3GPP TSG-RAN WG2 Meeting #109bis e Tdoc R2-2003892

Electronic 20th – 30th April 2020

**Source: Ericsson (Email discussion rapporteur)**

**Title: [AT109bis-e][102][EMIMO] RRC aspects (Ericsson)**

**Agenda Item: 6.16.2**

**Document for: Discussion**

# 1 Introduction

This discussion is to progress RRC issues for eMIMO WI as per below email discussion:

[R2-2003181](file:///C:\Data\3GPP\Extracts\R2-2003181_eMIMORRCOpenIssues_submitted.docx) [Post109e#34][EMIMO] RRC Open Issues (Ericsson) Ericsson discussion Rel-16 NR\_eMIMO-Core

* Moved to offline email discussion [102] with the intention to go back online during the web conference call(s)
* [AT109bis-e][102][EMIMO] RRC aspects (Ericsson)

Scope: Continue the discussion on RRC aspects, based on [R2-2003181](file:///C:\Data\3GPP\Extracts\R2-2003181_eMIMORRCOpenIssues_submitted.docx)

Initial intended outcome: summary of the offline discussion with e.g.:

* + - Set of proposals with full consensus, if any (agreeable over email)
    - Set of proposals with almost full consensus to discuss in the follow up conference call
    - Set of open issues and proposals to postpone to next meeting

Initial deadline (for companies' feedback): Wednesday 2020-04-22 16:00 UTC

Initial deadline (for rapporteur's summary in R2-2003892): Thursday 2020-04-23 10:00 UTC

Proposed agreements in R2-2003892 indicated for email agreement and not challenged until Thursday 2020-04-23 22:00 UTC will be declared as agreed by the session chair. For the other ones, the discussion will continue online.

This discussion is organized as follows. In Section 2, we have open issues that are suggested to be treated during this e-meeting. In Section 3 we list issues proposed to be postponed to next meeting. In Appendic C the total list of open issues is maintained.

Regarding these CRs the rapporteur conclusion is stated here:

[R2-2002870](file:///C:\Data\3GPP\Extracts\R2-2002870_Correction%20on%20the%20number%20of%20CORESETs%20per%20BWP%20(RIL%20v101).docx) Correction on the number of CORESETs per BWP (RIL v101) vivo CR Rel-16 38.331 16.0.0 1529 - F NR\_eMIMO-Core

* to be discussed in offline [102]
* Noted

*Rapporteur comment: The CR implemented CE whereas the CR interprets NCE which is where the confusion on number of CORESETs come from. How to implement the extension in the ID space has been on the RRC email discussions for a few rounds already and is listed in this document as well. The issue is waiting for ASN1 general discussion on how these ID space extensions are done.*

[R2-2002871](file:///C:\Data\3GPP\Extracts\R2-2002871_Correction%20on%20RLM%20RS%20configuration%20(RIL%20v102).docx) Correction on RLM RS configuration (RIL v102) vivo CR Rel-16 38.331 16.0.0 1530 - F NR\_eMIMO-Core

* to be discussed in offline [102]
* Noted

*Rapporteur comment: This is editorial and has been taken into account in Section 2.6 in this document.*

# 2 Discussion on open issues to be handled during this meeting

2.1 coresetPoolIndex-r16 in ControlResourceSet

In R2-2001705, the coresetPoolIndex-r16 in ControlResourceSet has value range (0..1) and the below field description which needs to be updated:

***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). When absent, UE shall use the index 0.

**Summary from R2-2003181**

Seems there are at least following issues:

* Having CORESETPoolIndex configurable to value 0 AND stating UE assumes value 0 if field is absent
* Having a UE not supporting mPDCCH mTRP assuming any value for CORESETPoolIndex, configured or by default assumption
* Having a UE supporting mPDCCH mTRP a mixture of CORESETs with/without CORESETPoolIndex value (configured or default)
* Having a UE supporting mPDCCH mTRP CORESETs with one CORESETPoolIndex value (e.g. 0) (configured or default) but no CORESETs with the other value (e.g. 1)

1. RAN2 to discuss whether the above list of issues is true and if that is all issues related CORESETPoolIndex
2. RAN2 to consider if the following approach would resolve the issues:
   1. UE is configured with CORESETPoolIndex only if it support (assumed) mPDCCH mTRP capability
   2. AND CORESETPoolIndex can only take value 1
   3. AND not all CORESETs can be configured with value 1
   4. AND other CORESETs assume value 0 if CORESETPoolIndex 1(or enable) is configured

*Q1. Companies are asked comment on Proposal 1 and 2.*

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| --- | --- |
| Company | Agree/disagree |
| Huawei, HiSilicon | Agree with a, b and d. What is the purpose of c? |
| Intel | Agree to all, seems reasonable approach. |
| Ericsson | Agree all  Purpos of c is that if all are configured with 1 there are no CORESET that can be left with value 0 |
| Qualcomm | For the second case, ‘Having a UE not supporting mPDCCH mTRP assuming any value for CORESETPoolIndex, configured or by default assumption’, if a CORESET is not configured with coresetPoolIndex or if CORESET0 is present in that CC, no other CORESET can be configured with coresetPoolIndex to 1. Otherwise, this CC will be the mPDCCH mTRP case.  For the fourth case, ‘Having a UE supporting mPDCCH mTRP CORESETs with one CORESETPoolIndex value (e.g. 0) (configured or default) but no CORESETs with the other value (e.g. 1)’, in our understanding, this is not mPDCCH mTRP case.  Regarding the proposal 2, the b is not clear for us. Does it mean coresetPoolIndex can only take value 1 and other CORESETs are not configured?  For c, even if all CORESETs are configured with coresetPoolIndex with 1, but CORESET0 is in that CC, this still results in mPDCCH mTRP. |
| Nokia, Nokia Shanghai Bell | Disagree: We can agree with a) but not with the others: These are changing both RAN1 and RAN2 behaviours. The cited cases are “problems” only because the proponents have named them so.  Let’s consider them a bit more in details:   * *Having CORESETPoolIndex configurable to value 0 AND stating UE assumes value 0 if field is absent* * **Nokia: This is not a problem at all, it’s coming from RAN1 specifications. A Rel-16 UE must bne able to cope within a Rell-15 configuration!** * *Having a UE not supporting mPDCCH mTRP assuming any value for CORESETPoolIndex, configured or by default assumption* * **This is again not a problem: m,TRP UE m,ay be operating under non-mTRP assumption in which case it always uses pool ID = 0. What is the problem with that?** * *Having a UE supporting mPDCCH mTRP a mixture of CORESETs with/without CORESETPoolIndex value (configured or default)* * **What is undefined in UE behaviour in these cases? Whether UE uses the configured value or the default value is all the same form L1 perspective. It doesn’t matter whether it’s configured or not.** * *Having a UE supporting mPDCCH mTRP CORESETs with one CORESETPoolIndex value (e.g. 0) (configured or default) but no CORESETs with the other value (e.g. 1)* * **Same as with previous: This is a network configuration and UE behaviour is still defined. It may not be the most advisable one, but we do not specify according to stupid network behaviour.**   The only thing RAN2 needs to define is what’s already there: UE applies value “0” if the pool ID is not configured. If these changes are so simple, why wasn’t a TP on the RAN2 changes for this provided in the annex? With out proposal, it seems only **one sentence** needs to be added to RAN2 for the absence of POOL ID = 0 (see red text below).  ***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. |
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2.2 nrofReportedRS-ForSINR in CSI-ReportConfig

In R2-2003181(previous RRC email discussion), the nrofReportedRS-ForSINR in CSI-ReportConfig was discussed and TP provided in Appendix A is suggested as the conclusion.

1. RAN2 to agree on the TP in Appendix A for the nrofReportedRS-ForSINR in CSI-ReportConfig

*Q2 Companies are asked to provide their views whether they agree with Proposal 3?*

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| --- | --- |
| Company | Answer |
| Huawei, HiSilicon | Agree |
| Intel | reportConfig-r16 is not referred, or is it meant to be CSI-ReportConfig-r16  *ER comment: IE name is in two lines above if that is the confusion* |
| Ericsson | agree |
| Qualcomm | Agree |
| Nokia, Nokia Shanghai Bell | No - Intent is OK but there are several ASN.1 errors in the Appendix A that make it difficult to understand:   * The IE is not used anywhere, which makes evaluting this option difficult – how is this used? * IE names must start with capital letter * The IE name is confusing – is it CSI-ReportConfig-v16xy or something else? So is it a critical extension of something else? * SEQUENCE definition never includes OPTIONAL – only fields do   Below shows an attempt to the IE definition, but this may also be incorrect:  CSI-ReportConfig-v16xy SEQUENCE {  nrofReportedRS-ForSINR-r16 ENUMERATED {n1, n2, n3, n4},  reportQuantity-r16 CHOICE {  cri-SINR-r16 NULL,  ssb-Index-SINR-r16 NULL  } OPTIONAL -- Need R  } |

2.3 dmrs-Downlink in DMRS-DownlinkConfig

In R2-2003181(previous RRC email discussion), the dmrs-Downlink in DMRS-DownlinkConfig was discussed and TP provided in Appendix B is suggested as the conclusion, also for DMRS-Uplink.

1. RAN2 to agree on the TP in Appendix A for the dmrs-Downlink and dmrs-Uplink field descriptions

*Q3. Companies are asked to provide their views whether they agree with Proposal 4?*

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| Company | Answer |
| Huawei, HiSilicon | Our RAN1 colleagues seem happy with the proposed definition but when the TP says:  This field indicates whether low PAPR DMRS is used, as specified in TS38.211 [16], clause 7.4.1.1.  while 38.211 clause 7.4.1.1 actually does not say anything about low PAPR, isn't it a little inconsistent?  Same problem for the other two parameters.  Either we wait for RAN1 to come up with some update of 38.211 or maybe we should just put definitions such as " This field is used in the sequence generation for DMRS for PDSCH as specified in TS 38.211 section 7.4.1.1.1" |
| Ericsson | The WI objective was to create RS that results in more PA friendly signal form and that is what is enabled here. Do we want to hide it given it is not mentioned in ran1 spec? It would give hint to next generations on why the new design is there as use of it may have disadvantages as well.. |
| Qualcomm | In RAN1 parameter list, it indicates that “When this parameter is present in DMRS-DownlinkConfig, then the Rel.16 low PAPR DMRS is used instead of the Rel.15 DMRS according to TS 38.211, Clause 7.4.1.1.1”.  For dmrs-Downlink, maybe we can say, ‘This field indicates whether the low PAPR DMRS is used, and the sequence generation for DMRS for PDSCH is specified in TS 38.211 [16], clause 7.4.1.1.1. ‘ |
| Nokia, Nokia Shanghai Bell | The field descriptions seem fine to us, but we are OK if the exact RAN1 specification clause is double-checked (as Huawei comments). We could probably rely on companies checking from their colleagues and bringing concrete proposals to next RAN2 (as this is anyway a very minor matter in the end). |
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2.4 New open issues brought up in previous RRC email discussion R2-2003181

These new open issues were classified by email discussion rapporteur to need WI specific discussion. Companies are asked to comment each item accordingly.

2.4.1 lte-CRS-PatternList

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| lte-CRS-PatternList-r16 and lte-CRS-PatternListSecond-r16 are placed under uplinkConfig while lte-CRS-ToMatchAround is placed directly under ServingCellConfig. We think it should be aligned i.e. lte-CRS-PatternList-r16 and lte-CRS-PatternListSecond-r16 should be placed under ServingCellConfig | WI |

*Q4.*

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| --- | --- |
| Company | Answer |
| Huawei, HiSilicon | Agree |
| Intel | Agree |
| Ericsson | agree |
| Qualcomm | Agree |
| Nokia, Nokia Shanghai Bell | Agree |
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2.4.2 maxNrofPorts

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| Change the signalling of maxNrofPorts from ENUMERATED {n2} to ENUMERATED {n1, n2} as RAN1 suggested.  In addition, add the condition when n2 can be selected in the field description.  Proposed change:  maxNrofPorts  The maximum number of DL PTRS ports specified in TS 38.214 [19] (clause 5.1.6.3). 2 PT-RS ports can only be configured for single-PDCCH based multi-TRP operation. | WI |

*Q5.*

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| Company | Answer |
| Intel | Agree |
| Ericsson | Half agree. I think in last rounds we changed to have only n2 as n1 does not seem to give any max value. For the value n2 we can add the restriction. |
| Qualcomm | Agree |
| Nokia, Nokia Shanghai Bell | Agree. |
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2.4.3 pdsch-TimeDomainAllocationList-v16xy

Note that this issue/item has cross WI impact between URLLC and NR-U.

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| pdsch-TimeDomainAllocationList-v16xy must always and only be configured when slotBased is configured in repetitionSchemeConfig, while they now look like independent configuration. | WI |

*Q6.*

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| Company | Answer |
| Huawei, HiSilicon | Agree (this was our remark) |
| Ericsson | Agree partly. The key part is taken into account in below. Now, timedomainallocation list only has this parameter but if we add … the suggestion is not true anymore. Better to refer to the exact parameter but agree the wording can be improved.  ***slotBased***  Configures UE with slot based repetition scheme. When slot based repetition scheme is configured the parameter *repetitionNumber* is present in IE *PDSCH-TimeDomainResourceAllocationList* |
| Nokia, Nokia Shanghai Bell | Agree and think we should clarify this via ASN.1 field descriptions and/or conditions. Ericsson proposal is one but its text is not quite aligned with normal way for network restrictions:  ***slotBased***  Configures UE with slot-based repetition scheme. Network always configures this field when the parameter *repetitionNumber* is present in IE *PDSCH-TimeDomainResourceAllocationList* |
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2.4.4 PDSCH-TimeDomainResourceAllocation

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| In PDSCH-TimeDomainResourceAllocation, it should be possible to signal n1 for repetitionNumber (suggest changing to Need S and capture that when the field is absent, the UE uses n1). | WI |

*Q7.*

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| Company | Answer |
| Huawei, HiSilicon | Agree (this was our remark) |
| Ericsson | It is not clear why n1 is needed. N1 is basically same as Rel-15 which is no repetition. Much clearer not to have it so we can keep the condition discussed in Q6. |
| Nokia, Nokia Shanghai Bell | Disagree: This parameter is about repetition: If we use n1, there is no repetition, which is the same as not configuring it at all. We don’t think this change is needed as the parameter can anyway be released (n1 would only be needed if there is no other way to release the field). |
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2.4.5 schedulingRequestID-BFR-SCell

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| Suggest capturing in the field description of schedulingRequestID-BFR-SCell in MAC-CellGroupConfig that this value is not used in any LogicalChannelConfig | WI |

*Q8.*

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| --- | --- |
| Company | Answer |
| Huawei, HiSilicon | Agree (this was our remark) |
| Ericsson | It is a topic in the BFR discussion and we should wait for it to converge. |
| Qualcomm | This issue is also discussed in [AT109bis-e][101][EMIMO] MAC corrections. Should discuss together. |
| Nokia, Nokia Shanghai Bell | Agree with Ericsson, this is discussed in the other eMIMO email discussion and it seems to converge to the solution that same SR can be allocated to BFR and LCH. |
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2.5 Unclear if open issues but brought up in previous RRC email discussions

Out of the total list of open issues, presented in Appendix C, marked with ASN1, these do NOT have RIL associated.

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| dataScramblingIdentityPDSCH, dataScramblingIdentityPDSCH2 in PDSCH-Config | HW: Is it so likely that the network can just add the r16 parameters without changing the value of any r15 parameter of any entry in the list?  No strong view but have some doubts that NCE is the best choice (supposing we keep NCE because we think this is likely that the network can add r16 parameters only, it is unclear in the field description whether the network can release the r16 parameters for all entries by setting the r16 parameter to release.).  [Huawei, HiSilicon] This was about pdsch-TimeDomainAllocationList-v16xy in PDSCH-Config |
| Cond PI2-BPSK  The field is optionally present if tp-pi2BPSK is included in PUSCH-Config. It is absent, Need R otherwise. | HW: Does this(PUSCHConfig) refer the field of the instance of PUSCH-Config in which the DMRS-Uplink is configured or does it also refer tp the PUSCH-Config in UL BPW in which the DRMS-Config is configured within configuredGrantConfig? |
|  | When an field is not to be used when a new field is configured:  - if the field not to be used is optional need R, then it should be the network responsibility not to configure both  - if the field not to be used is optional need M, we need to decide whether there should be a generic way to do that  - of the field not to be used is mandatory, it is ok to have "the UE shall ignore" for the mandatory field  For instance, in CSI-ReportConfig, codebookConfig is optional Need R so there should be no UE requirement to ignore it just in case a stupid network implementation would send it together with codebookConfig-r16. |

*Q8. Companies are asked to point out(and explain) if these are still relevant. If no comments these will be deleted going forward.*

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| --- | --- |
| Company | Answer |
| Huawei, HiSilicon | **1) pdsch-TimeDomainAllocationList-v16xy**: for PUSCH-TimeDomainAllocationList (for URLLC and NR-U), a "-r16" IE (actually using suffix "New" but that should be corrected) is created which includes all the R15 parameters plus the R16 parameters and extension markers.  Here, for the same thing for PDSCH, we add only R16 parameters and the structure is still not extensible.  We suggest that the extensions of the TimeDomainAllocation lists for PUSCH and for PDSCH are done in the same way, either both -v16 (only R16 parameters) or both -r16 (R15 and R16 parameters plus extension markers).  In addition, for URLLC, there is a new R16 field which is SetupRelease of the R15 PDSCH-TimeDomainResourceAllocationList, If a PDSCH-TimeDomainResourceAllocationList-r16 with extension markers is created, it is better to use it there.  We raised this as H003 with R2-2003626.  **2) dmrs-UplinkTransformPrecoding-r16** in DMRS-UplinkConfig: the presence condition is "The field is optionally present if tp-pi2BPSK is included in **PUSCH-Config**. It is absent, Need R otherwise."  There are fields of type DMRS-UplinkConfig: - in PUSCH-Config, i.e. dmrs-UplinkForPUSCH-MappingTypeA/B(-ForDCI-Format0-2-r16) - in ConfiguredGrantConfig, i.e. cg-DMRS-Configuration  We should clarify a) can dmrs-UplinkTransformPrecoding-r16 be included for DCI 0-2 and in ConfiguredGrantConfig? b) which PUSCH-Config does the condition refer to  In PUSCH-Config, it is probably "in the PUSCH-Config in which this instance is included". Also, is this supported only for DCI format 0-2?  In ConfiguredGrantConfig, is this supported? Is it related to "whether tp-pi2BPSK is included in the PUSCH-Config included in the BWP-UplinkDedicated in which the ConfiguredGrantConfig is included"?  **3) codebookConfig in CSI-ReportConfig**  This is in I626, marked as PropAgree and we agree with that. |
| Nokia, Nokia Shanghai Bell | There are two remaining issues: 1) and 2) from Huawei comment above.  1) We agree with Huawei that it would be netter to use same for both PUSCH and PDSCH lists if possible: The difference her is that the PUSCH parameters only affect certain DCIs, whereas the PDSCH parameters affect all of them.  If we harmonize, NCE has to be used as the parameters relate to existing allocations: they cannot exist as stand-alone.  if we were to use critical extension, it has to replace the existing Rel-15 structure as the number of elements cannot increase. That is what was done for the PUSCH, and it’s clearly more complex.  2) In our understanding the PI/2 BPSK refers to the same PUSCH where ther transform precoding is configured. But this might be something to further clarify from RAN1 as this is not in RAN2 responsibility. |
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2.6 Editorials to be fixed in next RRC CR

*Q9. Companies are asked to provide more if found.*

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| Company | Issues found |
| Huawei, HiSilicon(last round) | In SRS-ResourceSet, field description of pathlossReferenceRS-List is missing. |
| Huawei, HiSilicon(last round) | Change the variable name for maxNrofSRS-PathlossReferenceRS-r16-1 to maxNrofSRS-PathlossReferenceRS-1-r16 and need to define in the 6.4.  maxNrofSRS-PathlossReferenceRS-r16 INTEGER ::== 64  maxNrofSRS-PathlossReferenceRS-1-r16 INTEGER ::== 63 |
| Huawei, HiSilicon(last round) | Change IE name of PDSCH-TimeDomainResourceAllocation-v16 to PDSCH-TimeDomainResourceAllocation-r16. |
| Huawei, HiSilicon(last round) | When an field is not to be used when a new field is configured:  - if the field not to be used is optional need R, then it should be the network responsibility not to configure both  - if the field not to be used is optional need M, we need to decide whether there should be a generic way to do that  - of the field not to be used is mandatory, it is ok to have "the UE shall ignore" for the mandatory field  For instance, in CSI-ReportConfig, codebookConfig is optional Need R so there should be no UE requirement to ignore it just in case a stupid network implementation would send it together with codebookConfig-r16. |
| Vivo | ***purpose***  Determines whether the UE shall monitor the associated reference signal for the purpose of cell- and/or beam failure detection. For SCell, network only configures the value to beamFailure. |
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# 3 List WI specific issues proposed to be postponed to next meeting

Issues listed here are proposed to be postponed to next meeting as these depend on RAN1 reply LS.

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| Parameter/issue | comments | WI/ASN1 |
| BDFactor to be placed under PhysicalCellGroupConfig or servingCellConfig. | Question is included in the LS in R2-2001683.  [Samsung] according to the RAN1 excel (R1-2001478) BDFactorR is Per DL serving cell (i.e. It should be directly under ServingCellConfig or PDCCH-servingCellConfig) | WI |
| Current value range for BDFactor is ENUMERATED {n1} and it is unclear if this is what is needed in the end. | The question in the LS does not include to update the value range of the parameter. Companies are encouraged to lift this internally so the reply would contain also the updated value range. | WI |
| Whether repetition schemes 2a/2b/3 (fdmSchemeA, fdmSchemeB and tdmScheme) and scheme 4 (slotBased) are mutually exclusive in all UE configuration options. | Question is included in the LS in R2-2001683. | WI |
| maximum number of PUCCH resources in a PUCCH group | Question is included in the LS in R2-2001683. | WI |
| maximum value of serving cells in per CC/BWP lists. | Question is included in the LS in R2-2001683. | WI |
| The variable name of the maximum number of serving cells in simultaneousTCI-UpdateList (i.e. maxNrofServingCells) is already exist, so no need to introduce the same variable.  If this maximum number of serving cells in simultaneousTCI-UpdateList is different from the current one, then change the name of field to distinguish between both. | To be checked when we get the value | WI |
| In RepetitionSchemeConfig, it should not be possible to configure both fdm-tdm and slotBased | Question is included in the LS in R2-2001683. | WI |

# Appendix A

\_\_\_\_\_\_\_\_\_\_\_\_\_\_start of TP\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### – CSI-ReportConfig

The IE *CSI-ReportConfig* is used to configure a periodic or semi-persistent report sent on PUCCH on the cell in which the *CSI-ReportConfig* is included, or to configure a semi-persistent or aperiodic report sent on PUSCH triggered by DCI received on the cell in which the *CSI-ReportConfig* is included (in this case, the cell on which the report is sent is determined by the received DCI). See TS 38.214 [19], clause 5.2.1.

*CSI-ReportConfig* information element

-- ASN1START

-- TAG-CSI-REPORTCONFIG-START

CSI-ReportConfig ::= SEQUENCE {

reportConfigId CSI-ReportConfigId,

carrier ServCellIndex OPTIONAL, -- Need S

resourcesForChannelMeasurement CSI-ResourceConfigId,

csi-IM-ResourcesForInterference CSI-ResourceConfigId OPTIONAL, -- Need R

nzp-CSI-RS-ResourcesForInterference CSI-ResourceConfigId OPTIONAL, -- Need R

reportConfigType CHOICE {

periodic SEQUENCE {

reportSlotConfig CSI-ReportPeriodicityAndOffset,

pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF PUCCH-CSI-Resource

},

semiPersistentOnPUCCH SEQUENCE {

reportSlotConfig CSI-ReportPeriodicityAndOffset,

pucch-CSI-ResourceList SEQUENCE (SIZE (1..maxNrofBWPs)) OF PUCCH-CSI-Resource

},

semiPersistentOnPUSCH SEQUENCE {

reportSlotConfig ENUMERATED {sl5, sl10, sl20, sl40, sl80, sl160, sl320},

reportSlotOffsetList SEQUENCE (SIZE (1.. maxNrofUL-Allocations)) OF INTEGER(0..32),

p0alpha P0-PUSCH-AlphaSetId

},

aperiodic SEQUENCE {

reportSlotOffsetList SEQUENCE (SIZE (1..maxNrofUL-Allocations)) OF INTEGER(0..32)

}

},

reportQuantity CHOICE {

none NULL,

cri-RI-PMI-CQI NULL,

cri-RI-i1 NULL,

cri-RI-i1-CQI SEQUENCE {

pdsch-BundleSizeForCSI ENUMERATED {n2, n4} OPTIONAL -- Need S

},

cri-RI-CQI NULL,

cri-RSRP NULL,

ssb-Index-RSRP NULL,

cri-RI-LI-PMI-CQI NULL

},

reportFreqConfiguration SEQUENCE {

cqi-FormatIndicator ENUMERATED { widebandCQI, subbandCQI } OPTIONAL, -- Need R

pmi-FormatIndicator ENUMERATED { widebandPMI, subbandPMI } OPTIONAL, -- Need R

csi-ReportingBand CHOICE {

subbands3 BIT STRING(SIZE(3)),

subbands4 BIT STRING(SIZE(4)),

subbands5 BIT STRING(SIZE(5)),

subbands6 BIT STRING(SIZE(6)),

subbands7 BIT STRING(SIZE(7)),

subbands8 BIT STRING(SIZE(8)),

subbands9 BIT STRING(SIZE(9)),

subbands10 BIT STRING(SIZE(10)),

subbands11 BIT STRING(SIZE(11)),

subbands12 BIT STRING(SIZE(12)),

subbands13 BIT STRING(SIZE(13)),

subbands14 BIT STRING(SIZE(14)),

subbands15 BIT STRING(SIZE(15)),

subbands16 BIT STRING(SIZE(16)),

subbands17 BIT STRING(SIZE(17)),

subbands18 BIT STRING(SIZE(18)),

...,

subbands19-v1530 BIT STRING(SIZE(19))

} OPTIONAL -- Need S

} OPTIONAL, -- Need R

timeRestrictionForChannelMeasurements ENUMERATED {configured, notConfigured},

timeRestrictionForInterferenceMeasurements ENUMERATED {configured, notConfigured},

codebookConfig CodebookConfig OPTIONAL, -- Need R

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

groupBasedBeamReporting CHOICE {

enabled NULL,

disabled SEQUENCE {

nrofReportedRS ENUMERATED {n1, n2, n3, n4} OPTIONAL -- Need S

}

},

cqi-Table ENUMERATED {table1, table2, table3, spare1} OPTIONAL, -- Need R

subbandSize ENUMERATED {value1, value2},

non-PMI-PortIndication SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerConfig)) OF PortIndexFor8Ranks OPTIONAL, -- Need R

...,

[[

semiPersistentOnPUSCH-v1530 SEQUENCE {

reportSlotConfig-v1530 ENUMERATED {sl4, sl8, sl16}

} OPTIONAL -- Need R

]],

[[

semiPersistentOnPUSCH-v16xy SEQUENCE {

reportSlotOffsetListForDCI-Format0-2-r16 SEQUENCE (SIZE (1.. maxNrofUL-Allocations-r16)) OF INTEGER(0..32)

OPTIONAL, -- Need R

reportSlotOffsetListForDCI-Format0-1-r16 SEQUENCE (SIZE (1.. maxNrofUL-Allocations-r16)) OF INTEGER(0..32)

OPTIONAL -- Need R

} OPTIONAL, -- Need R

codebookConfig-r16 CodebookConfig-r16 OPTIONAL -- Need R

]]

}

reportConfig-r16 SEQUENCE {

nrofReportedRS-ForSINR-r16 ENUMERATED {n1, n2, n3, n4},

reportQuantity-r16 CHOICE {

cri-SINR-r16 NULL,

ssb-Index-SINR-r16 NULL

} OPTIONAL -- Need R

} OPTIONAL, -- Need R

\_\_\_\_\_\_\_\_\_\_\_\_\_\_end of TP\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# 5 Appendix B

\_\_\_\_\_\_\_\_\_\_\_\_\_\_start of TP\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### – DMRS-DownlinkConfig

The IE *DMRS-DownlinkConfig* is used to configure downlink demodulation reference signals for PDSCH.

*DMRS-DownlinkConfig* information element

-- ASN1START

-- TAG-DMRS-DOWNLINKCONFIG-START

DMRS-DownlinkConfig ::= SEQUENCE {

dmrs-Type ENUMERATED {type2} OPTIONAL, -- Need S

dmrs-AdditionalPosition ENUMERATED {pos0, pos1, pos3} OPTIONAL, -- Need S

maxLength ENUMERATED {len2} OPTIONAL, -- Need S

scramblingID0 INTEGER (0..65535) OPTIONAL, -- Need S

scramblingID1 INTEGER (0..65535) OPTIONAL, -- Need S

phaseTrackingRS SetupRelease { PTRS-DownlinkConfig } OPTIONAL, -- Need M

...,

[[

dmrs-Downlink-r16 ENUMERATED {enabled} OPTIONAL -- Need R

]]

}

-- TAG-DMRS-DOWNLINKCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *DMRS-DownlinkConfig* field descriptions |
| ***dmrs-AdditionalPosition***  Position for additional DM-RS in DL, see Tables 7.4.1.1.2-3 and 7.4.1.1.2-4 in TS 38.211 [16]. If the field is absent, the UE applies the value pos2. See also clause 7.4.1.1.2 for additional constraints on how the network may set this field depending on the setting of other fields. |
| ***dmrs-Downlink***  This field indicates whether low PAPR DMRS is used, as specified in TS38.211 [16], clause 7.4.1.1. |
| ***dmrs-Type***  Selection of the DMRS type to be used for DL (see TS 38.211 [16], clause 7.4.1.1.1). If the field is absent, the UE uses DMRS type 1. |
| ***maxLength***  The maximum number of OFDM symbols for DL front loaded DMRS. *len1* corresponds to value 1. *len2* corresponds to value 2. If the field is absent, the UE applies value *len1*. If set to *len2*, the UE determines the actual number of DM-RS symbols by the associated DCI. (see TS 38.211 [16], clause 7.4.1.1.2). |
| ***phaseTrackingRS***  Configures downlink PTRS. If the field is not configured, the UE assumes that downlink PTRS are absent. See TS 38.214 [19] clause 5.1.6.3. |
| ***scramblingID0***  DL DMRS scrambling initialization (see TS 38.211 [16], clause 7.4.1.1.1). When the field is absent the UE applies the value *physCellId* configured for this serving cell. |
| ***scramblingID1***  DL DMRS scrambling initialization (see TS 38.211 [16], clause 7.4.1.1.1). When the field is absent the UE applies the value *physCellId* configured for this serving cell. |

#### – DMRS-UplinkConfig

The IE *DMRS-UplinkConfig* is used to configure uplink demodulation reference signals for PUSCH.

*DMRS-UplinkConfig* information element

-- ASN1START

-- TAG-DMRS-UPLINKCONFIG-START

DMRS-UplinkConfig ::= SEQUENCE {

dmrs-Type ENUMERATED {type2} OPTIONAL, -- Need S

dmrs-AdditionalPosition ENUMERATED {pos0, pos1, pos3} OPTIONAL, -- Need S

phaseTrackingRS SetupRelease { PTRS-UplinkConfig } OPTIONAL, -- Need M

maxLength ENUMERATED {len2} OPTIONAL, -- Need S

transformPrecodingDisabled SEQUENCE {

scramblingID0 INTEGER (0..65535) OPTIONAL, -- Need S

scramblingID1 INTEGER (0..65535) OPTIONAL, -- Need S

...,

[[

dmrs-Uplink-r16 ENUMERATED {enabled} OPTIONAL -- Need R

]]

} OPTIONAL, -- Need R

transformPrecodingEnabled SEQUENCE {

nPUSCH-Identity INTEGER(0..1007) OPTIONAL, -- Need S

sequenceGroupHopping ENUMERATED {disabled} OPTIONAL, -- Need S

sequenceHopping ENUMERATED {enabled} OPTIONAL, -- Need S

...,

[[

dmrs-UplinkTransformPrecoding-r16 DMRS-UplinkTransformPrecoding-r16 OPTIONAL -- Cond PI2-BPSK

]]

} OPTIONAL, -- Need R

...

}

DMRS-UplinkTransformPrecoding-r16 ::= SEQUENCE {

pi2BPSK-ScramblingID0 INTEGER(0..65535) OPTIONAL, -- Need S

pi2BPSK-ScramblingID1 INTEGER(0..65535) OPTIONAL -- Need S

}

-- TAG-DMRS-UPLINKCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| *DMRS-UplinkConfig* field descriptions |
| ***dmrs-AdditionalPosition***  Position for additional DM-RS in UL (see TS 38.211 [16], clause 6.4.1.1.3). If the field is absent, the UE applies the value pos2. See also clause 6.4.1.1.3 for additional constraints on how the network may set this field depending on the setting of other fields. |
| ***dmrs-Type***  Selection of the DMRS type to be used for UL (see TS 38.211 [16], clause 6.4.1.1.3) If the field is absent, the UE uses DMRS type 1. |
| ***dmrs-Uplink***  This field indicates whether low PAPR DMRS is used, as specified in TS38.211 [16], clause 6.4.1.1.1.1. |
| ***dmrs-UplinkTransformPrecoding***  This field indicates whether low PAPR DMRS is used for PUSCH with pi/2 BPSK modulation, as specified in TS38.211 [16], clause 6.4.1.1.1.2. |
| ***maxLength***  The maximum number of OFDM symbols for UL front loaded DMRS. *len1* corresponds to value 1. *len2* corresponds to value 2. If the field is absent, the UE applies value *len1*. If set to *len2*, the UE determines the actual number of DM-RS symbols by the associated DCI. (see TS 38.211 [16], clause 6.4.1.1.3). |
| ***nPUSCH-Identity***  Parameter: N\_ID^(PUSCH) for DFT-s-OFDM DMRS. If the value is absent or released, the UE uses the value Physical cell ID (*physCellId*). See TS 38.211 [16]. |
| ***phaseTrackingRS***  Configures uplink PTRS (see TS 38.211 [16]). |
| ***pi2BPSK-ScramblingID0, pi2BPSK-ScramblingID1***  UL DMRS scrambling initialization for pi/2 BPSK DMRS for PUSCH (see TS 38.211 [16], Clause 6.4.1.1.2). When the field is absent the UE applies the value Physical cell ID (physCellId) of the serving cell. |
| ***scramblingID0***  UL DMRS scrambling initialization for CP-OFDM (see TS 38.211 [16], clause 6.4.1.1.1.1). When the field is absent the UE applies the value Physical cell ID (*physCellId*). |
| ***scramblingID1***  UL DMRS scrambling initialization for CP-OFDM. (see TS 38.211 [16], clause 6.4.1.1.1.1). When the field is absent the UE applies the value Physical cell ID (*physCellId*). |
| ***sequenceGroupHopping***  For DMRS transmission with transform precoder the NW may configure group hopping by the cell-specific parameter *groupHoppingEnabledTransformPrecoding* in *PUSCH-ConfigCommon*. In this case, the NW may include this UE specific field to disable group hopping for PUSCH transmission except for Msg3, i.e., to override the configuration in *PUSCH-ConfigCommon* (see TS 38.211 [16]). If the field is absent, the UE uses the same hopping mode as for Msg3. |
| ***sequenceHopping***  Determines if sequence hopping is enabled for DMRS transmission with transform precoder for PUSCH transmission other than Msg3 (sequence hopping is always disabled for Msg3). If the field is absent, the UE uses the same hopping mode as for msg3. The network does not configure simultaneous group hopping and sequence hopping. See TS 38.211 [16], clause 6.4.1.1.1.2. |
| ***transformPrecodingDisabled***  DMRS related parameters for Cyclic Prefix OFDM. |
| ***transformPrecodingEnabled***  DMRS related parameters for DFT-s-OFDM (Transform Precoding). |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *PI2-BPSK* | The field is optionally present if *tp-pi2BPSK* is included in *PUSCH-Config*. It is absent, Need R otherwise. |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_end of TP\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# 5 Appendix C

|  |  |  |
| --- | --- | --- |
| Parameter/issue | comments | WI/ASN1 |
| BDFactor to be placed under PhysicalCellGroupConfig or servingCellConfig. | Question is included in the LS in R2-2001683.  [Samsung] according to the RAN1 excel (R1-2001478) BDFactorR is Per DL serving cell (i.e. It should be directly under ServingCellConfig or PDCCH-servingCellConfig) | WI |
| Current value range for BDFactor is ENUMERATED {n1} and it is unclear if this is what is needed in the end. | The question in the LS does not include to update the value range of the parameter. Companies are encouraged to lift this internally so the reply would contain also the updated value range. | WI |
| Whether repetition schemes 2a/2b/3 (fdmSchemeA, fdmSchemeB and tdmScheme) and scheme 4 (slotBased) are mutually exclusive in all UE configuration options. | Question is included in the LS in R2-2001683. | WI |
| maximum number of PUCCH resources in a PUCCH group | Question is included in the LS in R2-2001683. | WI |
| maximum value of serving cells in per CC/BWP lists. | Question is included in the LS in R2-2001683. | WI |
| coresetPoolIndex-r16 in ControlResourceSet has value range (0..1), what kind of limitations need to specified e.g.:  value “1” should be configured only if “0” is configured  if configuration with “0” is removed, is configuration with “1” removed or only the index is removed?  If only one set is configured, is index “0” configured | See Question 1 and Proposals 1 and 2 in this email discussion. | WI |
| nrofReportedRS-ForSINR in CSI-ReportConfig | See Question 2 and Proposal 3 with TP in this email discussion. | WI |
| nrofReportedRS-ForSINR in CSI-ReportConfig | See Question 3 and Proposal 3 with TP in this email discussion. | WI |
| Field description for  dmrs-Downlink in DMRS-DownlinkConfig | See Question 4 and Proposal 4 with TP in this email discussion. | WI |
| lte-CRS-PatternList-r16 and lte-CRS-PatternListSecond-r16 are placed under uplinkConfig while lte-CRS-ToMatchAround is placed directly under ServingCellConfig. We think it should be aligned i.e. lte-CRS-PatternList-r16 and lte-CRS-PatternListSecond-r16 should be placed under ServingCellConfig | Suggestion is to agree | WI |
| The variable name of the maximum number of serving cells in simultaneousTCI-UpdateList (i.e. maxNrofServingCells) is already exist, so no need to introduce the same variable.  If this maximum number of serving cells in simultaneousTCI-UpdateList is different from the current one, then change the name of field to distinguish between both. | To be checked when we get the value | WI |
| No need two-level CHOICE structure in CodebookConfig-r16 IE because there are no more entries in this CHOICE structure.  Proposed change:  Remove codebookType CHOICE structure and type2 SEQUENCE structure. Then change the field name of subType to codebookType-r16. | [Huawei, HiSilicon] According to field description of codebookType, this parameter includes the parameters for each type, so numberOfPMI-SubbandsPerCQI-Subband-r16 and paramCombination-r16 should remain inside codebookType, which is not the case with this proposal. No strong view on the CHOICE, but it makes no coding difference and it may be more readable to keep the same format like R15.  One remark: do we need the "-16" suffixes everywhere? If yes, this is not consistently done.  [Ericsson] This was originally without the extra CHOICE but as per Nokia’s view it was changed. Reason was to aling with RAN1 specification. | WI |
| Change the signalling of maxNrofPorts from ENUMERATED {n2} to ENUMERATED {n1, n2} as RAN1 suggested.  In addition, add the condition when n2 can be selected in the field description.  Proposed change:  maxNrofPorts  The maximum number of DL PTRS ports specified in TS 38.214 [19] (clause 5.1.6.3). 2 PT-RS ports can only be configured for single-PDCCH based multi-TRP operation. | [Ericsson] Reference for the suggestion? | WI |
| pdsch-TimeDomainAllocationList-v16xy must always and only be configured when slotBased is configured in repetitionSchemeConfig, while they now look like independent configuration. |  | WI |
| In RepetitionSchemeConfig, it should not be possible to configure both fdm-tdm and slotBased | Question is included in the LS in R2-2001683. | WI |
| In PDSCH-TimeDomainResourceAllocation, it should be possible to signal n1 for repetitionNumber (suggest changing to Need S and capture that when the field is absent, the UE uses n1). |  | WI |
| Suggest capturing in the field description of schedulingRequestID-BFR-SCell in MAC-CellGroupConfig that this value is not used in any LogicalChannelConfig |  | WI |
| candidateBeamRSListExt-r16 in BeamFailureRecoveryConfig | Nokia: The intent here is to extend the maximum number of RS resources from 16 tro 64.  However: Now it’s also not clear what UE does if it’s signalled with both lists – does the R16 list fully replace the previous (as it seems since it’s done as CR) and what does UE do with the R15 version if the R16 is signalled?  Or if this is a size extension to the existing list, we should mark it with Ext.  Also, this list doesn’t seem, to be releasable withoöut releasing the whole upper level IE.  This is a “plain list” without AddModRelease – structure, for which there was some ambiguity earlier wrt. how to change the number of entries in the list. It might be better to change the (new list) structure to use AddModRel instead?  HW: Could make the R16 parameter a list of additional candidateBeamRS with size 0 (release) to 48 which is used together with the R15 list.  ZTE: Since the maximum number of candidate beam has been extended to 64, we think it would be nice to have AddModList/ ReleaseList for the candidateBeamRS | ASN1 |
| ControlResourceSetId-r16 in ControlResourceSetId | ER: Should start from 12 (to be defined as maxNrofControlResourceSets) because there is no need to repeat the existing values. | ASN1 |
| Cond PI2-BPSK  The field is optionally present if tp-pi2BPSK is included in PUSCH-Config. It is absent, Need R otherwise. | HW: Does this(PUSCHConfig) refer the field of the instance of PUSCH-Config in which the DMRS-Uplink is configured or does it also refer tp the PUSCH-Config in UL BPW in which the DRMS-Config is configured within configuredGrantConfig? | ASN1 |
| controlResourceSetToAddModList-r16 in PDCCH-Config | Size of this list needs to be discussed as well as extension.  HW: This makes it possible to configure 8 coresets, using the legacy parameter and this one. Isn't it sufficient to have a list of 2?  Nokia: This should be the R16 version.  Also, we might want to clarify that the R16 version of the list can release also the entries configured by R15 field and vice versa (where possible) to avoid similar ambiguities that were observed in LTE Rel-10 vs. Rel-13 CA.  Samsung: Agree with Nokia i.e. release mechanism of SCell in LTE can be re-used.  BTW, can we introduce ListExt for this?  HW: We should avoid ambiguities but would suggest also avoiding multiple options for the same action, e.g. if ControlResourceSetId-r16 is values from 13 to 64 only, this is clear that the R15 ToReleaseList is to release the CORESET with IDs in R15 range and the R16 ToReleaseList is used to release CORESETS with IDs in the R16 range.  (For addition, there is no restriction but we need to clarify that there is a single list maintained by the UE.).  About "ListExt": so far there is no guideline for extension of list using ToAddModList and ToReleaseList. | ASN1 |
| pdsch-TimeDomainAllocationList-v16xy in PDSCHConfig | Nokia: See definitions of the IE – better use NCE for the list.  Nokia: The point here is that the list extends the existing list, so the entries should be appended to the existing one. This then also allows network to retain Rel-15 version while only adding the Rel-16 part when needed.  HW: Have some doubts on the benefits, see below. | ASN1 |
| dataScramblingIdentityPDSCH, dataScramblingIdentityPDSCH2 in PDSCH-Config | HW: Is it so likely that the network can just add the r16 parameters without changing the value of any r15 parameter of any entry in the list?  No strong view but have some doubts that NCE is the best choice (supposing we keep NCE because we think this is likely that the network can add r16 parameters only, it is unclear in the field description whether the network can release the r16 parameters for all entries by setting the r16 parameter to release.). | ASN1 |
| spatialRelationInfoToAddModList-r16 in PUCCHConfig | Need to discuss is Ext is used. Further the size needs to be discussed.  HW: We need clarifications in the field description on how this is expected to be used in combination with the r15 field (depends on what we want to do exactly with the r16 structure as commented in PUCCH-SpatialRelationInfo | ASN1 |
| PUCCH-SpatialRelationInfoId-r16 in PUCCH-SpatialRelationInfo | HW: If the new structure is fully identical to the old structure except for the ID range, the extended ID range could only start from the first misssing ID value and the r16 ToAddModList in PUCCH-Config would be used only for entries with ID values not in the r15 range.  That said: if we want to add extension markers (might be a good idea?) for the new structure and make it possible to it use also for entries with IDs in the r15 range, we need to keep the full range. Nevertheless, we should try to avoid unnecesary use of two parameters for the same purpose. For instance, upon and after configuration of entries via the r16 ToAddModList, the network does not use the r15 ToAddModList and ToReleaseList until all entries or the parent structure are released. | ASN1 |
| pathlossReferenceRSToAddModList-r16 in PUSCH-PowerControl | Samsung: Do we need to discuss whether to introduce ListExt for pathlossReferenceRSToAddModList-r16? | ASN1 |
| pathlossReferenceRS-List-r16 is allowed for delta configuration but there are no ways to release the list.  pathlossReferenceRS-List-r16 SEQUENCE (SIZE(1..maxNrofSRS-PathlossReferenceRS-r16-1)) OF PathlossReferenceRS-Config OPTIONAL, -- Need M  To be able to release the list, Need code should be R or SetupRelease structure is needed. | [Huawei, HiSilicon] According to A.3.10, "Need M" for a list that is not using ToAddModList means the same like "Need R" (but this should be avoided because it is a source of confusion). | ASN1  In ASN1 Rew file |
| There is no clarification where both pathlossReferenceRS and pathlossReferenceRS-List-r16 are signalled. Like other cases, we can add the sentence in the field description as pathlossReferenceRS is ignored/released if pathlossReferenceRS-List-r16 is signalled. | [Huawei, HiSilicon] Introduction of an alternative to a Need M field (here in a list using ToAddModList) is a generic problem that should be discussed in ASN.1 review session. | ASN1 |
| What is the intention of size(0) of candidateBeamRSListExt-r16 though this field is optional? We assume that it allows the delta configuration by using Need M for this list, but if there are no additional meaning for this zero signalling it would be better to use SetupRelease structure, or size(1) with Need R (i.e. if delta configuration is not needed). | [Huawei, HiSilicon] Introduction of more items to a list not using ToAddModList should be discussed in ASN.1 review session. | ASN1 |
| It is not clear how SearchSpace-v16xy is configured. It seems this IE is the additional configuration using SearchSpace but there are no other configuration in this IE i.e. no searchSpaceId, etc.  Is it better to define searchSpace-r16? Or we can add more descriptions how it works.  For example, if the ControlResourceSetId-r16 in SearchSpace-v16xy is configured, UE ignore the ControlResourceSetId but use the same configuration in SearchSpace which ControlResourceSetId was configured. However we need at least earchSpaceId in this case. | [Huawei, HiSilicon] Again, the problem here is very generic, i.e. adding a missing parameter to non-extensible list using ToAddModList, this requires a general ASN.1 discussion. | ASN1 |
| Minor correction:  Change IE name of PDSCH-TimeDomainResourceAllocation-v16 to PDSCH-TimeDomainResourceAllocation-r16. |  | ASN1 |
| Change the variable name for maxNrofSRS-PathlossReferenceRS-r16-1 to maxNrofSRS-PathlossReferenceRS-1-r16 and need to define in the 6.4.  maxNrofSRS-PathlossReferenceRS-r16 INTEGER ::== 64  maxNrofSRS-PathlossReferenceRS-1-r16 INTEGER ::== 63 |  | ASN1 |
| When an field is not to be used when a new field is configured:  - if the field not to be used is optional need R, then it should be the network responsibility not to configure both  - if the field not to be used is optional need M, we need to decide whether there should be a generic way to do that  - of the field not to be used is mandatory, it is ok to have "the UE shall ignore" for the mandatory field  For instance, in CSI-ReportConfig, codebookConfig is optional Need R so there should be no UE requirement to ignore it just in case a stupid network implementation would send it together with codebookConfig-r16. |  | ASN1 |
|  |  |  |
|  |  |  |