (RS) configured as PUCCH pathloss reference (see TS 38.213 [13], clause 7.2).

*PUCCH-PathlossReferenceRS-Id* information element

-- ASN1START

-- TAG-PUCCH-PATHLOSSREFERENCERS-ID-START

PUCCH-PathlossReferenceRS-Id ::= INTEGER (0..maxNrofPUCCH-PathlossReferenceRSs-1)

PUCCH-PathlossReferenceRS-Id-r16 ::= INTEGER (0..maxNrofPUCCH-PathlossReferenceRSs-1-r16)

PUCCH-PathlossReferenceRS-Id-v16xy ::= INTEGER (maxNrofPUCCH-PathlossReferenceRSs.. maxNrofPUCCH-PathlossReferenceRSs-1-r16)

-- TAG-PUCCH-PATHLOSSREFERENCERS-ID-STOP

-- ASN1STOP

#### – *PUCCH-PowerControl*

The IE *PUCCH-PowerControl* is used to configure UE-specific parameters for the power control of PUCCH.

*PUCCH-PowerControl* information element

-- ASN1START

-- TAG-PUCCH-POWERCONTROL-START

PUCCH-PowerControl ::= SEQUENCE {

deltaF-PUCCH-f0 INTEGER (-16..15) OPTIONAL, -- Need R

deltaF-PUCCH-f1 INTEGER (-16..15) OPTIONAL, -- Need R

deltaF-PUCCH-f2 INTEGER (-16..15) OPTIONAL, -- Need R

deltaF-PUCCH-f3 INTEGER (-16..15) OPTIONAL, -- Need R

deltaF-PUCCH-f4 INTEGER (-16..15) OPTIONAL, -- Need R

p0-Set SEQUENCE (SIZE (1..maxNrofPUCCH-P0-PerSet)) OF P0-PUCCH OPTIONAL, -- Need M

pathlossReferenceRSs SEQUENCE (SIZE (1..maxNrofPUCCH-PathlossReferenceRSs)) OF PUCCH-PathlossReferenceRS

OPTIONAL, -- Need M

twoPUCCH-PC-AdjustmentStates ENUMERATED {twoStates} OPTIONAL, -- Need S

...,

[[

pathlossReferenceRSs-v16xy SEQUENCE (SIZE (1..maxNrofPUCCH-PathlossReferenceRSs-Diff-r16)) OF PUCCH-PathlossReferenceRS-r16

OPTIONAL -- Need M

]]

}

P0-PUCCH ::= SEQUENCE {

p0-PUCCH-Id P0-PUCCH-Id,

p0-PUCCH-Value INTEGER (-16..15)

}

P0-PUCCH-Id ::= INTEGER (1..8)

PUCCH-PathlossReferenceRS ::= SEQUENCE {

pucch-PathlossReferenceRS-Id PUCCH-PathlossReferenceRS-Id,

referenceSignal CHOICE {

ssb-Index SSB-Index,

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

}

}

PUCCH-PathlossReferenceRS-r16 ::= SEQUENCE {

pucch-PathlossReferenceRS-Id-r16 PUCCH-PathlossReferenceRS-Id-v16xy,

referenceSignal CHOICE {

ssb-Index SSB-Index,

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

}

}

-- TAG-PUCCH-POWERCONTROL-STOP

-- ASN1STOP

|  |
| --- |
| *P0-PUCCH* field descriptions |
| ***p0-PUCCH-Value***  P0 value for PUCCH with 1dB step size. |

|  |
| --- |
| *PUCCH-PowerControl* field descriptions |
| ***deltaF-PUCCH-f0***  deltaF for PUCCH format 0 with 1dB step size (see TS 38.213 [13], clause 7.2). |
| ***deltaF-PUCCH-f1***  deltaF for PUCCH format 1 with 1dB step size (see TS 38.213 [13], clause 7.2). |
| ***deltaF-PUCCH-f2***  deltaF for PUCCH format 2 with 1dB step size (see TS 38.213 [13], clause 7.2). |
| ***deltaF-PUCCH-f3***  deltaF for PUCCH format 3 with 1dB step size (see TS 38.213 [13], clause 7.2). |
| ***deltaF-PUCCH-f4***  deltaF for PUCCH format 4 with 1dB step size (see TS 38.213 [13], clause 7.2). |
| ***p0-Set***  A set with dedicated P0 values for PUCCH, i.e., {P01, P02,... } (see TS 38.213 [13], clause 7.2). |
| ***pathlossReferenceRSs, pathlossReferenceRSs-v16xy***  A set of Reference Signals (e.g. a CSI-RS config or a SS block) to be used for PUCCH pathloss estimation. Up to *maxNrofPUCCH-PathlossReference-RSs* may be configured. When the field is absent, the UE uses the SSB as reference signal (see TS 38.213 [13], clause 7.2). The set includes References Signals indicated in *pathlossReferenceRSs* (without suffix) and in *pathlossReferenceRSs-v16xy*. |
| ***twoPUCCH-PC-AdjustmentStates***  Number of PUCCH power control adjustment states maintained by the UE (i.e., g(i)). If the field is present (n2) the UE maintains two power control states (i.e., g(i,0) and g(i,1)). If the field is absent, it maintains one power control state (i.e., g(i,0)) (see TS 38.213 [13], clause 7.2). |

#### – *PUCCH-SpatialRelationInfo*

The IE *PUCCH-SpatialRelationInfo* is used to configure the spatial setting for PUCCH transmission and the parameters for PUCCH power control, see TS 38.213, [13], clause 9.2.2.

*PUCCH-SpatialRelationInfo* information element

-- ASN1START

-- TAG-PUCCH-SPATIALRELATIONINFO-START

PUCCH-SpatialRelationInfo ::= SEQUENCE {

pucch-SpatialRelationInfoId PUCCH-SpatialRelationInfoId,

servingCellId ServCellIndex OPTIONAL, -- Need S

referenceSignal CHOICE {

ssb-Index SSB-Index,

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

srs PUCCH-SRS

},

pucch-PathlossReferenceRS-Id PUCCH-PathlossReferenceRS-Id,

p0-PUCCH-Id P0-PUCCH-Id,

closedLoopIndex ENUMERATED { i0, i1 }

}

PUCCH-SpatialRelationInfoExt-r16 ::= SEQUENCE {

pucch-SpatialRelationInfoId-v16xy PUCCH-SpatialRelationInfoIdExt-r16 OPTIONAL, -- Cond SetupOnly

pucch-PathlossReferenceRS-Id-v16xy PUCCH-PathlossReferenceRS-IdExt-r16 OPTIONAL -- Need R

}

PUCCH-SRS ::= SEQUENCE {

resource SRS-ResourceId,

uplinkBWP BWP-Id

}

-- TAG-PUCCH-SPATIALRELATIONINFO-STOP

-- ASN1STOP

|  |
| --- |
| *PUCCH-SpatialRelationInfo* field descriptions |
| ***pucch-PathLossReferenceRS-Id***  When *pucch-PathLossReferenceRS-Id-v16xy* is configured, the UE shall ignore *pucch-PathLossReferenceRS-Id* (without suffix). |
| ***pucch-SpatialRelationInfoId***  When *pucch-SpatialRelationInfoId-v16xy* is configured, the UE shall ignore *pucch-SpatialRelationInfoId* (without suffix). |
| ***servingCellId***  If the field is absent, the UE applies the *ServCellId* of the serving cell in which this *PUCCH-SpatialRelationInfo* is configured |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *SetupOnly* | This field is mandatory present upon creation of a *PUCCH-SpatialRelationInfo*. It is absent, Need M otherwise. |

#### – *PUCCH-SpatialRelationInfo-Id*

The IE *PUCCH-SpatialRelationInfo-Id* is used to indentify a *PUCCH-SpatialRelationInfo*

*PUCCH-SpatialRelationInfo-Id* information element

-- ASN1START

-- TAG-PUCCH-SPATIALRELATIONINFO-START

PUCCH-SpatialRelationInfoId ::= INTEGER (1..maxNrofSpatialRelationInfos)

PUCCH-SpatialRelationInfoId-r16 ::= INTEGER (1..maxNrofSpatialRelationInfos-r16)

PUCCH-SpatialRelationInfoId-v16xy::= INTEGER (maxNrofSpatialRelationInfos-plus-1..maxNrofSpatialRelationInfos-r16)

-- TAG-PUCCH-SPATIALRELATIONINFO-STOP

-- ASN1STOP

– *PUSCH-PowerControl*

The IE *PUSCH-PowerControl* is used to configure UE specific power control parameter for PUSCH.

***PUSCH-PowerControl* information element**

-- ASN1START

-- TAG-PUSCH-POWERCONTROL-START

PUSCH-PowerControl ::= SEQUENCE {

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

msg3-Alpha Alpha OPTIONAL, -- Need S

p0-NominalWithoutGrant INTEGER (-202..24) OPTIONAL, -- Need M

p0-AlphaSets SEQUENCE (SIZE (1..maxNrofP0-PUSCH-AlphaSets)) OF P0-PUSCH-AlphaSet OPTIONAL, -- Need M

pathlossReferenceRSToAddModList SEQUENCE (SIZE (1..maxNrofPUSCH-PathlossReferenceRSs)) OF PUSCH-PathlossReferenceRS

OPTIONAL, -- Need N

pathlossReferenceRSToReleaseList SEQUENCE (SIZE (1..maxNrofPUSCH-PathlossReferenceRSs)) OF PUSCH-PathlossReferenceRS-Id

OPTIONAL, -- Need N

twoPUSCH-PC-AdjustmentStates ENUMERATED {twoStates} OPTIONAL, -- Need S

deltaMCS ENUMERATED {enabled} OPTIONAL, -- Need S

sri-PUSCH-MappingToAddModList SEQUENCE (SIZE (1..maxNrofSRI-PUSCH-Mappings)) OF SRI-PUSCH-PowerControl

OPTIONAL, -- Need N

sri-PUSCH-MappingToReleaseList SEQUENCE (SIZE (1..maxNrofSRI-PUSCH-Mappings)) OF SRI-PUSCH-PowerControlId

OPTIONAL -- Need N

}

P0-PUSCH-AlphaSet ::= SEQUENCE {

p0-PUSCH-AlphaSetId P0-PUSCH-AlphaSetId,

p0 INTEGER (-16..15) OPTIONAL, -- Need S

alpha Alpha OPTIONAL -- Need S

}

P0-PUSCH-AlphaSetId ::= INTEGER (0..maxNrofP0-PUSCH-AlphaSets-1)

PUSCH-PathlossReferenceRS ::= SEQUENCE {

pusch-PathlossReferenceRS-Id PUSCH-PathlossReferenceRS-Id,

referenceSignal CHOICE {

ssb-Index SSB-Index,

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

}

}

PUSCH-PathlossReferenceRS-r16 ::= SEQUENCE {

pusch-PathlossReferenceRS-Id-r16 PUSCH-PathlossReferenceRS-Id-rv16xy,

referenceSignal-r16 CHOICE {

ssb-Index-r16 SSB-Index,

csi-RS-Index-r16 NZP-CSI-RS-ResourceId

}

}

PUSCH-PathlossReferenceRS-Id ::= INTEGER (0..maxNrofPUSCH-PathlossReferenceRSs-1)

PUSCH-PathlossReferenceRS-Id-r16 ::= INTEGER (0..maxNrofPUSCH-PathlossReferenceRSs-1-r16)

PUSCH-PathlossReferenceRS-ID-v16xy ::= INTEGER (maxNrofPUSCH-PathlossReferenceRSs...maxNrofPUSCH-PathlossReferenceRSs-1-r16)

SRI-PUSCH-PowerControl ::= SEQUENCE {

sri-PUSCH-PowerControlId SRI-PUSCH-PowerControlId,

sri-PUSCH-PathlossReferenceRS-Id PUSCH-PathlossReferenceRS-Id,

sri-P0-PUSCH-AlphaSetId P0-PUSCH-AlphaSetId,

sri-PUSCH-ClosedLoopIndex ENUMERATED { i0, i1 }

}

SRI-PUSCH-PowerControlId ::= INTEGER (0..maxNrofSRI-PUSCH-Mappings-1)

PUSCH-PowerControl-v16xy ::= SEQUENCE {

pathlossReferenceRSToAddModList2-r16 SEQUENCE (SIZE (1..maxNrofPUSCH-PathlossReferenceRSsDiff-r16)) OF PUSCH-PathlossReferenceRS-r16

OPTIONAL, -- Need N

pathlossReferenceRSToReleaseList2-r16 SEQUENCE (SIZE (1..maxNrofPUSCH-PathlossReferenceRSsDiff-r16)) OF PUSCH-PathlossReferenceRS-Id-v16xy

OPTIONAL, -- Need N

p0-PUSCH-SetList-r16 SEQUENCE (SIZE (1..maxNrofSRI-PUSCH-Mappings)) OF P0-PUSCH-Set-r16 OPTIONAL, -- Need R

olpc-ParameterSet SEQUENCE {

olpc-ParameterSetForDCI-Format0-1-r16 INTEGER (1..2) OPTIONAL, -- Need M

olpc-ParameterSetForDCI-Format0-2-r16 INTEGER (1..2) OPTIONAL -- Need M

} OPTIONAL, -- Need M

...

}

P0-PUSCH-Set-r16 ::= SEQUENCE {

p0-PUSCH-SetId-r16 P0-PUSCH-SetId-r16,

p0-List-r16 SEQUENCE (SIZE (1..maxNrofP0-PUSCH-Set-r16)) OF P0-PUSCH-r16 OPTIONAL, -- Need R

...

}

P0-PUSCH-SetId-r16 ::= INTEGER (0..maxNrofSRI-PUSCH-Mappings-1)

P0-PUSCH-r16 ::= INTEGER (-16..15)

-- TAG-PUSCH-POWERCONTROL-STOP

-- ASN1STOP

|  |
| --- |
| ***P0-PUSCH-AlphaSet* field descriptions** |
| ***alpha***  alpha value for PUSCH with grant (except msg3) (see TS 38.213 [13], clause 7.1). When the field is absent the UE applies the value 1. |
| ***p0***  P0 value for PUSCH with grant (except msg3) in steps of 1dB (see TS 38.213 [13], clause 7.1). When the field is absent the UE applies the value 0. |

|  |
| --- |
| ***P0-PUSCH-Set* field descriptions** |
| ***p0-List***  Configuration of {p0-PUSCH, p0-PUSCH} sets for PUSCH. If SRI is present in the DCI, then one p0-PUSCH can be configured in P0-PUSCH-Set. If SRI is not present in the DCI, and both *OLPCParameterSet-ForDCIFormat0\_1* and *OLPCParameterSet-ForDCIFormat0\_2* are configured to be 1 bit, then one p0-PUSCH can be configured in P0-PUSCH-Set. If SRI is not present in the DCI, and if any of *OLPCParameterSet-ForDCIFormat0\_1* and *OLPCParameterSet-ForDCIFormat0\_2* is configured to be 2 bits, then two p0-PUSCH values can be configured in P0-PUSCH-Set (see TS 38.213 [13] clause 7 and TS 38.212 [17] clause 7.3.1). |
| ***p0-PUSCH-SetId***  Configure the index of a p0-PUSCH-Set (see TS 38.213 [13] clause 7 and TS 38.212 [17] clause 7.3.1). |

|  |
| --- |
| ***PUSCH-PowerControl* field descriptions** |
| ***deltaMCS***  Indicates whether to apply delta MCS. When the field is absent, the UE applies Ks = 0 in delta\_TFC formula for PUSCH (see TS 38.213 [13], clause 7.1). |
| ***msg3-Alpha***  Dedicated alpha value for msg3 PUSCH (see TS 38.213 [13], clause 7.1). When the field is absent the UE applies the value 1. |
| ***olpc-ParameterSetForDCI-Format0-1, olpc-ParameterSetForDCI-Format0-2***  Configures the number of bits for Open-loop power control parameter set indication for DCI format 0\_1/0\_2 in case SRI is not configured in the DCI. 2 bits is applicable only if SRI is not present in the DCI format 0\_1. The field *olpc-ParameterSetForDCI-Format0-1* refers to DCI format 0\_1 and the field *olpc-ParameterSetForDCI-Format0-2* refers to DCI format 0\_2, respectively (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 11). |
| ***p0-AlphaSets***  configuration {p0-pusch, alpha} sets for PUSCH (except msg3), i.e., { {p0,alpha,index1}, {p0,alpha,index2},...} (see TS 38.213 [13], clause 7.1). When no set is configured, the UE uses the P0-nominal for msg3 PUSCH, P0-UE is set to 0 and alpha is set according to msg3-Alpha configured for msg3 PUSCH. |
| ***p0-NominalWithoutGrant***  P0 value for UL grant-free/SPS based PUSCH. Value in dBm. Only even values (step size 2) allowed (see TS 38.213 [13], clause 7.1). |
| ***p0-PUSCH-SetList***  Configure one additional *P0-PUSCH-Set* per SRI. If present, the one bit or 2 bits in the DCI is used to dynamically indicate among the P0 value from the existing *P0-PUSCH-AlphaSet* and the P0 value(s) from the *P0-PUSCH-Set* (See TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 17). |
| ***pathlossReferenceRSToAddModList, pathlossReferenceRSToAddModList***2A set of Reference Signals (e.g. a CSI-RS config or a SS block) to be used for PUSCH path loss estimation. The list consists in Reference Signals configured using *pathLossReferenceRSToAddModList* and Reference Signals configured using *pathlossReferenceRSToAddModList2*. Up to *maxNrofPUSCH-PathlossReferenceRSs* may be configured (see TS 38.213 [13], clause 7.1). |
| ***sri-PUSCH-MappingToAddModList***  A list of *SRI-PUSCH-PowerControl* elements among which one is selected by the SRI field in DCI (see TS 38.213 [13], clause 7.1). |
| ***tpc-Accumulation***  If enabled, UE applies TPC commands via accumulation. If not enabled, UE applies the TPC command without accumulation. If the field is absent, TPC accumulation is enabled (see TS 38.213 [13], clause 7.1). |
| ***twoPUSCH-PC-AdjustmentStates***  Number of PUSCH power control adjustment states maintained by the UE (i.e., fc(i)). If the field is present (*n2*) the UE maintains two power control states (i.e., fc(i,0) and fc(i,1)). If the field is absent, it maintains one power control state (i.e., fc(i,0)) (see TS 38.213 [13], clause 7.1). |

|  |
| --- |
| ***SRI-PUSCH-PowerControl* field descriptions** |
| ***sri-P0-PUSCH-AlphaSetId***  The ID of a *P0-PUSCH-AlphaSet* as configured in *p0-AlphaSets* *in PUSCH-PowerControl*. |
| ***sri-PUSCH-ClosedLoopIndex***  The index of the closed power control loop associated with this *SRI-PUSCH-PowerControl.* |
| ***sri-PUSCH-PathlossReferenceRS-Id***  The ID of *PUSCH-PathlossReferenceRS* as configured in the *pathlossReferenceRSToAddModList* in *PUSCH-PowerControl*. |
| ***sri-PUSCH-PowerControlId***  The ID of this *SRI-PUSCH-PowerControl* configuration. It is used as the codepoint (payload) in the SRI DCI field. |

#### – *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},

...,

[[

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

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

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

OPTIONAL, -- Need NR

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

]]

}

} OPTIONAL -- Need M

}

SearchSpaceExt-r16 ::= SEQUENCE {

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

searchSpaceType-r16 CHOICE {

common-r16 SEQUENCE {

dci-Format2-4-r16 SEQUENCE {

nrofCandidates-CI-r16 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

},

...

},

dci-Format2-5-r16 SEQUENCE {

nrofCandidates-IAB-r16 SEQUENCE {

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

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

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

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

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

},

...

} OPTIONAL, -- Need R

dci-Format2-6-r16 SEQUENCE {

...

} OPTIONAL, -- Need R

...

},

} OPTIONAL, -- Need M

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

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

}

-- TAG-SEARCHSPACE-STOP

-- ASN1STOP

|  |
| --- |
| *SearchSpace* field descriptions |
| ***common***  Configures this search space as common search space (CSS) and DCI formats to monitor. |
| ***controlResourceSetId***  The CORESET applicable for this SearchSpace. Value 0 identifies the common CORESET#0 configured in MIB and in *ServingCellConfigCommon*. Values 1..*maxNrofControlResourceSets-1* identify CORESETs configured in System Information or by dedicated signalling. The CORESETs with *non-zero controlResourceSetId* are configured in the same BWP as this *SearchSpace*. If the field *controlResourceSetId-r16* is present, UE shall ignore the *controlResourceSetId* (without suffix). |
| ***dummy1, dummy2***  This field is not used in the specification. If received it shall be ignored by the UE. |
| ***dci-Format0-0-AndFormat1-0***  If configured, the UE monitors the DCI formats 0\_0 and 1\_0 according to TS 38.213 [13], clause 10.1. |
| ***dci-Format2-0***  If configured, UE monitors the DCI format 2\_0 according to TS 38.213 [13], clause 10.1, 11.1.1. |
| ***dci-Format2-1***  If configured, UE monitors the DCI format 2\_1 according to TS 38.213 [13], clause 10.1, 11.2. |
| ***dci-Format2-2***  If configured, UE monitors the DCI format 2\_2 according to TS 38.213 [13], clause 10.1, 11.3. |
| ***dci-Format2-3***  If configured, UE monitors the DCI format 2\_3 according to TS 38.213 [13], clause 10.1, 11.4 |
| ***dci-Format2-4***  If configured, UE monitors the DCI format 2\_4 according to TS 38.213 [13], clause 11.5. |
| ***dci-Format2-5***  If configured, IAB-MT monitors the DCI format 2\_5 according to TS 38.213 [13], clause 14. |
| ***dci-Format2-6***  If configured, UE monitors the DCI format 2\_6 according to TS 38.213 [13], clause 10.1, 11.5. DCI format 2\_6 can only be configured on the SpCell. |
| ***dci-Formats***  Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1. |
| ***dci-FormatsExt***  If this field is present, the field *dci-Formats* is ignored and *dci-FormatsExt* is used instead to indicate whether the UE monitors in this USS for DCI format 0\_2 and 1\_2 or formats 0\_1 and 1\_1 and 0\_2 and 1\_2 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 10.1). |
| ***dci-Formats-MT***  Indicates whether the IAB-MT monitors the DCI formats 2-5 according to TS 38.213 [13], clause 14. |
| ***dci-FormatsSL***  Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1 or for format 3-0 of dynamic grant or for format 3-1 or for formats 3-0 of dynamic grant and 3-1. |
| ***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*).  For IAB-MT, duration indicates number of consecutive slots that a SearchSpace lasts in every occasion, i.e., upon every period as given in the *periodicityAndOffset*. If the field is absent, the IAB-MT applies the value 1 slot, except for DCI format 2\_0 and DCI format 2\_5. The UE ignores this field for DCI format 2\_0 and DCI format 2\_5. The maximum valid duration is periodicity-1 (periodicity as given in the *monitoringSlotPeriodicityAndOffset*). |
| ***freqMonitorLocations***  Value 1 indicates that 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).  For IAB-MT, If the IAB-MT is configured to monitor DCI format 2\_1, only the values 'sl1', 'sl2' or 'sl4' are applicable. If the IAB-MT is configured to monitor DCI format 2\_0 or DCI format 2\_5, only the values ′sl1′, ′sl2′, ′sl4′, ′sl5′, ′sl8′, ′sl10′, ′sl16′, and ′sl20′ are applicable (see TS 38.213, clause 10). If the UE is configured to monitor DCI format 2\_4, the maximum monitoring periodicity for DCI format 2\_4 is 10 slots. |
| ***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-CI***  The number of PDCCH candidates specifically for format 2-4 for the configured aggregation level. If an aggregation level is absent, the UE does not search for any candidates with that aggregation level. The network configures only one aggregationLevel and the corresponding number of candidates (see TS 38.213 [13], clause 10.1). |
| ***nrofCandidates-SFI***  The number of PDCCH candidates specifically for format 2-0 for the configured aggregation level. If an aggregation level is absent, the UE does not search for any candidates with that aggregation level. The network configures only one aggregationLevel and the corresponding number of candidates (see TS 38.213 [13], clause 11.1.1). |
| ***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. The network configures at most 2 search space groups per BWP where the group ID is either 0 or 1. |
| ***searchSpaceId***  Identity of the search space. SearchSpaceId = 0 identifies the *searchSpaceZero* configured via PBCH (MIB) or *ServingCellConfigCommon* and may hence not be used in the *SearchSpace* IE. The *searchSpaceId* is unique among the BWPs of a Serving Cell. In case of cross carrier scheduling, search spaces with the same *searchSpaceId* in scheduled cell and scheduling cell are linked to each other. The UE applies the search space for the scheduled cell only if the DL BWPs in which the linked search spaces are configured in scheduling cell and scheduled cell are both active.  For an IAB-MT, the search space defines how/where to search for PDCCH candidates for an IAB-MT. Each search space is associated with one ControlResearchSet. For a scheduled cell in the case of cross carrier scheduling, except for nrofCandidates, all the optional fields are absent. |
| ***searchSpaceType***  Indicates whether this is a common search space (present) or a UE specific search space as well as DCI formats to monitor for. For each search space, the network always configures the *searchSpaceType* (without suffix) or the *searchSpaceType-r16*, and does not configure both simultaneously. |
| ***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. |
| *SetupOnly2* | In *PDCCH-Config*, the field is optionally present upon creation of a new *SearchSpace* and absent, Need M upon reconfiguration of an existing *SearchSpace*.  In *PDCCH-ConfigCommon*, the field is absent. |

#### – *SearchSpaceId*

The IE *SearchSpaceId* is used to identify Search Spaces. The ID space is used across the BWPs of a Serving Cell. The search space with the *SearchSpaceId* = 0 identifies the search space configured via PBCH (MIB) and in *ServingCellConfigCommon* (*searchSpaceZero*). The number of Search Spaces per BWP is limited to 10 including the common and UE specific Search Spaces.

*SearchSpaceId* information element

-- ASN1START

-- TAG-SEARCHSPACEID-START

SearchSpaceId ::= INTEGER (0..maxNrofSearchSpaces-1)

-- TAG-SEARCHSPACEID-STOP

-- ASN1STOP

## 6.4 RRC multiplicity and type constraint values

### – Multiplicity and type constraint definitions

-- ASN1START

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

ffsValue INTEGER ::= 65536 -- Placehold for all FFS values, to be removed

maxNrofFFS-r16 INTEGER ::= 65536 -- Maximum number of FFS

maxAI-DCI-PayloadSize-r16 INTEGER ::= 128 --Maximum size of the DCI payload scrambled with ai-RNTI

maxAI-DCI-PayloadSize-r16-1 INTEGER ::= 127 --Maximum size of the DCI payload scrambled with ai-RNTI minus 1

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

maxBandsUTRA-FDD-r16 INTEGER ::= 64 -- Maximum number of bands listed in UTRA-FDD UE caps

maxBH-RLC-channelID INTEGER ::= 65536 -- Maximum value of BH RLC Channel ID

maxBT-IdReport-r16 INTEGER ::= 32 -- Maximum number of Bluetooth IDs to report

maxBT-Name-r16 INTEGER ::= 4 -- Maximum number of Bluetooth name

maxCAG-Cell-r16 INTEGER ::= 16 -- Maximum number of NR CAG cell ranges in SIB3, SIB4

maxCBR-Config-r16 INTEGER ::= 8 -- Maximum number of CBR range configurations for sidelink communication

-- congestion control

maxCBR-Config-1-r16 INTEGER ::= 7 -- Maximum number of CBR range configurations for sidelink communication

-- congestion control minus 1

maxCBR-Level-r16 INTEGER ::= 16 -- Maximum nuber of CBR levels

maxCBR-Level-1-r16 INTEGER ::= 15 -- Maximum number of CBR levels minus 1

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

maxCellHistory-r16 INTEGER ::= 16 -- Maximum number of visited cells reported

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

maxCellMeasIdle-r16 INTEGER ::= 6 -- Maximum number of cells per carrier for idle/inactive measurements

maxCellMeasUTRA-FDD-r16 INTEGER ::= 32 -- Maximum number of cells in FDD 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

maxLogMeasReport-r16 INTEGER ::= 520 -- Maximum number of entries for logged measurements

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

maxFreqIdle-r16 INTEGER ::= 8 -- Maximum number of carrier frequencies for idle/inactive measurements

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

maxNrofDUCells-r16 INTEGER ::= 512 -- Max number of cells configured on the collocated IAB-DU

maxNrofAvailabilityCombinationsPerSet-r16 INTEGER ::= 512 -- Max number of AvailabilityCombinationId used in the DCI format 2\_5

maxNrofAvailabilityCombinationsPerSet-r16-1 INTEGER ::= 511 -- Max number of AvailabilityCombinationId used in the DCI format 2\_5 minus 1

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

maxNrofCG-SL-r16 INTEGER ::= 8 -- Max number of configured sidelink grant

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

-- measurement

maxNrofCondCells-r16 INTEGER ::= 8 -- Max number of conditional candidate SpCells

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

maxLC-ID-Iab-r16 INTEGER ::= 65536 -- Maximum value of BH Logical Channel ID extension

maxLTE-CRS-Patterns-r16 INTEGER ::= 3 -- Maximum number of additional LTE CRS rate matching patterns

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 INTEGER ::= 12 -- Max number of CoReSets configurable on a serving cell

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

maxNrofControlResourceSets-1-r16 INTEGER ::= 15 -- Max number of CoReSets configurable on a serving cell extended in minus 1

maxNrofCoresetPools-r16 INTEGER ::= 2 -- Maximum number of CORESET pools

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

-- reporting

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

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

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

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

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

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

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

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

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

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

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

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

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

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

-- in 38.214.

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

-- in 38.214

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

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

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

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

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

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

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

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

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

maxNrofFreqSL-r16 INTEGER ::= 8 -- Maximum number of carrier frequncy for for NR sidelink communication

maxNrofSL-BWPs-r16 INTEGER ::= 4 -- Maximum number of BWP for for NR sidelink communication

maxFreqSL-EUTRA-r16 INTEGER ::= 8 -- Maximum number of EUTRA anchor carrier frequncy for NR sidelink

-- communication

maxNrofSL-MeasId-r16 INTEGER ::= 84 -- Maximum number of sidelink measurement identity (RSRP)

maxNrofSL-ObjectId-r16 INTEGER ::= 64 -- Maximum number of sidelink measurement objects (RSRP)

maxNrofSL-ReportConfigId-r16 INTEGER ::= 64 -- Maximum number of sidelink measurement reporting configuration(RSRP)

maxNrofSL-PoolToMeasureEUTRA-r16 INTEGER ::= 72 -- Maximum number of resoure pool for V2X sidelink measurement to measure

-- for each measurement object (for CBR)

maxNrofSL-PoolToMeasureNR-r16 INTEGER ::= 8 -- Maximum number of resoure pool for NR sidelink measurement to measure for

-- each measurement object (for CBR)

maxFreqSL-NR-r16 INTEGER ::= 8 -- Maximum number of NR anchor carrier frequncy for NR sidelink

-- communication

maxNrofSL-QFIs-r16 INTEGER ::= 2048 -- Maximum number of QoS flow for NR sidelink communication per UE

maxNrofSL-QFIsPerDest-r16 INTEGER ::= 64 -- Maximum number of QoS flow per destination for NR sidelink communication

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

maxNrofSL-Dest-r16 INTEGER ::= 32 -- Maximum number of destination for NR sidelink communication

maxNrofSL-Dest-1-r16 INTEGER ::= 31 -- Highest index of destination for NR sidelink communication

maxNrofSLRB-r16 INTEGER ::= 512 -- Maximum number of radio bearer for NR sidelink communication per UE

maxSL-LCID-r16 INTEGER ::= 512 -- Maximum number of RLC bearer for NR sidelink communication per UE

maxSL-SyncConfig-r16 INTEGER ::= 16 -- Maximum number of sidelink Sync configurations

maxNrofRXPool-r16 INTEGER ::= 16 -- Maximum number of Rx resource poolfor NR sidelink communication

maxNrofTXPool-r16 INTEGER ::= 8 -- Maximum number of Tx resourcepoolfor NR sidelink communication

maxNrofPoolID-r16 INTEGER ::= 16 -- Maximum index of resource pool for NR sidelink communication

maxNrofSRS-PathlossReferenceRS-r16 INTEGER ::= 64 -- Maximum number of RSs used as pathloss reference for SRS power control.

maxNrofSRS-PathlossReferenceRS-1-r16 INTEGER ::= 63 -- Maximum number of RSs used as pathloss reference for SRS power control-1.

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-PosResourceSets-r16 INTEGER ::= 16 -- Maximum number of SRS Positioning resource sets in a BWP.

maxNrofSRS-PosResourceSets-1-r16 INTEGER ::= 15 -- Maximum number of SRS Positioning 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-PosResources-r16 INTEGER ::= 64 -- Maximum number of SRS Positioning resources.

maxNrofSRS-PosResources-1-r16 INTEGER ::= 63 -- Maximum number of SRS Positioning resources in an SRS Positioning

-- 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.

maxNrofTrafficPattern-r16 INTEGER ::= 8 -- Maximum number of Traffic Pattern for NR sidelink communication.

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.

maxNrofPUCCH-PathlossReferenceRSs-r16 INTEGER ::= 64 -- Maximum number of RSs used as pathloss reference for PUCCH power control

-- extended.

maxNrofPUCCH-PathlossReferenceRSs-1-r16 INTEGER ::= 63 -- Maximum number of RSs used as pathloss reference for PUCCH power control

-- minus 1 extended.

maxNrofPUCCH-PathlossReferenceRSsDiff-r16 INTEGER ::= 60 -- Difference between the extended maximum and the non-extended maximum

maxNrofPUCCH-ResourceGroups-r16 INTEGER ::= 4 -- Maximum number of PUCCH resources groups.

maxNrofPUCCH-ResourcesPerGroup-r16 INTEGER ::= 128 -- Maximum number of PUCCH resources in a PUCCH group.

maxNrofPUCCH-ResourcesPerGroup-1-r16 INTEGER ::= 127 -- Maximum number of PUCCH resources in a PUCCH group 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.

maxNrofPUSCH-PathlossReferenceRSs-r16 INTEGER ::= 64 -- Maximum number of RSs used as pathloss reference for PUSCH power control

-- extended

maxNrofPUSCH-PathlossReferenceRSs-1-r16 INTEGER ::= 63 -- 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-r16 INTEGER ::= 128 -- Max number of frequencies for IDC indication.

maxCombIDC-r16 INTEGER ::= 128 -- Max number of reported UL CA for IDC indication.

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.

maxNrofCandidateBeams-r16 INTEGER ::= 64 -- Max number of candidate beam resources in BFR config.

maxNrofCandidateBeamsExt-r16 INTEGER ::= 9999 -- FFS

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

maxNrofQFIs INTEGER ::= 64

maxNrofResourceAvailabilityPerCombination-r16 INTEGER ::= 256 -- FFS

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

maxNrofSpatialRelationInfos-plus-1 INTEGER ::= 9

maxNrofSpatialRelationInfos-r16 INTEGER ::= 64

maxNrofSpatialRelationInfosDiff-r16 INTEGER ::= 56 -- Difference between maxNrofSpatialRelationInfos-r16 and maxNrofSpatialRelationInfos

maxNrofIndexesToReport INTEGER ::= 32

maxNrofIndexesToReport2 INTEGER ::= 64

maxNrofSSBs-r16 INTEGER ::= 64 -- Maximum number of SSB resources in a resource set.

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

maxHRNN-Len-r16 INTEGER ::= 48-- Maximum length of HRNNs

maxNPN-r16 INTEGER ::= 12 -- Maximum number of NPNs broadcast and reported by UE at establishment

maxNrOfMinSchedulingOffsetValues-r16 INTEGER ::= 2 -- Maximum number of min. scheduling offset (K0/K2) configurations

maxK0-SchedulingOffset-r16 INTEGER ::= 16 -- Maximum number of slots configured as min. scheduling offset (K0)

maxK2-SchedulingOffset-r16 INTEGER ::= 16 -- Maximum number of slots configured as min. scheduling offset (K2)

maxDCI-2-6-Size-r16 INTEGER ::= 140 -- Maximum size of DCI format 2-6

maxDCI-2-6-Size-1-r16 INTEGER ::= 139 -- Maximum DCI format 2-6 size minus 1

maxNrofUL-Allocations-r16 INTEGER ::= 64 -- Maximum number of PUSCH time domain resource allocations

maxNrofP0-PUSCH-Set-r16 INTEGER ::= 2 -- Maximum number of P0 PUSCH set(s)

maxOnDemandSIB INTEGER ::= 3 -- Maximum number of SIB(s) that can be requested on-demand

maxCI-DCI-PayloadSize-r16 INTEGER ::= 126 -- Maximum number of the DCI size for CI

maxCI-DCI-PayloadSize-r16-1 INTEGER ::= 125 -- Maximum number of the DCI size for CI minus 1

maxWLAN-Id-Report-r16 INTEGER ::= 32 -- Maximum number of WLAN IDs to report

maxWLAN-Name-r16 INTEGER ::= 4 -- Maximum number of WLAN name

maxRAReport-r16 INTEGER ::= 8 -- Maximum number of RA procedures information to be included in the

-- RA report

maxTxConfig-r16 INTEGER ::= 64 -- Maximum number of sidelink transmission parameters configurations

maxTxConfig-1-r16 INTEGER ::= 63 -- Maximum number of sidelink transmission parameters configurations minus 1

maxPSSCH-TxConfig-r16 INTEGER ::= 16 -- Maximum number of PSSCH TX configurations

maxNrofCLI-RSSI-Resources-r16 INTEGER ::= 64 -- Maximum number of CLI-RSSI resources for UE

maxNrofCLI-RSSI-Resources-r16-1 INTEGER ::= 63 -- Maximum number of CLI-RSSI resources for UE minus 1

maxNrofSRS-ResourcesCLI-r16 INTEGER ::= 32 -- Maximum number of SRS resources for CLI measurement for UE

maxCLI-Report-r16 INTEGER ::= 8

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

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

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

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

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

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

maxNrofDormancyGroups INTEGER ::= 5 --

maxNrofPUCCH-ResourceGroups-1-r16 INTEGER ::= 3 --

maxNrofServingCellsTCI-r16 INTEGER ::= 32 -- Maximum number of serving cells in simultaneousTCI-UpdateList

maxNrofMultiplePUSCHs-r16 INTEGER ::= ffsValue --

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

-- ASN1STOP

### – End of NR-RRC-Definitions

-- ASN1START

END

-- ASN1STOP