**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-2106134**

**Electronic Meeting, 12th – 20th April, 2021**

**Agenda item:** 5.1.4.4

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Email discussion summary for [98-bis-e][316] NR\_unlic\_Demod\_BS

**Document for:** Information

# Introduction

The email discussion is for Rel-16 NR-U BS demodulation performance in agenda 5.1.4.4. It mainly include the simulation alignment for PUSCH, PUCCH and PRACH, remaining open issues and draft CR review.

List of candidate target of email discussion for 1st round and 2nd round as follows:

* 1st round:
* Topic#1: PUSCH requirements
	+ Sub-topic 1-1: Simulation results alignment
	+ Sub-topic 1-2: Test applicability rules
	+ Sub-topic 1-3: Simulation assumptions for CG-UCI requirements
* Topic#2: PUCCH requirements
	+ Sub-topic 2-1: Simulation results alignment
	+ Sub-topic 2-2:Test metric for PF3
	+ Sub-topic 2-3: Bit pattern for information bits
* Topic#3: PRACH requirements
	+ Sub-topic 3-1: Simulation results alignment
	+ Sub-topic 3-2: BS declaration for extended PRACH
* 2nd round:
	+ Further discuss the remaining issues for each topics
	+ Continue to review the revised draft CR and try to endorse them with SNR set to TBD considering more companies will provide simulation results for next meeting.

# Topic #1: PUSCH requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2104548**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104548.zip) | Ericsson | **Proposal:** The information bit could be 7bits for RM coding and 18bits for Polar coding. If only one test case is preferred, the largest bit length18bits would be better. **Observation:** Define a fixed information bits pattern in specification is more practical for real tests than just a statement as “random information bits pattern”. **Observation:** The performance difference between different bit patterns are small. **Proposal:** Use following simulation assumptions for CG-UCI multiplexing on PUSCH. |
| [**R4-2104549**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104549.zip) | Ericsson | Provide the simulation results for NR-U PUSCH and CG-UCI  |
| [**R4-2104621**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104621.zip) | Nokia | **Observation 1:** The maximum payload size of the CG-UCI is 18 bits.**Proposal 1:** Define payload of 18 bits for CG-UCI performance requirements.**Observation 2**: Explicit HARQ feedback depends on correct demodulation of CG-UCI when using configured grants in unlicensed bands.**Observation 3:** Large indexes increase overhead of CG-UCI while improving its robustness.**Proposal 2:** Define that guarantees better performance of CG-UCI in comparison to CG-PUSCH data payload.**Proposal 3:** Define with relatively low CG-UCI overhead.**Proposal 4:** Define that fulfils the following criteria: SNR@1% CG-UCI BLER < SNR@10% PUSCH BLER -3 dB.**Proposal 5:** Define =3 or 1 for the CG-UCI performance requirements.**Proposal 6:** Consider the parameters in Table 2 for the CG-UCI performance requirements.**Observation 4:** 20 MHz wide interlaces are not expected to be allocated in the center of 40 or 80 MHz carriers.**Proposal 7:** RAN4 to adopt an applicability rule that reflects the possible allocations of 20 MHz interlaces within a wideband carrier.**Proposal 8:** RAN4 to test all the possible 20 MHz subbands contained on the declared bandwidth.**Proposal 9:** RAN4 to adopt the following note for the FRC definition of NR-U interlaced PUSCH requirements:For 30 kHz SCS: For reference channel Ax-y, the allocated RB’s are uniformly spaced over the channel bandwidth at RB index N+B, N+B+5,N+B+10,..,N+B+45 where N={0} and B={0} for a 20 MHz carrier, B={0,55} for a 40 MHz carrier, B={0,55,110} for a 60 MHz carrier, and B={0,55,110,165} for a 80 MHz carrier.For 15 kHz SCS: For reference channel Aw-z, the allocated RB’s are uniformly spaced over the channel bandwidth at RB index N+B, N+B+10,N+B+20,..,N+B+90 where N={0} and B={0} for a 20 MHz carrier, and B={0,110} for a 40 MHz carrier. |
| [**R4-2104622**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104622.zip) | Nokia | Provide the simulation results for NR-U PUSCH and CG-UCI  |
| [**R4-2106508**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106508.zip) | Intel Corporation | Provide the simulation results for NR-U PUSCH |
| [**R4-2106787**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106787.zip) | Huawei, HiSilicon | Provide the simulation results for NR-U PUSCH |
| [**R4-2106788**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106788.zip) | Huawei, HiSilicon | **Proposal 1:** Use following test applicability for BS support different bandwidth.* For each subcarrier spacing declared to be supported, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.xx in table 4.6-1).Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement defined for 20MHz channel bandwidth;
* If bandwidth to be tested is 80MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into four RB sets, each RB set contains 54RBs, 54RBs, 54RBs and 55 RBs respectively. The tested interlace shall be put on the intersection of the RBs of the first interlace and the second RB set. i.e. RB 55, RB 60, …, RB 105
* If bandwidth to be tested is 60MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into three RB sets, each RB set contains 53RBs, 53RBs, and 56RBs respectively. The tested interlace shall be put on the intersection of the RBs of the first interlace and the second RB set. i.e. RB 55, RB 60, …, RB 105
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 15 kHz, the bandwidth is divided into two RB sets, each RB set contains 108 RBs. The tested interlace shall be put on the intersection of the RBs of the first interlace and the first RB set. i.e. RB 0, RB 10, …, RB 100.
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into two RB sets, each RB set contains 53 RBs. The tested interlace shall be put on the intersection of the RBs of the first interlace and the first RB set. i.e. RB 0, RB 5, …, RB 50.

**Proposal 2:** Use Table 2.2-1 for CG-UCI simulation assumptions: |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1 Test applicability rules for BS supporting different bandwidths

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-1-1: Test applicability rules for BS supporting different bandwidth**

* Proposals
* Option 1 (Huawei): For each subcarrier spacing declared to be supported, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.xx in table 4.6-1).Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement defined for 20MHz channel bandwidth;
* If bandwidth to be tested is 80MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into four RB sets, each RB set contains 54RBs, 54RBs, 54RBs and 55 RBs respectively. The tested interlace shall be put on the intersection of the RBs of the first interlace and the second RB set. i.e. RB 55, RB 60, …, RB 105
* If bandwidth to be tested is 60MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into three RB sets, each RB set contains 53RBs, 53RBs, and 56RBs respectively. The tested interlace shall be put on the intersection of the RBs of the first interlace and the second RB set. i.e. RB 55, RB 60, …, RB 105
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 15 kHz, the bandwidth is divided into two RB sets, each RB set contains 108 RBs. The tested interlace shall be put on the intersection of the RBs of the first interlace and the first RB set. i.e. RB 0, RB 10, …, RB 100.
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into two RB sets, each RB set contains 53 RBs. The tested interlace shall be put on the intersection of the RBs of the first interlace and the first RB set. i.e. RB 0, RB 5, …, RB 50.
* Option 2 (Nokia):
* Proposal 2a: RAN4 to test all the possible 20 MHz subbands contained on the declared bandwidth.
* Proposal 2b: Test all the possible 20 MHz subbands contained on the declared bandwidth.
* For 30 kHz SCS: For reference channel Ax-y, the allocated RB’s are uniformly spaced over the channel bandwidth at RB index N+B, N+B+5,N+B+10,..,N+B+45 where N={0} and B={0} for a 20 MHz carrier, B={0,55} for a 40 MHz carrier, B={0,55,110} for a 60 MHz carrier, and B={0,55,110,165} for a 80 MHz carrier.
* For 15 kHz SCS: For reference channel Aw-z, the allocated RB’s are uniformly spaced over the channel bandwidth at RB index N+B, N+B+10,N+B+20,..,N+B+90 where N={0} and B={0} for a 20 MHz carrier, and B={0,110} for a 40 MHz carrier.
* **[Moderator’s observation]**: The only difference the between two options is whether to test the performance with all RB sets(20 MHz subbands) for BS supporting widerband. For option 2, the overall description may be revised to reflect previous agreements where the number of allocated RBs within the interlace is 11.

* Recommended WF
	+ TBA

### Sub-topic 1-2 Simulation assumptions for CG-UCI requirements

**Issue 1-2-1: *betaOffsetCG-UCI-index***

* Proposals
	+ Option 1: 3 (Nokia, Ericsson, Huawei (compromise))
	+ Option 2: 8 (Huawei)
	+ Option 3: 1 (Nokia)
* Recommended WF
	+ Use *betaOffsetCG-UCI-index* = 3

**Issue 1-2-2: Information bits**

* + Option 1: Only 18 bits (Nokia, Huawei(compromise), Ericsson)
	+ Option 2: 8 and 18 bits (Huawei)
	+ Option 3: 7 and 18 bits (Ericsson)
* Recommended WF
	+ Only 18 bits

**Issue 1-2-3: Information bits pattern**

* + Option 1: Use fixed information pattern. i.e. [0 0 0 1 0 0 0] for 7bits (If necessary) and [0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0] for 18 bits (Ericsson)
	+ Option 2: Random information bits pattern
* Recommended WF

**Issue 1-2-4: Detailed simulation assumptions**

* Recommended WF
	+ Use following table as simulation assumptions

|  |  |
| --- | --- |
| Parameter | Value |
| Channel model | TDLA30-10 |
| Bandwidth | 20 MHz |
| Transform precoding | Disabled |
| Default TDD UL-DL pattern  | 30 kHz SCS:7D1S2U, S=6D:4G:4U15 kHz SCS: 3D1S1U S=10D:2G:2U |
| MCS | MCS 20 |
| HARQ | Maximum number of HARQ transmissions | 1 |
|  | RV sequence | 0 |
| DM-RS | DM-RS configuration type | 1 |
|  | DM-RS duration | Single-symbol DM-RS |
|  | Additional DM-RS position | pos1 |
|  | Number of DM-RS CDM group(s) without data | 2 |
|  | Ratio of PUSCH EPRE to DM-RS EPRE  | -3 dB |
|  | DM-RS port(s) | {0} |
|  | DM-RS sequence generation | *NID0*=0, *nSCID*=0 |
| Time domain | PUSCH mapping type | A, B |
| resource | Start symbol | 0 |
| assignment | Allocation length | 14 |
| Frequency domain resource | RB assignment | 1 interlace |
| assignment | Frequency hopping | Disabled |
| Code block group based PUSCH transmission | Disabled |
|  | Number GC-UCI information bit payload | 18 |
|  | *Scaling* | 1 |
| UCI | *betaOffsetGC-UCI index*  | 3 |
|  | UCI partition for frequency hopping | Disabled |

### Sub-topic 1-3 Simulation results alignment

* Simulation results collected from companies are summarized as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SCS | Mapping type | Huawei | Ericsson | Intel | Nokia |
| Ideal | Impairment | Ideal | Impairment | Ideal | Impairment | Ideal | Impairment |
| 15kHz | Type A | 10.4 | 11.9 | 9.5 | 12 | 9.5 | 12 | 9.9 | 12.4 |
| Type B | 10.4 | 11.9 | 9.5 | 12 | 9.5 | 12 | 9.9 | 12.4 |
| 30kHz | Type A | 10.4 | 11.9 | 9.4 | 11.9 | 9.3 | 11.8 | 9.8 | 12.3 |
| Type B | 10.4 | 11.9 | 9.4 | 11.9 | 9.3 | 11.8 | 9.8 | 12.3 |

* **[Moderator’s observation]**:
	+ Reuse the performance requirement derivation rules agreed for NR Rel-15 for the final performance requirements derivation?

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | **Issue 1-1-1: Test applicability rules for BS supporting different bandwidth**We suggest to double check the UL transmission scheme at first. In previous meeting, we agree to define requirements for “All or nothing” transmission scheme which means sub-band LBT failure is not considered. In that case, full bandwidth interlace PUSCH is expected to be transmitted. To align the real transmission, maybe all four bandwidth requirements are needed even we also want to reduce the simulation effort. **Issue 1-2-1: *betaOffsetCG-UCI-index***The modtivation is to reduce overhead by using betaOffset as small as possible. The principle is to keep PUSCH BLER < 0.1 at the same time. Option 1 can be accepted since there are enough margin (6dB between SNR@CG-UCI BLER<=0.01 and SNR@PUSCH BLER<=0.1) to secure this method. **Issue 1-2-2: Information bits**No strong view on short information bits. Option 2 and 3 are both OK to us if short information is also considered. **Issue 1-2-3: Information bits pattern**Support Option 1. The motivation is to avoid misunderstanding for testers. There is no such a button named as “random information bit” on instrument. A fixed pattern is needed eventually. In that case, we can define a pattern in specification to make it clear. Furthermore, a fixed pattern could avoid big performance variation by different people.  |
| Samsung | **Issue 1-1-1: Test applicability rules for BS supporting different bandwidth**We are OK with option 1, Although there is no considering sub-band LBT failure for requirement setup, it is lower probability that the full bandwidth transmission is available in the practical field. From the performance perspective and receiver processing perspective, there is no different foreseen. Therefore, we prefer to only test one of sub-band to reduce the test effort.**Issue 1-2-1: *betaOffsetCG-UCI-index***We prefer option 2 as betaOffsetCG-UCI-index =8. Larger beta offset will increase the overhead for CG-UCI transmission. While from the reliability perspective, the effective coding rate of CG-UCI transmission will be lower with larger beta offset, which can guarantee the better performance of CG-UCThis value can be configured with RRC or DCI indication. Base on the spec, if the beta offset is absent, the UE will apply the default value as 11, and similar value was defined for beta offset ACK in UCI multiplexed on PUSCH.In that sense, option 2 can be the tradeoff between small beta offset and large beta offset.We are also open to option 1 if companies have strong concern of overhead, **Issue 1-2-2: Information bits**We are ok with option 1, only 18 bits, since purpose is not to verify different coding schemes**Issue 1-2-3: Information bits pattern**We prefer Option 2 if only 18 bits is agreed.Since CRC is available for 18bits, we prefer to random selection for information bit , similar approach is applied in UCI on PUSCH for Rel-15**Issue 1-2-4: Detailed simulation assumptions****Sub-topic 1-3 Simulation results alignment**We will provide the results in the next RAN4 meeting, for performance derivation rule, we are ok to the rule defined in Rel-15  |
| Nokia, Nokia Shanghai Bell | **Issue 1-1-1: Test applicability rules for BS supporting different bandwidth**We prefer Option 2. We think it is important to test the 20 MHz RB sets as in Proposal 2a. This procedure that is proposed on Proposal 2b is something that is already being used for the REFSENS requirements, for example G-FR1-A1-15 and even in eLAA (see Table A.1-1 in 36.141). As pointed out by the moderator, the text of Proposal 2b is not reflecting exactly the 11 PBRs allocation we have agreed previously. We can revise this text until the end of this meeting to reflect that. Considering Ericsson’s reply, we would also be fine defining tests for the full bandwidth, which we believe would the best approach. **Issue 1-2-1: betaOffsetCG-UCI-index**We prefer Option 1 or 3. Since CG-UCI has to be transmitted in every transmission of PUSCH when CG is used, the realistic scenario is to chose a that does not consume too much PUSCH resources. Additionally, since CG-UCI is needed to demodulate PUSCH, it must be more robust than the data payload of PUSCH. From our simulations =3 satisfies both conditions. **Issue 1-2-2: Information bits**We prefer Option 1. We think only 1 payload size is enough for testing CG-UCI with no need to testing, no need to test both polar coding and RM. **Issue 1-2-3: Information bits pattern**Option 2. Since for a number of information bits > 11 CRC is used, we understand that random bit pattern can be used in this case. **Issue 1-2-4: Detailed simulation assumptions**We are fine with the recommended WF.  |
| Huawei | **Issue 1-1-1: Test applicability rules for BS supporting different bandwidth**Support Option1.For Proposal 2b: To Nokia, it should be mentioned that all RBs in the reference sensitivity test should be tested, so the interlace is changing from slot to slot in that test. But for demodulation test for LAA and NR-U, the tested interlace is fixed. We don’t need to test all interlaces from demodulation’s perspective. For proposal 2a:To Ericsson and NokiaWe can’t understand how to test all the possible 20 MHz sub-bands contained in the declared bandwidth (Or full bandwidth) because the tested RB is only 11. We think there are two possible test procedures:1. Run one case, the tested interlace is put on 20MHz sub-band randomly from slot to slot.
2. Run four cases, the tested interlaces is put on different 20MHz sub-band for each case.

If a) is selected, we think frequency hopping is used and we should need more time to check the performance.If b) is selected, we think it is very complex and will need much more testing time. No essential difference from demodulation performance point of view.Option 1 is similar to the existing Rel-15 PUSCH test method for testing performance defined for smaller bandwidth for UE supporting larger bandwidth, we just reuse it with modifications of tested RBs locations.We had discussion for defining performance requirements for all four full bandwidths of 20MHz, 40MHz, 60MHz and 80MHz or just 20MHz bandwidth, the conclusion is only to define requirements for 20MHz bandwidth, we are not sure if companies are happy to reopen this discussion.[Ericsson] Our comment is just to point out the NR-U UL wideband transmission is no sub-band LBT failure consideration. In that case, a full interlace spread the whole bandwidth would be transmitted. But we also realized that we can only schedule a part of this interlace for transmission anyway. It is similar to Rel-15 demodulation test method. We can accept Option 1. **Issue 1-2-1: betaOffsetCG-UCI-index**Based on our simulation results, option 1 and option 2 are feasible. For option 3, we need more time to check. Therefore, option1 and 2 are OK to us.**Issue 1-2-2: Information bits**Prefer option 1, since only one coding scheme to be tested is enough.**Issue 1-2-3: Information bits pattern**Option 2. In Rel-15 UCI multiplexing on PUSCH test, it is randomly transmitted for 20bits payload size, we can reuse it and don’t see any necessity to use fix pattern.**Issue 1-2-4: Detailed simulation assumptions**We are fine with the recommended WF.  |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| **R4-2104619** DraftCR on NR-U BS-demod applicability rules(38.141-1) | Ericsson: We agreed to define the requirements band agonic at the beginning of the discussion. So it’s better not to include “n46 or n96” in applicability rule. For SCS 15kHz and 30kHz are both supported for PUSCH, maybe “only one of them should be tested” is better than mandatory test for 30kHz. For BW, it should wait for the agreement of Issue 1-1-1.For SCS 15kHz and 30kHz are both supported for PRACH, it might be good to test both of them since the format is different.  |
| Nokia: @EricssonOn the band part, we think it is good that we discuss how the applicability is defined. We understand we either link it to the band declaration, or we need to create another vendor declaration field for interlaced formats. It would be nice to hear the opinion of other companies on the topic. On the SCS issue for PUSCH. This is following the agreement from RAN4 #97

|  |
| --- |
| * SCS: Both 15kHz and 30kHz
* Test applicability rule for different SCS:
	+ Test performance requirements for 15kHz and/or 30kHz SCS based on BS’s declaration
	+ If BS declares to support both 15kHz and 30kHz
		- Only test performance requirements for 30kHz
 |

For the SCS of PRACH, we also agreed on that on RAN4 #98

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| --- |
| Applicability rules for different subcarrier spacings: Unless otherwise stated, for each PRACH format with LRA =1151 and LRA =571 declared to be supported, the tests shall apply only for the supported subcarrier spacing. If both 15kHz and 30kHz SCS are declared to be supported, the tests shall be done for 30kHz SCS. (see [D.111] in table 4.6-1). |

 @Nokia: We accept the agreed applicability rule, so only 30kHz SCS will be tested is OK for us. Thanks for clarification. |
| Huawei: 1) We agree with Ericsson that we should define the requirements as band agnostic way because we had made following agreements in WF R4-2017688:2) To Ericsson: We prefer that if a BS declares to support both 15kHz and 30kHz, only test performance requirements for 30kHz because we had made following agreements in WF R4-2017688:3) Share same views with Ericsson that for BW, it should wait for the agreement of Issue 1-1-14) To Ericsson: According to the agreements in R4-2103808, we have made following agreements:5) The “other specs affected” in the coversheet is wrong, this CR should affect Test specifications rather than core specificationsSamsung:1, cover page,Since it is the conformance test spec, there should be no impact on core spec. As for 141-1, other specs affected should be 141-2Similar with Ericsson comment, the requirements should be band agonic, there is no need to include the specific band The BW and PRACH declaration should be based on the agreement of Issue 1-1-1 and 3-1 |
| **R4-2104620** DraftCR on NR-U BS-demod applicability rules(38.141-2) | Ericsson: Same comments as for **R4-2104619** The declaration should be applied for 1-H and 1-O, no 2-O.  |
| Nokia: @EricssonSame as R4-2104619We will fix the declaration for 1-H and 1-O in the next version, thanks for noticing that.  |
| Huawei: Same views as for **R4-2104619.** To Ericsson: BS type 2-O have radiated requirements so they should be included:**[**Ericsson] To HW: Our point is the NR-U PRACH declaration should be only for 1-H and 1-O, no 2-O should be considered. Sorry for the misleading.Samsung:1, cover page,Since it is the core spec other specs affected should be 141-1 and 141-2 |
| **R4-2106789** Draft CR for 38.104 Introduction of performance requirements for PUSCH with interlace allocation | Samsung:General comments for section title PUSCH and PUCCH, based on the CR submitted, different wording is used for interlace designWe suggest to align the section title of PUSCH and PUCCH. Either Requirements for PUSCH with interlace allocation or Requirements for interlaced PUSCHRequirements for PUCCH format X with interlace allocation or Requirements for interlaced PUCCH format X  |
| Company B |
|  |
| **R4-2106790** Draft CR for 38.104 Introduction of FRC tables for PUSCH performance requirements with interlace allocation | Ericsson: The Note 2 in bottom row is just for code block size, please remove “(Note2)” for Code rate. |
| Nokia: May need to be updated depending on the outcome of Issue 1-1-1.Independently on the outcome of issue 1-1-1, it would be good to have a note with a description of the allocated PRBs for 1 interlace.  |
| Huawei: To Ericsson: We think it is better to keep align with RMC of Rel-15 PUSCH in the existing specs. We can’t understand the relation between removing note 2 and coding rate, could you clarify more?[Ericsson] There are two “Note 2” (one for coderate, the other is for code block size) in the FRC tables, but there is only one Note 2 clarification which is for code block size in the bottom row. That is an edition error and should be removed.  |
| **R4-2106791** Draft CR for 38.141-1 Introduction of conducted conformance performance testing for PUSCH with interlace allocation | Ericsson: Applicability rule for BW needs to wait for the agreement of Issue 1-1-1.  |
| Nokia: R4-2104619 is also covering the applicability part. The title of clause 8.1.2.1.2 is marked as new text, but 38.141-1 already has this clause. In R4-2104619 the applicability of interlaced formats is introduced in a new clause. We need to decide if it is better to do it in a new clause specific for interlaced formats or reuse the existing PUSCH applicability clause 8.1.2.1. |
| Samsung:General comments for section title PUSCH and PUCCH, based on the CR submitted, different wording is used for interlace designWe suggest to align the section title of PUSCH and PUCCH. Either Requirements for PUSCH with interlace allocation or Requirements for interlaced PUSCHRequirements for PUCCH format X with interlace allocation or Requirements for interlaced PUCCH format X The parameters “Sub-carrier spacing (kHz)” in Table 8.2.10.4.2-1 should be in bold-faced letter style as “**Sub-carrier spacing (kHz)**”[Ericsson] We agree to align the naming of section title. It seems most of companies use “Requirements for interlaced xxxx” ,we can accept that either. |
| **R4-2106792** Draft CR for 38.141-1 Introduction of FRC tables for conducted conformance performance testing for PUSCH with interlace allocation | Ericsson: same comments as for **R4-2106790** |
| Nokia: “additional DM-RS” in the caption of Table A.5-3 can be in lower case. May need to be updated depending on the outcome of Issue 1-1-1.Independently on the outcome of issue 1-1-1, it would be good to have a note with a description of the allocated PRBs for 1 interlace |
|  |
| **R4-2106793** Draft CR for 38.141-2 Introduction of FRC tables for radiated conformance performance testing for PUSCH with interlace allocation | Ericsson: same comments as for **R4-2106790** |
| Nokia: “additional DM-RS” in the caption of Table A.5-5 can be in lower case. May need to be updated depending on the outcome of Issue 1-1-1.Independently on the outcome of issue 1-1-1, it would be good to have a note with a description of the allocated PRBs for 1 interlace.  |
|  |
| **R4-2106794** Draft CR for 38.141-2 Introduction of radiated conformance performance testing for PUSCH with interlace allocation | Ericsson: same comments as for **R4-2106791** |
| Nokia: same as for R4-2106791Typo in Table 8.2.10.4.2-1, “Frist” should be “First”Wrong formatting style used for the note after Table 8.2.10.5-1.  |
| Samsung:General comments for section title PUSCH and PUCCH, based on the CR submitted, different wording is used for interlace designWe suggest to align the section title of PUSCH and PUCCH. Either Requirements for PUSCH with interlace allocation or Requirements for interlaced PUSCHRequirements for PUCCH format X with interlace allocation or Requirements for interlaced PUCCH format X The parameters “Sub-carrier spacing (kHz)” in Table 8.2.10.4.2-1 should be in bold-faced letter style as “**Sub-carrier spacing (kHz)**” |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic #1-1: Test applicability rules for BS supporting different bandwidths** | **Issue 1-1-1: Test applicability rules for BS supporting different bandwidth**Agreements from GTW:Use following applicability rules for BS supporting different bandwidth as baseline with further rewording:* For each subcarrier spacing declared to be supported, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.xx in table 4.6-1).Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement defined for 20MHz channel bandwidth;
* If bandwidth to be tested is 80MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into four RB sets, each RB set contains 54RBs, 54RBs, 54RBs and 55 RBs respectively. The tested interlace shall be put on the intersection of the RBs of the first interlace and the second RB set. i.e. RB 55, RB 60, …, RB 105
* If bandwidth to be tested is 60MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into three RB sets, each RB set contains 53RBs, 53RBs, and 56RBs respectively. The tested interlace shall be put on the intersection of the RBs of the first interlace and the second RB set. i.e. RB 55, RB 60, …, RB 105
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 15 kHz, the bandwidth is divided into two RB sets, each RB set contains 108 RBs. The tested interlace shall be put on the intersection of the RBs of the first interlace and the first RB set. i.e. RB 0, RB 10, …, RB 100.
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into two RB sets, each RB set contains 53 RBs. The tested interlace shall be put on the intersection of the RBs of the first interlace and the first RB set. i.e. RB 0, RB 5, …, RB 50.
1. Recommendations for 2nd round:

Further discuss the wording of this applicability rule |
| **Sub-topic 1-2 Simulation assumptions for CG-UCI requirements** | **Issue 1-2-1: betaOffsetCG-UCI-index**Agreements from GTW: Use betaOffsetCG-UCI-index = 8**Issue 1-2-2: Information bits**Agreements from GTW: Use 18 bits **Issue 1-2-3: Information bits pattern**1. Candidate options:
* Option 1: Use [0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0] for 18 bits
* Option 2: Randomly select 0 or 1 for each information bits for each PUSCH transmission
1. Recommendations for 2nd round:

Need Further discussion **Issue 1-2-4: Detailed simulation assumptions**Tentative agreements: Use test parameters in the following Table as simulation assumptions for CG-UCI test:

|  |  |
| --- | --- |
| Parameter | Value |
| Channel model | TDLA30-10 |
| Bandwidth | 20 MHz |
| Transform precoding | Disabled |
| Default TDD UL-DL pattern  | 30 kHz SCS:7D1S2U, S=6D:4G:4U15 kHz SCS: 3D1S1U S=10D:2G:2U |
| MCS | MCS 20 |
| HARQ | Maximum number of HARQ transmissions | 1 |
|  | RV sequence | 0 |
| DM-RS | DM-RS configuration type | 1 |
|  | DM-RS duration | Single-symbol DM-RS |
|  | Additional DM-RS position | pos1 |
|  | Number of DM-RS CDM group(s) without data | 2 |
|  | Ratio of PUSCH EPRE to DM-RS EPRE  | -3 dB |
|  | DM-RS port(s) | {0} |
|  | DM-RS sequence generation | *NID0*=0, *nSCID*=0 |
| Time domain | PUSCH mapping type | A, B |
| resource | Start symbol | 0 |
| assignment | Allocation length | 14 |
| Frequency domain resource | RB assignment | 1 interlace |
| assignment | Frequency hopping | Disabled |
| Code block group based PUSCH transmission | Disabled |
|  | Number GC-UCI information bit payload | 18 |
|  | *Scaling* | 1 |
| UCI | *betaOffsetGC-UCI index*  | 8 |
|  | UCI partition for frequency hopping | Disabled |

 |
| **Sub-topic 1-3 Simulation results alignment** | Tentative agreements: Reuse the performance requirement derivation rules agreed for NR Rel-15 for the final performance requirements derivation. Considering that some companies will update the simulation results for next meeting, we can keep TBD in the CR for this meeting and capture the derived SNR values in the CR in next meeting. |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2104619 | *To be revised* |
| R4-2104620 | *To be revised* |
| R4-2106789 | *To be revised* |
| R4-2106790 | *To be revised* |
| R4-2106791 | *To be revised* |
| R4-2106792 | *To be revised* |
| R4-2106793 | *To be revised* |
| R4-2106794 | *To be revised* |

## Discussion on 2nd round

### Open issues summary

**Issue 1-5-1: Test applicability rules for BS supporting different bandwidth**

* Proposals
* For each subcarrier spacing declared to be supported, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.xx in table 4.6-1).Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement defined for 20MHz channel bandwidth.
* Option 1:
* For 15kHz subcarrier spacing:
* For PUSCH test and PF0, PF1, PF2 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {0, 10, …,100}.
* For PF3 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {0, 10, …,90}.
* For 30kHz subcarrier spacing:
* For PUSCH test and PF0, PF1, PF2 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {55, 60,…,105}
* For PF3 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {55, 60,…,100}
* Option 2: The tested RB shall be put on the intersection of the first interlace and the second RB set which is specified in clause 6.1.2.2.3 of TS 38.214. It should be guaranteed that the number of RBs of intersection of the first interlace and the second RB set is more than number of tested RBs
* Option 3: The tested RB shall be put on the intersection of the first interlace and the second RB set which is specified in clause 6.1.2.2.3 of TS 38.214. The derivation of RB sets is specified as follows:
* If bandwidth to be tested is 80MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into four RB sets, each RB set contains 54RBs, 54RBs, 54RBs and 55 RBs respectively.
* If bandwidth to be tested is 60MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into three RB sets, each RB set contains 53RBs, 53RBs, and 56RBs respectively
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 15 kHz, the bandwidth is divided into two RB sets, each RB set contains 108 RBs.
* If bandwidth to be tested is 40MHz and subcarrier spacing to be tested is 30 kHz, the bandwidth is divided into two RB sets, each RB set contains 53 RBs.
* Recommended WF

Three different rewording styles on original Option 1 are listed, company can share your preference or further rewording suggestions.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We prefer Option 1 approach by defining specific PRB index. But it would be better to align used RB sets between 15kHz and 30kHz. It seems 15kHz use the intersection PRB index in the first RB sets but 30kHz use PRB index in the second RB sets. @Huawei @Samsung We also think use the intersection of the first interlace with the second RB set might be better for bandwidth having more than 1 RB set.  |
| Nokia | We prefer Option 1, which is we think it clearer. We are ok aligning the RB sets as Ericsson proposed.19th of AprilCan we say PRBs for 15 kHz are {111, 121, …, 211} for PUSCH and ePF0, ePF1, ePF2{120, 130, …, 210} for ePF3? |
| Samsung | Generally, we are fine for option1 with specific PRB index with lowest RB sets.With minor updated as * For 15kHz subcarrier spacing:
* For PUSCH test and PF0, PF1, PF2 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {0, 10, …,100}.
* For ~~PUSCH test and~~ PF3 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {0, 10, …,90}.
* For 30kHz subcarrier spacing:
* For PUSCH test and PF0, PF1, PF2 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {0, 5,…,50}
* For ~~PUSCH test and PF0, PF1,~~ PF3 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {0, 5,…,45}
 |
| Huawei, HiSilicon | Option 1 is also fine for us.We do not have very strong preference to use the first or second RB sets for 15kHz SCS. Considering that only 20MHz and 40MHz CBW for 15kHz SCS, for testing 40MHz CBW by using performance requirements defined for 20MHz, it is no difference to use the first or second RB sets for testing.@Samsung: thanks for pointing out the errors for PF3 part. For the RB set used for testing: we agreed “The tested interlace shall then be the one closest to the centre in this widest supported channel bandwidth” in last meeting by following NR Rel-15 test methodology, using the 2nd RB set for 30kHz SCS is closer to the centre of the channel bandwidth. |

**Issue 1-5-2: Information bits pattern for CG-UCI test**

* Proposals
	+ Option 1: Use [0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0] for 18 bits
	+ Option 2: Randomly select 0 or 1 for each information bits for each PUSCH transmission
	+ Option 3: Use a bit pattern that is generated as:
		- HARQ process number = [0 0 0 1]
		- RV = [0 0]
		- NDI = [1]
		- COT information – sequence of 0’s, i.e. [0,0,0,0,0,0,0,0,0,0,0]
	+ Option 4: Use a bit pattern that is generated as:
		- HARQ process number = [0 0 0 1]
		- RV = [0 0]
		- NDI = toggle for every new transmission, e.g. 0 for even transmissions and 1 for odd ones
	+ COT information – sequence of 0’s, i.e. [0,0,0,0,0,0,0,0,0,0,0]
	+ ~~Option 5: Use a bit pattern that is generated as:~~
		- ~~HARQ process number [c0, c1, c2, c3] = [0 0 0 1]~~
		- ~~RV [c4, c5]= [0 0]~~
		- ~~NDI [c6] = toggle for every new transmission, e.g. 0 for even transmissions and 1 for odd ones~~
		- ~~COT information [c7, …, c17]=. [1,0,0,0,0,0,0,0,0,0,0]~~
* Recommended WF

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Support Option 1. As we clarified in GTW, tester have to choose a fix pattern by themselves during the test. It is random selection but fixed during the test, not random setting for each PUSCH transmission. It would be good to define a fixed pattern to avoid some chosen pattern is actually violate specification. Another reason is to reduce the risk that someone use a special pattern which can easily pass requirement. @Samsung it is not true that TE “generate” random bits during the test. The truth is the TE is configured by tester to use a PN sequence, e.g. PN23 sequence, or “all 0/1” for SCH channel. For control channel, the bit information for PDCCH etc are also configured to a fixed bit pattern during RF conformance test. The key issue is not what the bits looks like but now it’s a “freely selection by tester” not “automatically generated by TE” if we don’t define a fixed pattern. @Nokia Thanks for the proposal. The RV should be 2 bits. We also think NDI =0 could be better. We can accept Option 3 to align with assumptions. @Huawei @Nokia “COT information” bitwidth = log2(C), and C is *cg-COT-SharingList* from 1 to 1709. If we want to get 11bit COT information, it needs to be larger than 1023. If UE won’t share the COT to gNB, then this COT information won’t be sent in our understanding. Then only 7bits are available. For NDI, we think it only indicate PUSCH data, but we don’t test PUSCH in this test, then we might not need to concern about it. In that case, NDI could be 0 or 1 for all the time. @Samsung MSB and LSB is a common issue for all pre-defined pattern. I think it is naturally to take the first bits as MSB and the last bits as LSB. @Huawei We are OK with NDI to be toggled in every new transmission. But we believe it is impossible to configure the COT information as [0,0,0,0,0,0,0,0,0,0,0] based on the bitwidth definition in CG-UCI. The decimal number should be larger than 1023, otherwise the CG-UCI will be less than 18bit. We are also OK to reuse MSB and LSB definition in Rel-15 CSI multiplexing on PUSCH. But it would be straight forward to also take it for PUCCH UCI bits pattern. We propose Option 5 to have 18bits CG-UCI information. @Huawei Thanks for detailed clarification. We realized that it is feasible to configure one row with 11bits “0” to indicate as “No sharing”, and the table entries could reach more than 1023. In that case, we support Option 4.  |
| Nokia | We support Option 1. Since bit pattern is supposed to be fixed during the test we prefer to have a predefined pattern. @Huawei: We agree with your comment. In order to progress the discussion I suggest that we consider Option 3 for discussion. In principle the NDI should be toggled for every new transmission of PUSC if it is not a retransmission. But since we are testing the CG-UCI and not the data payload of PUSCH that should not influence the demodulation of GC-UCI. 2nd reply to HWI agree that the gNB would try to recombine all the transmissions as if it were retransmissions if NDI is constant. I included option 4 for our consideration. 19th of AprilWe are fine with Option 4.  |
| Samsung | We still prefer option 2, which was used in LTE and NR, we do not see any impact for test, considering the CRC is available. The reason of predefined pattern is that it is not feasible for CRC at BS side, during test.For test, the information pattern is generated by TE vendor. It is up to TE implementation. Random sequences method have been used in BS conformance test to generate Tx signal.TE is mandated to implement fixed pattern, which will increase the additional implementation complexity. For performance perspective, the performance difference is minor between randomization generation and fix pattern generation.@Ericsson, we agree your comment, the test is configured by tester (BS). Even it is freely selected by tester, for sequence generation itself, we are not sure whether it is any limitation for TE implementation. As mentioned, PN 23 or random 0 or 1 have already used in existing tests, which can be supported by TE, there is no addition complexity foreseen.Meanwhile, from demodulation performance perspective, we do not specific the exacting value of information bits during requirement setup, especially with BLER metric, considering there is no significant difference foreseen.If needed to specific the exacting value of CG-UCI based on the payload size, we can go with option 3. Then next question, do we need to specific the detail bit map information, which bits is MSB, which bits are LSB? Should be we change the bit pattern during the test based on the different retransmission as mentioned by Huawei to align the real environment.  |
| Huawei, HiSilicon | For the validity of setting CG-UCI bits, as per Table 6.3.2.1.3-1 of TS 38.212:Table 6.3.2.1.3-1: Mapping order of CG-UCI fields

|  |  |
| --- | --- |
| **Field** | **Bitwidth** |
| HARQ process number | 4 |
| Redundancy version | 2 |
| New data indicator | 1 |
| Channel Occupancy Time (COT) sharing information |  if both higher layer parameter *ul-toDL-COT-SharingED-Threshold* and higher layer parameter *cg-COT-SharingList* are configured, where *C* is the number of combinations configured in *cg-COT-SharingList;* 1 if higher layer parameter *ul-toDL-COT-SharingED-Threshold* is not configured and higher layer parameter *cg-COT-SharingOffset* is configured;0 otherwise; If a UE indicates COT sharing other than "no sharing" in a CG PUSCH within the UE's initiated COT, the UE should provide consistent COT sharing information in all the subsequent CG PUSCHs, if any, occurring within the same UE's initiated COT such that the same DL starting point and duration are maintained. |

The first 7 bits should be configured as per the agreed simulation assumptions and should be set as following:* HARQ process number = 1
* RV=0
* NDI needs be toggled during the test as per the test results

The only left 11 bits for COT sharing information is used to indicate whether the UL-toDL COT sharing is used or not, “no sharing” is suitable for BS testing without considering DL transmission during the test, so we can set the left 11 bits equals to 0. If sharing is used, as yellow highlighted in above table, the 11 bits should have different values not random.Based on the above analysis, the CG-UCI information bits are fixed, but they can be derived as per the test parameter configurations, it is not necessary to set additional CG-UCI information bit pattern for test.@Nokia: Thanks for adding Option 3, generally we are OK with it. For NDI keeping unchanged during the test, we are not sure if it will cause some issues to BS that tries to combine all the following retransmissions.2nd response to Nokia: It is fine for us to focus on discussion on Option 3. The mean concern from our side is that BS will always combine all retransmission during the testing, maybe it will cause high challenge for BS soft buffer combing. Company can double check this point.@Ericsson: It is right that 2 bits for RV. What’s Ericsson understanding to set NDI=0?@Samsung: We would like to reuse the bit map designed for Rel-15 UCI multiplexing on PUSCH test. i.e. The Leftmost bit is LSB and the rightmost bit is MSB:Details for bitmap of CG-UCI: [c0, c1, c2,…,c17].Where c0, c1, c2 and c3 bits represent HARQ process number; c4 and c5 bits represent RV sequence; c6,c7,…,c17 bits represent COT sharing information.If company would like to think more about NDI setting, it is fine for us to keep both Option 3 and Option 4 for this meeting. Otherwise we prefer Option 4 currently.@Ericsson: If we want to set 11 bits for COT sharing information in CG-UCI, it means the both higher layer parameter *ul-toDL-COT-SharingED-Threshold* and higher layer parameter *cg-COT-SharingList* are configured, there will be more than 1023 entries (i.e. C) in the table for CG COT sharing information indicated by *cg-COT-SharingList,* as per clause 4.1.3 of TS 37.213: For BS CG-UCI testing, no DL transmission is needed during the test, so we can set the row index, such as Row#0, that indicates the channel occupancy sharing not available during the test. Even the decimal row index is 0, but the real number of COT sharing bits is derived by , it should be 11 bits as per agreement. |

### Open issues

### CR comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised R4-2104619 | Huawei. Please check following comment1. We prefer to add additional explanation that “Declaration of support of GC-UCI multiplexed on PUSCH as specified in TS 38.211 [17]. -> We prefer to add additional explanation that “Declaration of support of GC-UCI multiplexed on interlaced PUSCH as specified in TS 38.211 [17]. “
2. BS declaration for CG-UCI: The sentence” This declaration is applicable to the same SCS(s) declared in D.7.” can be removed. Since CG-UCI test applicability rules for BS supporting different SCS is included in that of PUSCH part.
3. For BS applicability rules: Since some companies prefer to use second RB set as tested RB’s location and we still haven’t reach a agreement on that, this part can be open until the final agreement is reached.
 |
| Nokia: we are fine with the suggested changes. Lets try to clarify the exact PRBs for the 15 kHz case on issue 1-5-1.  |
| Ericsson: No strong opinion on choosing RB sets. Only 40MHz will be impacted. Current proposal implies testing the first RB sets for 15kHz SCS and testing the second RB sets for 30kHz SCS. Slightly tend to the second RB sets.  |
| Revised R4-2104620 | Huawei: Same views with R4-2106011 |
| Nokia: same as in 4619.  |
| Ericsson: Same as in R4-2104619 |
| Revised R4-2106789 | Samsung: whether the requirement of different SCS should be defined as separate table? |
| Ericsson: Separate tables for different SCS would be better to align with PUCCH part.  |
|  |
| Revised R4-2106790 | Company A |
| Company B |
|  |
| Revised R4-2106791 | Samsung: section title “8.2.10 Requirements for interlaced PUSCH with interlace” should change as “Requirements for interlaced PUSCH”, whether the requirement of different SCS should be defined as separate table? |
| Company B |
|  |
| Revised R4-2106792 | Company A |
| Company B |
|  |
| Revised R4-2106793 | Company A |
| Company B |
|  |
| Revised R4-2106794 | Samsung: “number of Rx antennas” should be changed as “Number of demodulation branches” in table 8.2.10.5-1, whether the requirement of different SCS should be defined as separate table? |
| Company B |
|  |

## Summary for 2nd round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic #1-5-1: Test applicability rules for BS supporting different bandwidths** | Tentative agreement: Agree Option 1 with specification of the specific RB index for testing, the 2nd RB set is selected.For each subcarrier spacing declared to be supported, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.xx in table 4.6-1). Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement defined for 20MHz channel bandwidth.* For 15kHz SCS:
* For PUSCH test and PF0, PF1, PF2 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {110, 120,…, 210}
* For PF3 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {110, 120,…, 200}
* For 30kHz SCS:
* For PUSCH test and PF0, PF1, PF2 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {55, 60,…,105}
* For PF3 test, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {55, 60,…,100}
 |
| **Sub-topic 1-5-2 Information bits pattern for CG-UCI test** | Tentative agreements: set each field in the CG-UCI to specific values:* Use a bit pattern {c0,c1,…,c17} that consists of :
	+ HARQ process number: [c0,c1,c2,c3] = [0 0 0 1]
	+ RV sequence: [c4,c5] = [0 0]
	+ NDI: [c6]
		- Option 1: [c6] = [1]
		- Option 2: [c6] = toggle for every new transmission, e.g. 0 for even transmissions and 1 for odd ones
	+ COT sharing information field: [c7,c8,…c17] = [0,0,0,0,0,0,0,0,0,0,0]
 |

# Topic #2: PUCCH requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2104550**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104550.zip) | Ericsson | **Proposal:** Use fixed bit pattern for information bits for interlacing PUCCH requirements. Consider following bit pattern and content.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Bit length | Bit pattern  | Information content |
| Epf0 | 1 | [0] | HARQ-ACK only |
| Epf1 | 2 | [0 1] | HARQ-ACK only |
| Epf2 | 22 | [0 1 0 1… 0 1] | HARQ-ACK and CSI part 1 |
| Epf3 | 4 | [0 1 0 1] | HARQ-ACK only |

**Proposal:** Define enhanced PUCCH format 3 requirement test metric as SNR@ACK missed <= 10-2 with SNR@Prob(DTX->ACK)≤ 10-2 |
| [**R4-2104551**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104551.zip) | Ericsson | Provide the simulation results |
| [**R4-2104623**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104623.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1:** Define performance requirements of interlaced PUCCH format 3 with ACK missed detection metric.  |
| [**R4-2104624**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104624.zip) | Nokia, Nokia Shanghai Bell | Provide the simulation results |
| [**R4-2106795**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106795.zip) | Huawei, HiSilicon | **Proposal 1:** For PF3 test, UCI bits only contain HARQ-ACK information and use following test metric:* Prob (DTX->ACK)≤1%
* Prob (ACK miss)≤1%.
 |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1 Test metric for PF3

**Issue 2-1-1: Test metric for PF3**

* Proposals
	+ Option 1: Prob(DTX->ACK)<=1% and Prob(ACK miss)<=1% (Huawei, Ericsson, Nokia)
* Recommended WF
	+ Use Prob(DTX->ACK)<=1% and Prob(ACK miss)<=1% as test metric for PF3

### Sub-topic 2-2 Bit pattern for information bits

**Issue 2-2-1: Pattern for information bits**

* Proposals
	+ Option 1: Use fixed pattern for information bits. For example: (Ericsson)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Bit length | Bit pattern  | Information content |
| Epf0 | 1 | [0] | HARQ-ACK only |
| Epf1 | 2 | [0 1] | HARQ-ACK only |
| Epf2 | 22 | [0 1 0 1… 0 1] | HARQ-ACK and CSI part 1 |
| Epf3 | 4 | [0 1 0 1] | HARQ-ACK only |

* + Option 2: Random information bits pattern
* Recommended WF

### Sub-topic 2-3 Simulation results alignment

* Simulation results collected from companies are summarized as follows:
	+ PF0/PF1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Format | SCS | Test metric | Huawei | Ericsson | Nokia |
| Ideal | Impairment | Ideal | Impairment | Ideal | Impairment |
| PF0 | 15kHz | 1% ACK miss | -4.6 | -3.1 | -5.2 | -2.7 | -4.7 | -2.2 |
| 30kHz | 1% ACK miss | -3.9 | -2.4 | -5.1 | -2.6 | -3.6 | -1.1 |
| PF1 | 15kHz | 1% ACK miss | -17.2 | -15.7 | -16.3 | -13.8 | -16.5 | -14 |
| 0.1% NACK to ACK | -16.7 | -15.2 | -16.1 | -13.6 | -15.5 | -13 |
| 30kHz | 1% ACK miss | -17.1 | -15.6 | -16.4 | -13.9 | -15.6 | -13.1 |
| 0.1% NACK to ACK | -16.3 | -14.8 | -16.1 | -13.6 | -14.6 | -12.1 |

* + PF2/PF3:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Format | SCS | Test metric | Huawei | Ericsson | Nokia |
| Ideal | Impairment | Ideal | Impairment | Ideal | Impairment |
| PF2 | 15kHz | 1% UCI BLER | 1.3 | 2.8 | 1.3 | 3.8 | 1.5 | 4 |
| 30kHz | 1% UCI BLER | 1.9 | 3.4 | 1.2 | 3.7 | 2.2 | 4.7 |
| PF3 | 15kHz | 1% ACK miss | -0.11 | 1.39 | -9 | -6.5 | -5.3 | -2.8 |
| 30kHz | 1% ACK miss | -0.68 | 0.82 | -9 | -6.5 | -4.3 | -1.8 |

* **[Moderator’s observation]**:
* The simulation results are not well aligned for PF3, further checking is needed
* Reuse the performance requirement derivation rules agreed for NR Rel-15 for the final performance requirements derivation?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | **Issue 2-1-1: Test metric for PF3**Support WF.**Issue 2-2-1: Pattern for information bits**The motivation is the same as clarified in Issue 1-2-3. Support Option 1.We will check the simulation results for PF3.  |
| Samsung | **Issue 2-1-1: Test metric for PF3**We are ok with option 1 and recommended WF**Issue 2-2-1: Pattern for information bits**Generally, we are ok with F0.F1and F3, since there is no CRC operation for these Formats. As for F2, the CRC is available, Therefore, we prefer to apply the assumption of random information bit selection for F2, similar method is applied in LTE to BS conformance test

|  |  |  |  |
| --- | --- | --- | --- |
|  | Bit length | Bit pattern  | Information content |
| Epf0 | 1 | [0] | HARQ-ACK only |
| Epf1 | 2 | [0 1] | HARQ-ACK only |
| Epf2 | 22 | Random selection  | HARQ-ACK and CSI part 1 |
| Epf3 | 4 | [0 1 0 1] | HARQ-ACK only |

Sub-topic 2-3 Simulation results alignmentWe will provide the results in the next meeting |
| Nokia, Nokia Shanghai Bell | **Issue 2-1-1: Test metric for PF3**We agree with option 1. **Issue 2-2-1: Pattern for information bits**We partially agree with Option 1. We think for Epf2 random pattern can be used, since it uses 22 bits and has a CRC that can be used for verification on the test. **Sub-topic 2-3 Simulation results alignment** Agree with reusing derivation rules for NR Rel-15. **NEW:**We verified that our Epf3 results are indeed using * DTX to Ack probability <1%
* Missed Ack probability < 1%
* 4 bits 4 symbols
* TDLA30-10 low
 |
| Huawei | **Issue 2-1-1: Test metric for PF3**We agree with option 1. **Issue 2-2-1: Pattern for information bits**We are OK with Epf0.For Epf1: Since the NACK requirements is prob(NACK->ACK) <=0.1% while ACK miss is prob(ACK miss)<=1%, the NACK transmitted samples should be 10 times of ACK transmitted samples. But for Option 1, the number of samples for both ACK and NACK is same. That means when we guarantee the test time for NACK, the test time of ACK is increased by ten times.To reduce the test time, we prefer the following pattern:For PUCCH transmission occasion i: if mod(I, 11)=0, bit pattern is [0 0], otherwise, bit pattern is [1 1]. By this configuration, we can guarantee that NACK samples is ten times of ACK samples and reduce the test time at the same time.[Ericsson] Is it easy to do in this way in real test? If yes, then we can accept it.For EpF2: We share the same views with Samsung and Nokia, random information bits pattern can be used.For EpF3: We prefer to change it to [0 0 0 0], since there is no NACK requirements for EpF3 based on most companies’ comments on Issue 2-1-1. To reduce the test time, we prefer to only transmit ACK to reduce the test time.**Sub-topic 2-3 Simulation results alignment** Agree with reusing derivation rules for NR Rel-15. And we will further check the simulation results for PF3.Thanks Ericsson to fill the results for PF3 with 30kHz SCS. |

### CRs/TPs comments collection

*Major close to finalize Wis and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going Wis, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| **R4-2104554** draft CR for TS38104 introduction of NR-U PUCCH PF0 PF1 demodulation requirements | Nokia:On the titles, we prefer “interlaced” instead of “interlacing”.Typo in note 1 of Table 8.3.8.1-1 and Table 8.3.9.1.1-1, HAQR should be HARQ. Paragraphs starting with “The transient period as specified in” should be removed as we agreed not to test with frequency hopping. [Ericsson] We will change the title and remove this paragraph. Thanks.  |
| Samsung:General comments for section title PUSCH and PUCCH, based on the CR submitted, different wording is used for interlace designWe suggest to align the section title of PUSCH and PUCCH. Either Requirements for PUSCH with interlace allocation or Requirements for interlaced PUSCHRequirements for PUCCH format X with interlace allocation or Requirements for interlaced PUCCH format X “The transient period as specified in TS 38.101-1 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC centre, i.e. intra-slot frequency hopping is enabled.” Since there is no hopping for interlaced PUCCH, we suggest to remove this sentence The details of information patter depends on the issue 2-2[Ericsson] We will change the title and remove this paragraph. Thanks. |
|  |
| **R4-2104555** draft CR for TS38141-1 introduction of NR-U PUCCH PF0 PF1demodulation requirements | Nokia:On the titles, we prefer “interlaced” instead of “interlacing”.Sentence “The transient period as specified in TS 38.101-1 [21] clause 6.3.3.1 is not taken into account …” seems not needed [Ericsson] We will change the title and remove this paragraph. Thanks. |
| Samsung:General comments for section title PUSCH and PUCCH, based on the CR submitted, different wording is used for interlace designWe suggest to align the section title of PUSCH and PUCCH. Either Requirements for PUSCH with interlace allocation or Requirements for interlaced PUSCHRequirements for PUCCH format X with interlace allocation or Requirements for interlaced PUCCH format X “The transient period as specified in TS 38.101-1 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC centre, i.e. intra-slot frequency hopping is enabled.” Since there is no hopping for interlaced PUCCH, we suggest to remove this sentence The details of information patter depends on the issue 2-2[Ericsson] We will change the title and remove this paragraph. Thanks. |
|  |
| **R4-2104556** draft CR for TS38141-2 introduction of NR-U PUCCH PF0 PF1 demodulation requirements | Nokia:On the titles, we prefer “interlaced” instead of “interlacing”.Sentence “The transient period as specified in TS 38.101-1 [25] clause 6.3.3.1 is not taken into account …” seems not neededTypo in note 1 of Table 8.3.7.4.2-1, Table 8.3.8.1.4.2-1and Table 8.3.8.2.4.2-1, HAQR should be HARQ. [Ericsson] We will change the title and remove this paragraph. Thanks. |
| Samsung:General comments for section title PUSCH and PUCCH, based on the CR submitted, different wording is used for interlace designWe suggest to align the section title of PUSCH and PUCCH. Either Requirements for PUSCH with interlace allocation or Requirements for interlaced PUSCHRequirements for PUCCH format X with interlace allocation or Requirements for interlaced PUCCH format X “The transient period as specified in TS 38.101-1 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC centre, i.e. intra-slot frequency hopping is enabled.” Since there is no hopping for interlaced PUCCH, we suggest to remove this sentence The details of information patter depends on the issue 2-2[Ericsson] We will change the title and remove this paragraph. Thanks. |
|  |
| **R4-2105032**Draft CR on interlaced PUCCH performance requirement for TS 38.104 | Nokia: In 8.3.11.1 this text:The ACK missed detection requirement only applies to the PUCCH format 2 with 4 UCI bits.Should be replaced by that:The ACK missed detection requirement only applies to the PUCCH format 3 with 4 UCI bits. |
| Company B |
|  |
| **R4-2105033**Draft CR on interlaced PUCCH performance requirement for TS 38.141-1 | Nokia: Clauses 8.3.9 and 8.3.10 should include paragraph on applicability of the test like:“Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.2.” |
| Company B |
|  |
| **R4-2105034**Draft CR on interlaced PUCCH performance requirement for TS 38.141-2 | Nokia: Clauses 8.3.9 and 8.3.10 should include paragraph on applicability of the test like:“Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.2.” |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#2-1: Test metric for PF3** | **Issue 2-1-1: Test metric for PF3**Tentative agreements:* Use Prob(DTX->ACK)<=1% and Prob(ACK miss)<=1% as test metric for PF3
 |
| **Sub-topic 2-2 Bit pattern for information bits** | **Issue 2-2-1: Pattern for information bits**Agreements from GTW:* PF0: [0]
* PF1: [0 1]
* for PF3: [0 0 0 0]

Candidate options: Information bit pattern for PF2* Option 1: [0 1 0 1… 0 1] including HARQ-ACK and CSI part 1
* Option 2: Random (random selection of information bits, same as LTE)

Recommendations for 2nd round:Need Further discussion  |
| **Sub-topic 2-3 : Simulation results alignment** | Tentative agreements: * Reuse the performance requirement derivation rules agreed for NR Rel-15 for the final performance requirements derivation. Considering that some companies will update the simulation results for next meeting, we can keep TBD in the CR for this meeting and capture the derived SNR values in the CR in next meeting.
 |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2104554 | *To be revised* |
| R4-2104555 | *To be revised* |
| R4-2104556 | *To be revised* |
| R4-2105032 | *To be revised* |
| R4-2105033 | *To be revised* |
| R4-2105034 | *To be revised* |

## Discussion on 2nd round

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

### Open issues summary

**Issue 2-5-1: Information bits pattern for PF2**

* Proposals
	+ Option 1: [0 1 0 1… 0 1] including HARQ-ACK and CSI part 1
	+ Option 2: Random (random selection of information bits, same as LTE)
* Recommended WF

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Support use a fixed pattern in specification. The reason is the same as Issue 1-5-2. @Huawei @Samsung We don’t quite understand the point. As we comment in Issue 1-5-2, it is a “freely selection by testers” not “automatically generated by TE” if we don’t predefine a fixed pattern. @Huawei If we don’t define a fixed pattern, an information bit pattern will be decided by the testers. Then someone would find a pattern can easier pass the requirement. So the requirement is relaxed in some level. It is not relative to UE behaviour in network. The bit pattern is not a big issue, but maybe we need to make configuration as clear as possible. “the specific information bits are up to testing” looks strange. We define a test specification but the test configuration “is up to testing”. Is that a good instruction for testers? @Huawei If companies don’t think it is a problem, then we also don’t want to block the progress with this issue. We would like to keep the “random information bits selection” in the specification.  |
| Nokia | Option 1We support using fixed pattern. 19th of AprilWe can also compromise on that issue for helping progress.  |
| Samsung | We still prefer option 2, which was used in LTE and NR, we do not see any impact for test, considering the CRC is available. The reason of predefined pattern is that it is not feasible for CRC at BS side, during test.For test, the information pattern is generated by TE vendor. It is up to TE implementation. Random sequences method have been used in BS conformance test to generate Tx signal.TE is mandated to implement fixed pattern, which will increase the additional implementation complexity. For performance perspective, the performance difference is minor between randomization generation and fix pattern generation. |
| Huawei, HiSilicon | This is different from CG-UCI, the information of HARQ-ACK and CSI part 1 included in PF2 can be random value that is same as LTE.@Ericsson: In real testing, the TE should allow the tester to set the specific information bits for HARQ-ACK bits and CSI part1 as per the specification, this is also consistent with real network behaviour, we do not know what information will be sent by UE. If Ericsson has concern on wording of “freely selection by tester”, maybe we can change to “the specific information bits are up to testing”.@Ericsson: actually we cannot understand which information bit pattern is easier to pass the test? As per the real network, UE can feedback any possible information bits for HARQ-ACK and CSI part 1 that BS should ensure no performance difference. Otherwise if we set a fixed pattern, it will be inconsistent with real network behaviour and make the BS easier to pass the requirements. The proposed wording from our side just tried to give clear description if some company think the existing wording has some confusions or is easy to bring misunderstanding, other better wording is welcome if necessary rewording is really needed. |

### CR comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised R4-2104554 | Huawei: We think it would better to define the requirement for different SCS with different table to keep align with existing spec |
| samsung: in cover page, The CR in line of TS/TR 38.141-1, 38.141-2 should be removed |
|  |
| Revised R4-2104555  | Huawei Same views with Revised R4-2104554Other comments:The description:“ ” |
| Samsung: in coverage “TS/TR 38.104 CR ...” can be removed, since 141-1 is the test specification. The “CR” in line of “TS/TR 38.141-2 CR .” can be removed |
|  |
| Revised R4-2104556 | Huawei: Same views with Revised R4-2104554 |
| Samsung: in coverage “TS/TR 38.104 CR ...” can be removed, since 141-1 is the test specification. 141-2 has no impact on 38.141-1, the number of Rx antennas should be changed as ”Number of demodulation branches‘ |
|  |
| Revised R4-2105032 | Company A |
| Company B |
|  |
| Revised R4-2105033 | Company A |
| Company B |
|  |
| Revised R4-2105034 | Company A |
| Company B |
|  |

## Summary for 2nd round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic 2-5-1 Information bits pattern for PF2** | Tentative agreements: Option 2* Random information bits selection
 |

# Topic #3: PRACH requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2104552](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104552.zip) | Ericsson | **Proposal:** Create new declaration field for extended PRACH sequences in 38.141-1 which includes format, SCS, and LRA.

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 for 15kHz SCS and LRA = 571 for 30kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

 |
| [R4-2104553](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104553.zip) | Ericsson | Provide the simulation results |
| [**R4-2104625**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104625.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: RAN4 to adopt text of Option 1 as part of the manufacturer declaration for PRACH with LRA=1151 and LRA=571 as: Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |
| [**R4-2104626**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2104626.zip) | Nokia, Nokia Shanghai Bell | Provide the simulation results |
| **[R4-2106509](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106509.zip)** | Intel Corporation | Provide the simulation results |
| [R4-2106796](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106796.zip) | Huawei, HiSilicon | Proposal 1:  Create new declaration field for extended PRACH sequences in 38.141-1 which includes format, SCS, and LRA.:

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 and LRA = 571 and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2.Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

Provide the simulation results |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1 BS declaration for extended PRACH

**Issue 3-1-1: BS declaration for extended PRACH**

* Proposals
	+ Create new declaration field for extended PRACH sequences in 38.141-1 which includes format, SCS, and LRA, with the following slightly different wording:
		- Option 1: (Huawei, Nokia, Ericsson)

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 and LRA = 571 and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2.Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

* + - Option 2: (Ericsson)

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 for 15kHz SCS and LRA = 571 for 30kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

* Recommended WF

### Sub-topic 3-2 Simulation results alignment

* Simulation results collected from companies are summarized as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Format | LRA | PropagationConditions | Huawei | Nokia | Ericsson | Intel |
| Ideal | Impairment | Ideal | Impairment | Ideal | Impairment | Ideal | Impairment |
| A2 | 1151 | AWGN | -23.36 | -21.86 | -23.6 | -21.1 | -24.2 | -21.7 | -22.9 | -20.4 |
| TDLA30-10 | -18.3 | -16.8 | -17.5 | -15 | -17.1 | -14.6 | -16.4 | -13.9 |
| 571 | AWGN | -20.34 | -18.84 | -20.6 | -18.1 | -21.3 | -18.8 | -19.9 | -17.4 |
| TDLA30-10 | -14.7 | -13.2 | -13.7 | -11.2 | -14.6 | -12.1 | -13.2 | -10.7 |
| B4 | 1151 | AWGN | -27.02 | -25.52 | -27.3 | -24.8 | -26.8 | -24.3 | -26.5 | -24 |
| TDLA30-10 | -21.1 | -19.6 | -21.1 | -18.6 |  |  | -19.7 | -17.2 |
| 571 | AWGN | -24 | -22.5 | -24.5 | -22 | -25.5 | -23 | -23.4 | -20.9 |
| TDLA30-10 | -18.4 | -16.9 | -17.4 | -14.9 | -17.1 | -14.6 | -16.5 | -14 |
| C2 | 1151 | AWGN | -23.7 | -22.2 | -23.3 | -20.8 | -24.2 | -21.7 | -22.9 | -20.4 |
| TDLA30-10 | -18.35 | -16.85 | -17.4 | -14.9 | -17.1 | -14.6 | -16.4 | -13.9 |
| 571 | AWGN | -20.6 | -19.1 | -20.6 | -18.1 | -21.3 | -18.8 | -19.9 | -17.4 |
| TDLA30-10 | -14.83 | -13.33 | -13.6 | -11.1 | -14.6 | -12.1 | -13.2 | -10.7 |

* **[Moderator’s observation]**:
* Reuse the performance requirement derivation rules agreed for NR Rel-15 for the final performance requirements derivation?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | **Issue 3-1-1: BS declaration for extended PRACH**We can accept Option 1.  |
| Samsung | **Issue 3-1-1: BS declaration for extended PRACH**Slightly prefer the wording of option 2.Just one clarification for “PRACH format with LRA = 1151 and LRA = 571 and SCS” in option 1, which including formats, LRA and SCS. For extended PRACH sequence, there is one to one mapping relationship of SCS and LRA, i.e LRA=1151 is only available for 15KHz SCS and LRA=571 is only available for 30KHz SCS. If go option1, there may be confusion that LRA=1151 is applicable for both 15KHz and 30KHz SCSSub-topic 3-2 Simulation results alignmentWe will provide the simulation results in the next meeting. |
| Nokia, Nokia Shanghai Bell | **Issue 3-1-1: BS declaration for extended PRACH**We prefer Option 1 but have no strong view on it. **Sub-topic 3-2 Simulation results alignment** We agree with reusing Rel. 15 derivation rules.  |
| Huawei | **Issue 3-1-1: BS declaration for extended PRACH**Both options are OK. But prefer option 1.**Sub-topic 3-2 Simulation results alignment** We agree with reusing Rel.15 derivation rules. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going Wis, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| **R4-2104627** DraftCR NR-U BS demod PRACH performance requirements 38.104 | ericsson: Can we change the title of 8.4.2.4 to “Minimum requirements for long sequences” or other implicit expression of purpose? Because other sections use “normal mode” or “high speed train”, it might be better to align with other sections. We don’t have strong opinion, just bring this for discussion.  |
| nokia: In response to Ericsson’s comment. These titles are following the agreement from RAN4#98, as:

|  |
| --- |
| * Specification structure for PRACH
	+ Create new clause in 38.104 “8.4.2.4 Minimum requirements for PRACH with LRA=1151 and LRA=571”.
	+ Create new clause in 38.141-1 “8.4.1.7 Test requirement for PRACH with LRA=1151 and LRA=571”.
	+ Create new clause in 38.141-2 “8.4.1.7 Test requirement for PRACH with LRA=1151 and LRA=571”.
 |

The intention of this title was to avoid confusion with sequence “0” which is also called long PRACH sequence. This is also we though about before the last meeting. If you have another suggestion, we can consider it, but we would like to avoid saying “long” if possible.  |
| Huawei: The title of Table 8.4.2.4-1: “Table 8.4.2.4-1: Missed detection requirements for PRACH with LRA=1151 and LRA=571, 15 kHz SCS” can be set to “Table 8.4.2.4-1: Missed detection requirements for PRACH with LRA=1151, 15 kHz SCS” Since there are no requirements for PRACH with LRA=571 in this table.We also have the same comments for Table 8.4.2.4-2. |
| Samsung: LRA=1151 is only available for 15Khz , and LRA=571 is only available for 30KHz, so, LRA=571 in Table 8.4.2.4-1 should be removed , and LRA=1151 in Table 8.4.2.4-2 should be removed |
| **R4-2104628**DraftCR NR-U BS demod PRACH conducted performance requirements 38.141-1 | Ericsson: same comments as for **R4-2104627.** |
| nokia: same as R4-2104627. |
| Huawei: Share the same comments as for **R4-2104627** |
| Samsung: LRA=1151 is only available for 15Khz , and LRA=571 is only available for 30KHz, so, LRA=571 in Table 8.4.2.4-1 should be removed , and LRA=1151 in Table 8.4.2.4-2 should be **removed** |
| **R4-2104629**DraftCR NR-U BS demod PRACH radiated performance requirements 38.141-2 | ericsson: same comments as for **R4-2104627** |
| Nokia: same as R4-2104627. |
| Huawei: Share the same comments as for **R4-2104627** |
| Samsung: LRA=1151 is only available for 15Khz , and LRA=571 is only available for 30KHz, so, LRA=571 in Table 8.4.2.4-1 should be removed , and LRA=1151 in Table 8.4.2.4-2 should be removed |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#3-1: BS declaration for extended PRACH** | **I****ssue 3-1-1: BS declaration for extended PRACH**1. Candidate options:
* Option 1:

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 and LRA = 571 and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2.Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

* Option 2:

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 for 15kHz SCS and LRA = 571 for 30kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

1. Recommendations for 2nd round:

Need further discussion  |
| **Sub-topic#3-2:Simulation alignment** | Tentative agreements: * Reuse the performance requirement derivation rules agreed for NR Rel-15 for the final performance requirements derivation. Considering that some companies will update the simulation results for next meeting, we can keep TBD in the CR for this meeting and capture the derived SNR values in the CR in next meeting.
 |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2104627 | *to be revised* |
| R4-2104628 | *to be revised* |
| R4-2104629 | *to be revised* |

## Discussion on 2nd round

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

### Open issues summary

**Issue 3-5-1: BS declaration for extended PRACH**

1. Candidate options:
* Option 1:

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 and LRA = 571 and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2.Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

* Option 2:

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 for 15kHz SCS and LRA = 571 for 30kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

* Recommended WF

Considering the confusion of declaration SCS for extended PRACH formats, moderator would like to recommend Option 2, company can further share your view on this recommendation.

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We tend to option 2 considering some users might not know background and would misunderstanding.  |
| Nokia | Fine with both options.  |
| Samsung | We prefer option 2, “PRACH format with LRA = 1151 and LRA = 571 and SCS” will make misunderstanding that PRACH format with LRA = 1151 and LRA = 571 are available for both 15Khz SCS and 30KHz SCS, it is not aligned to spec. |
| Huawei, HiSilicon | Option 2 is fine for us. |

### CR comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised R4-2104627 | Samsung: the revision number should be 1 |
| Company B |
|  |
| Revised R4-2104628 | Samsung: Same comment as R4-2104627, no need add the other core specification 38104, since 141 is the test specifications, 38141-2 should be added in line of test specifications. |
| Company B |
|  |
| Revised R4-2104629 | Samsung: same comment as R4-2104627, no need add the other core specification 38104, Number of Rx antennas in table 8.4.1.7.1-1/2 should be changed as “Number of demodulation branches” |
| Company B |
|  |

## Summary for 2nd round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#3-5-1: BS declaration for extended PRACH** | Tentative agreements: Option 2* Option 2:

|  |  |  |
| --- | --- | --- |
| [D.111] | PRACH format with LRA = 1151 for 15kHz SCS and LRA = 571 for 30kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. |

  |

# Work split for CR drafting

Table 4-1: Work split for CR drafting

|  |  |  |
| --- | --- | --- |
| Spec | Topic | Company |
| 38.104 | Big CR for NR-U BS demodulation requirements in TS 38.104 | Huawei |
| Performance requirements for PUSCH with interlace allocation for both conducted and radiated | Huawei |
| Performance requirements for CG-UCI multiplexed on PUSCH with interlace allocation | Huawei |
| FRC tables for PUSCH with interlace allocation | Huawei |
| Performance requirements for PUCCH format 0 with interlace allocation for both conducted and radiated | Ericsson |
| Performance requirements for PUCCH format 1 with interlace allocation for both conducted and radiated | Ericsson  |
| Performance requirements for PUCCH format 2 with interlace allocation for both conducted and radiated | Samsung |
| Performance requirements for PUCCH format 3 with interlace allocation for both conducted and radiated | Samsung |
| Performance requirements and Annex for PRACH with LRA=1151 and LRA=571 for both conducted and radiated | Nokia |
| 38.141-1 | Big CR for NR-U BS conducted conformance testing in TS 38.141-1 | Ericsson |
| Manufacture declarations and test applicability | Nokia |
| Conformance requirements for PUSCH with interlace allocation | Huawei |
| Performance requirements for CG-UCI multiplexed on PUSCH with interlace allocation | Ericsson |
| FRC for PUSCH with interlace allocation | Huawei |
| Performance requirements for PUCCH format 0 with interlace allocation | Ericsson |
| Performance requirements for PUCCH format 1 with interlace allocation | Ericsson |
| Performance requirements for PUCCH format 2 with interlace allocation | Samsung |
| Performance requirements for PUCCH format 3 with interlace allocation | Samsung |
| Performance requirements and Annex for PRACH with LRA=1151 and LRA=571 | Nokia |
| 38.141-2 | Big CR for NR-U BS radiated conformance testing in TS 38.141-2 | Nokia |
| Manufacturer declarations and test applicability | Nokia |
| Performance requirements for PUSCH with interlace allocation | Huawei |
| Performance requirements for CG-UCI multiplexed on PUSCH with interlace allocation | Nokia |
| FRC for interlaced PUSCH with interlace allocation | Huawei |
| Performance requirements for PUCCH format 0 with interlace allocation | Ericsson |
| Performance requirements for PUCCH format 1 with interlace allocation | Ericsson |
| Performance requirements for PUCCH format 2 with interlace allocation | Samsung |
| Performance requirements for PUCCH format 3 with interlace allocation | Samsung |
| Performance requirements and Annex for PRACH with LRA=1151 and LRA=571 | Nokia |
| Simulation results | Simulation results summary sheet creation and maintaining | Huawei |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on NR-U BS demodulation requirements | Huawei, HiSilicon |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2104619 | DraftCR on NR-U BS-demod applicability rules(38.141-1) | Nokia | Revised |  |
| R4-2104620 | DraftCR on NR-U BS-demod applicability rules(38.141-2) | Nokia | Revised |  |
| R4-2106789 | Draft CR for 38.104 Introduction of performance requirements for PUSCH with interlace allocation | Huawei,HiSilicon | Revised |  |
| R4-2106790 | Draft CR for 38.104 Introduction of FRC tables for PUSCH performance requirements with interlace allocation | Huawei,HiSilicon | Revised |  |
| R4-2106791 | Draft CR for 38.141-1 Introduction of conducted conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Revised |  |
| R4-2106792 | Draft CR for 38.141-1 Introduction of FRC tables for conducted conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Revised |  |
| R4-2106793 | Draft CR for 38.141-2 Introduction of FRC tables for radiated conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Revised |  |
| R4-2106794 | Draft CR for 38.141-2 Introduction of radiated conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Revised |  |
| R4-2104554 | draft CR for TS38104 introduction of NR-U PUCCH PF0 PF1 demodulation requirements | Ericsson | Revised |  |
| R4-2104555 | draft CR for TS38141-1 introduction of NR-U PUCCH PF0 PF1demodulation requirements | Ericsson | Revised |  |
| R4-2104556 | draft CR for TS38141-2 introduction of NR-U PUCCH PF0 PF1 demodulation requirements | Ericsson | Revised |  |
| R4-2105032 | Draft CR on interlaced PUCCH performance requirement for TS 38.104 | Samsung | Revised |  |
| R4-2105033 | Draft CR on interlaced PUCCH performance requirement for TS 38.141-1 | Samsung | Revised |  |
| R4-2105034 | Draft CR on interlaced PUCCH performance requirement for TS 38.141-2 | Samsung | Revised |  |
| R4-2104627 | DraftCR NR-U BS demod PRACH performance requirements 38.104 | Nokia | Revised |  |
| R4-2104628 | DraftCR NR-U BS demod PRACH conducted performance requirements 38.141-1 | Nokia | Revised |  |
| R4-2104629 |  | Nokia | Revised |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-2106010 | WF on NR-U BS demodulation requirements | Huawei, HiSilicon | Agreeable |  |
| R4-210xxxx | Big CR for NR-U BS demodulation requirements in TS 38.104 | Huawei, HiSilicon | Email approval | New Tdoc |
| R4-210xxxx | Big CR for NR-U BS conducted conformance testing in TS 38.141-1 | Ericsson | Email approval | New Tdoc |
| R4-210xxxx | Big CR for NR-U BS radiated conformance testing in TS 38.141-2 | Nokia, Nokia Shanghai Bell | Email approval | New Tdoc |
| R4-2106011 | DraftCR on NR-U BS-demod applicability rules(38.141-1) | Nokia | Agreeable | Revised from R4-2104619 |
| R4-2106012 | DraftCR on NR-U BS-demod applicability rules(38.141-2) | Nokia | Agreeable | Revised from R4-2104620 |
| R4-2106013 | Draft CR for 38.104 Introduction of performance requirements for PUSCH with interlace allocation | Huawei,HiSilicon | Agreeable | Revised from R4-2106789 |
| R4-2106014 | Draft CR for 38.104 Introduction of FRC tables for PUSCH performance requirements with interlace allocation | Huawei,HiSilicon | Agreeable | Revised from R4-2106790 |
| R4-2106015 | Draft CR for 38.141-1 Introduction of conducted conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Agreeable | Revised from R4-2106791 |
| R4-2106016 | Draft CR for 38.141-1 Introduction of FRC tables for conducted conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Agreeable | Revised from R4-2106792 |
| R4-2106017 | Draft CR for 38.141-2 Introduction of FRC tables for radiated conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Agreeable | Revised from R4-2106793 |
| R4-2106018 | Draft CR for 38.141-2 Introduction of radiated conformance performance testing for PUSCH with interlace allocation | Huawei,HiSilicon | Agreeable | Revised from R4-2106794 |
| R4-2106019 | draft CR for TS38104 introduction of NR-U PUCCH PF0 PF1 demodulation requirements | Ericsson | Agreeable | Revised from R4-2104554 |
| R4-2106020 | draft CR for TS38141-1 introduction of NR-U PUCCH PF0 PF1demodulation requirements | Ericsson | Agreeable | Revised from R4-2104555 |
| R4-2106021 | draft CR for TS38141-2 introduction of NR-U PUCCH PF0 PF1 demodulation requirements | Ericsson | Agreeable | Revised from R4-2104556 |
| R4-2106022 | Draft CR on interlaced PUCCH performance requirement for TS 38.104 | Samsung | Agreeable | Revised from R4-2105032 |
| R4-2106023 | Draft CR on interlaced PUCCH performance requirement for TS 38.141-1 | Samsung | Agreeable | Revised from R4-2105033 |
| R4-2106024 | Draft CR on interlaced PUCCH performance requirement for TS 38.141-2 | Samsung | Agreeable | Revised from R4-2105034 |
| R4-2106025 | DraftCR NR-U BS demod PRACH performance requirements 38.104 | Nokia | Agreeable | Revised from R4-2104627 |
| R4-2106026 | DraftCR NR-U BS demod PRACH conducted performance requirements 38.141-1 | Nokia | Agreeable | Revised from R4-2104628 |
| R4-2106027 | DraftCR NR-U BS demod PRACH radiated performance requirements 38.141-2 | Nokia | Agreeable | Revised from R4-2104629 |
| R4-2104548 | Discussion on NR-U PUSCH demodulation | Ericsson | Noted |  |
| R4-2104549 | Simulation result for NR-U PUSCH demodulation | Ericsson | Noted |  |
| R4-2104550 | Discussion on NR-U PUCCH demodulation | Ericsson | Noted |  |
| R4-2104551 | Simulation result for NR-U PUCCH demodulation | Ericsson | Noted |  |
| R4-2104552 | Discussion on NR-U PRACH demodulation | Ericsson | Noted |  |
| R4-2104553 | Simulation result for NR-U PRACH demodulation | Ericsson | Noted |  |
| R4-2104621 | PUSCH Demodulation performance requirements for operation in unlicensed bands | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2104622 | NR-U PUSCH simulation results | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2104623 | PUCCH Demodulation performance requirements for operation in unlicensed bands | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2104624 | NR-U PUCCH simulation results | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2104625 | PRACH Demodulation performance requirements for operation in unlicensed bands | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2104626 | NR-U PRACH simulation results | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2106508 | NR-U PUSCH simulation results | Intel Corporation | Noted |  |
| [R4-2106509](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106509.zip) | NR-U PRACH simulation results | Intel Corporation | Noted |  |
| R4-2106786 | Summary of simulation results for NR-U BS performance requirements | Huawei, HiSilicon | Noted |  |
| R4-2106787 | Simulation results on NR-U PUSCH performance requirements | Huawei, HiSilicon | Noted |  |
| R4-2106788 | Discussions on NR-U PUSCH performance requirements | Huawei, HiSilicon | Noted |  |
| R4-2106795 | Simulation results on NR-U PUCCH performance requirements | Huawei, HiSilicon | Noted |  |
| R4-2106796 | Simulation results on NR-U PRACH performance requirements | Huawei, HiSilicon | Noted |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
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	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents