**3GPP TSG-RAN WG4 Meeting # 104-bis-e R4-2216903**

**Electronic Meeting, 10– 19 October 2022**

**Agenda item:** 4.3.8

**Source:** Moderator (Nokia, Nokia Shanghai Bell)

**Title:** Email discussion summary for [104-bis-e][319] NR\_exto71GHz\_Demod\_Part1

**Document for:** Information

# Introduction

This document contains the summary for guiding the discussion on the email thread [104-bis-e][319] NR\_exto71GHz\_Demod\_Part1, which discusses demodulation requirements for extension to 71 GHz, with general issues and issues related to base station demodulation. Issues related to UE demodulation are discussed on [104-bis-e][320] NR\_exto71GHz\_Demod\_Part2.

This summary is based on the contributions submitted to the agenda items:

* 4.3.7 Demodulation and CSI requirements [NR\_ext\_to\_71GHz-Perf]
* 4.3.7.1 General (incl. Channel models) [NR\_ext\_to\_71GHz-Perf]
* (…) \* AI 4.3.7.2 is covered by [104-bis-e][320] NR\_exto71GHz\_Demod\_Part2
* 4.3.7.3 BS demodulation requirements [NR\_ext\_to\_71GHz-Perf]
* 4.3.7.3.1 PUSCH requirements [NR\_ext\_to\_71GHz-Perf]
* 4.3.7.3.2 PUCCH requirements [NR\_ext\_to\_71GHz-Perf]
* 4.3.7.3.3 PRACH requirements [NR\_ext\_to\_71GHz-Perf]

The topics for this discussion are organized as follows:

* Topic #1 includes general aspects which apply for BS demod
* Topic #2 includes BS demodulation aspects only related to PUSCH
* Topic #3 includes BS demodulation aspects only related to PUCCH
* Topic #4 includes BS demodulation aspects only related to PRACH

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

* Since this is a short meeting, it is suggested to comment on the technical issues and CRs already on the first round.

Previous WFs for information:

* R4-2207223, WF on demodulation performance requirements definition for 52.6 - 71 GHz, Intel
* R4-2207205, Work plan for FR2-2 demodulation performance requirement definition, Intel
* R4-2210664, WF on general and BS aspects for FR2-2 demodulation requirements, Intel
* R4-2214655, WF on general aspects for demodulation requirements for FR2-2, Huawei
* R4-2214388, WF on PUSCH demodulation requirements for FR2-2, Nokia, Nokia Shanghai Bell
* R4-2214500, WF on PUCCH demodulation requirements for FR2-2, Ericsson
* R4-2214389, WF on PRACH demodulation requirements for FR2-2, Samsung

Contact information

|  |  |  |
| --- | --- | --- |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: General aspects for BS demodulation

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **Issue mapping** |
| [**R4-2215690**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215690.zip) | Ericsson | Discussion on general and PUSCH issue for FR2-2 BS demodulation  Observation 1: Defining 960kHz SCS requirements as optional would lead to the same results that no tests will be done for 960kHz SCS if corresponding requirements are optional.  Proposal 1: RAN4 do not consider 960kHz SCS for FR2-2 BS demodulation requirements.  Proposal 2: Only consider the minimum CBW 400MHz BS demodulation requirement for 480kHz SCS in Rel-17 based on current progress.  Proposal 3: Take adjusting AWGN offset level as the last method for link budget calculation when margin is not enough. And the corresponding feasibility should be checked.  Proposal 4: Keep the agreement in the previous meeting that using the minimum CBW and 20dB SNR limit for discussion at current stage.  Observation 2: Two proposals indicate similar approach.  Proposal 5: Take Option 3-3 that MCS20 with 1T2R low and MCS18 with 2T2R low If the final link budget agreement indicate 20dB SNR limit could be applied for FR2-2. | P1: Issue 1-1-1  P2: 1-1-2  P3: 1-2-2  2-1-1  P4: 1-2-1  P5: 2-2-1 |
| [**R4-2216691**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216691.zip) | Samsung | View on BS demodulation requirement for NR extended to 71GHz  Proposal 1: RAN4 applies only 120KHz and 480KHz SCS for UL requirements definition.  Proposal 2: RAN4 applies only 100MHz CBW with 120KHz SCS, 400MHz CBW with 480KHz SCS for PUSCH requirement. | P1: 1-1-1 2-1-1  P2: 2-1-2 |
| [**R4-2216010**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216010.zip) | Huawei,HiSilicon | Discussion on general issues for FR2-2 demodulation requirements | Discussed in [320] |
| [**R4-2216179**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216179.zip) | Qualcomm Incorporated | Draft CR to 38.101-4 for FR2-2 Demod - General section | Discussed in [320] |

## Open issues summary

### Sub-topic 1-1 Channel bandwidth and SCS

**Issue 1-1-1: SCS for demodulation requirements**

* Proposals
  + Option 1: RAN4 do not consider 960kHz SCS for FR2-2 BS demodulation requirements.
  + Option 2: Consider 120 kHz, 480 kHz and 960 kHz SCS for FR2-2 BS demodulation requirements
* Recommended WF
  + Discuss your preferences
  + Please notice there are specific issues discussing SCS for PUSCH, PUCCH and PRACH

**Issue 1-1-2: Channel bandwidth for demodulation requirements**

* Proposals
  + Option 1: Only consider the minimum CBW 400MHz BS demodulation requirement for 480kHz SCS in Rel-17 based on current progress.
  + Option 2:
* Recommended WF
  + Please discuss the options

### Sub-topic 1-2 SNR limit

From the discussion in RAN4 #104 the following WF was open on the SNR limit R4-2214655:

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| --- |
| * Proposals   + Option 1: Keep the agreement in the previous meeting that using the minimum CBW and 20dB SNR limit for discussion at current stage. Pending the decision until RF have agreements on the link budget.   + Option 2: Keep the agreement in the previous meeting that using the minimum CBW and 20dB SNR limit for discussion at current stage.   + Other options are not precluded |

And from RAN4 #102, we have this agreement R4-2207223:

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| --- |
| **Issue 2-2-3: Test SNR limit**  Take [20] dB SNR limit FR2-2 at starting point. New test cases and method should be defined if it is finally approved that FR2-2 SNR limit is much lower than [20] dB. |

From the RF session, the following agreement was reached during the previous meeting R4-2214374:

|  |
| --- |
| Sub-topic #3-1: BS demod OTA test methodology Issue 3-1: AWGN offset  **Agreement:**   * RAN4 to define demodulation requirements for FR2-2 including opportunity for [0-15] dB AWGN offset as specified for FR2-1. * Demodulation requirements can be proceeded based on the agreements from RF session. |

**Issue 1-2-1: SNR limit**

* Proposals
  + Option 1: Use the minimum CBW and 20dB SNR limit for discussion at current stage. Pending the decision until RF have agreements on the link budget.
  + Option 2 (new): Follow RF agreement and consider 20 dB SNR limit.
  + Other options.
* Recommended WF
  + Please discuss.

**Issue 1-2-2: AWGN offset**

* Proposals
  + Option 1: Take adjusting AWGN offset level as the last method for link budget calculation when margin is not enough. And the corresponding feasibility should be checked.
  + Other options.
* Recommended WF
  + Please discuss.

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1 Channel bandwidth and SCS

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| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 1-1-1: SCS for demodulation requirements  Issue 1-1-2: Channel bandwidth for demodulation requirements |
|  |  |
| Nokia | Issue 1-1-1: SCS for demodulation requirements  Option 2, consider all SCS for BS demodulation requirements.  We understand 960 kHz is an important feature added as part of the work in FR2-2, and we would like that to be included in the requirements.  Issue 1-1-2: Channel bandwidth for demodulation requirements  No need to agree on that point as part of the general topic.  This discussion is only relevant to the PUSCH topic, so we prefer to discuss that as part of the PUSCH requirements in Sub-topic 2-1. |
| Ericsson | Issue 1-1-1: SCS for demodulation requirements  Support Option 1. We don’t see the necessary of introducing 960kHz SCS demodulation requirements regarding it is UE optional support and test limit on larger CBW.  Issue 1-1-2: Channel bandwidth for demodulation requirements  Support Option 1. |
| Samsung | Issue 1-1-1: SCS for demodulation requirements  Support option 1, both 480 KHz and 960KHz SCS are UE optional supported. 960KHz SCS for the SSB is not supported by UE, and 480 kHz is an optional SSB numerology for initial access for the UE. We would like to prioritize the requirement for UE with supported SCS for both data and initial access. Considering the schedule and time plan for this WI, we prefer to define the requirement with UE mandatory supported SCS  Issue 1-1-2: Channel bandwidth for demodulation requirements  Support option 1. Regarding the CBW for requirement, the minimum CBW can meet the test purpose for baseband processing verification. Meanwhile, based on the core requirement discussion, 1600MHz for 480KHz and 2000MHz for 960KHz are UE optional. |
| Moderator (Nokia) | Update after GTW on 11th of October.  Issue 1-1-1: SCS for demodulation requirements   * Agreement: RAN4 agree to focus on 120kHz and 480kHz SCSs for introducing FR2-2 BS demodulation requirements in Rel-17.   No need to further discussion on Issue 1-1-1. |
| Huawei | Issue 1-1-2: Channel bandwidth for demodulation requirements  We support option 1. Considering bandwidth except 400MHz is optional for UE to support, we don’t the need to define cases for optional cases |

Sub topic 1-2 SNR limit

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| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 1-2-1: SNR limit  Issue 1-2-2: AWGN offset |
| Nokia | Issue 1-2-1: SNR limit  We proposed a new Option 2.  We think that the RF agreement is clear enough and there is no reason why to make joint CBW and SNR limit agreement here since we are anyway discussing maximum CBW in subtopic 2-1.  Additionally, during the last meeting R4-2213927 provided analysis considering wider bandwidths. We also provided link budget analysis in R4-2209389.  Issue 1-2-2: AWGN offset  We don’t see that agreement is needed.  AWGN\_offset is a choice to be adjusted during test time and has been already used for FR2-1. We are basically using the same procedure as has been used in the past. |
| Ericsson | Issue 1-2-1: SNR limit  We support to keep 20dB SNR limit at current stage. We are still lacking link budget calculation for BS demodulation.  Issue 1-2-2: AWGN offset  We support Option 1. |
| Samsung | Issue 1-2-1: SNR limit  We prefer to follow RF requirement, take [20] dB SNR limit FR2-2 at starting point.  Issue 1-2-2: AWGN offset  We prefer to follow RF requirement, take AWGN offset level by using the same procedure in FR2-1 for 47GHz |
| Huawei | Issue 1-2-1: SNR limit  We support to take 20dB at temporary value  Issue 1-2-2: AWGN offset  Support option 1 |

## Summary for 1st round

### Open issues

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| --- | --- |
|  | **Status summary** |
| **Sub-topic #1-1** | Issue 1-1-1: SCS for demodulation requirements  *Agreement from GTW:*   * Agreement: RAN4 agree to focus on 120kHz and 480kHz SCSs for introducing FR2-2 BS demodulation requirements in Rel-17.   *Recommendations for 2nd round:*   * No further discussion is needed   Issue 1-1-2: Channel bandwidth for demodulation requirements  *Tentative agreements:*   * None   *Candidate options:*   * Option 1: Only consider the minimum CBW 400MHz BS demodulation requirement for 480kHz SCS in Rel-17 based on current progress. * Option 2:   *Recommendations for 2nd round:*   * Since there is parallel discussion for the PUSCH topic, it is recommended that the discussion is only on Topic #2 |
| **Sub-topic #1-2** | Issue 1-2-1: SNR limit  Two options were discussed with diverging opinion on the 1st round.  One company supported Option 1, one company supported Option 2. Two other companies want to use 20 dB pending RF further agreements.  *Tentative agreements:*   * None   *Candidate options:*   * Option 1: Use the minimum CBW and 20dB SNR limit for discussion at current stage. Pending the decision until RF have agreements on the link budget. * Option 2: Follow RF agreement and consider 20 dB SNR limit. * Option 3: Use 20dB SNR limit for discussion   + SNR limit might be reviewed if there is further conclusions in the RF session.   *Recommendations for 2nd round:*   * Considering the comments from the companies, can we agree on Option 3?   Issue 1-2-2: AWGN offset  *Tentative agreements:*   * None   *Candidate options:*   * Option 1: Take adjusting AWGN offset level as the last method for link budget calculation when margin is not enough. And the corresponding feasibility should be checked. * Option 2: Adopt same procedure as in FR2-1 regarding AWGN\_offset.   *Recommendations for 2nd round:*   * Further discussion is needed. |
|  |  |

## Discussion on 2nd round

### Sub-topic 1-1 Channel bandwidth and SCS

**Issue 1-1-1: SCS for demodulation requirements**

* Issue is closed, no further discussion needed

**Issue 1-1-2: Channel bandwidth for demodulation requirements**

* Discussion moved to Sub-topic 2-1

### Sub-topic 1-2 SNR limit

**Issue 1-2-1: SNR limit**

* Proposals
  + Option 1: Use the minimum CBW and 20dB SNR limit for discussion at current stage. Pending the decision until RF have agreements on the link budget.
  + Option 2: Follow RF agreement and consider 20 dB SNR limit.
  + Option 3: Use 20dB SNR limit for discussion
    - SNR limit might be reviewed if there is further conclusions in the RF session.
* Recommended WF
  + Considering the comments from the companies, can we agree on Option 3?

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| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with Option 2 or Option 3. |
| Ericsson | Fine with Option 3. Encourage companies deliver link budget analysis in the next meetings if RF have good progress on the conformance test setup. |
| Huawei | Support option 3 |

**Issue 1-2-2: AWGN offset**

* Proposals
  + Option 1: Take adjusting AWGN offset level as the last method for link budget calculation when margin is not enough. And the corresponding feasibility should be checked.
  + Option 2: Adopt same procedure as in FR2-1 regarding AWGN\_offset.
* Recommended WF
  + Please comment on Option 1 and Option 2.

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| **Company** | **Comments** |
| Nokia | Option 2  We think this procedure has already been used for FR2-1 and we can keep the same as baseline for FR2-2. |
| Ericsson | Fine with Option 2 in general, and encourage companies deliver link budget analysis in next meetings. |
| Huawei | We support option 1. To guarantee the accuracy of SNR value, we support to set the assumptions to leave sufficient margin between target SNR and 20dB to avoid reduce the AWGN offset. |

# Topic #2: PUSCH requirements

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **Issue mapping** |
| [**R4-2215690**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215690.zip) | Ericsson | Discussion on general and PUSCH issue for FR2-2 BS demodulation  Observation 1: Defining 960kHz SCS requirements as optional would lead to the same results that no tests will be done for 960kHz SCS if corresponding requirements are optional.  Proposal 1: RAN4 do not consider 960kHz SCS for FR2-2 BS demodulation requirements.  Proposal 2: Only consider the minimum CBW 400MHz BS demodulation requirement for 480kHz SCS in Rel-17 based on current progress.  Proposal 3: Take adjusting AWGN offset level as the last method for link budget calculation when margin is not enough. And the corresponding feasibility should be checked.  Proposal 4: Keep the agreement in the previous meeting that using the minimum CBW and 20Db SNR limit for discussion at current stage.  Observation 2: Two proposals indicate similar approach.  Proposal 5: Take Option 3-3 that MCS20 with 1T2R low and MCS18 with 2T2R low If the final link budget agreement indicate 20Db SNR limit could be applied for FR2-2. | P1: Issue 1-1-1  P2: 1-1-2  P3: 1-2-2  2-1-1  P4: 1-2-1  P5: 2-2-1 |
| [**R4-2215691**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215691.zip) | Ericsson | Simulation results for FR2-2 PUSCH | Simulation alignment |
| [**R4-2215694**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215694.zip) | Ericsson | draftCR for TS38.104 introduce FRC tables for FR2-2 PUSCH requirements | CR session |
| [**R4-2215695**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215695.zip) | Ericsson | draftCR for TS38.141-2 introduce FRC tables for FR2-2 PUSCH requirements | CR session |
| [**R4-2216020**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216020.zip) | Huawei,HiSilicon | Draft CR: Introduction of FR2-2 PUSCH radiated conformance testing requirements in TS 38.141-2 |  |
| [**R4-2216021**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216021.zip) | Huawei,HiSilicon | Discussions on FR2-2 PUSCH demodulation requirements  Proposal 1: RAN 4 to define the PUSCH requirements with 120 SCS and 480kHz SCS.  Proposal 2: Disabled PTRS for QPSK for both CP-OFDM and DFT-S-OFDM.  Observation 1: For case with (120kHz SCS/100MHz bandwidth, MCS16, TDLA30-650,2T2R), the target SNR is quite close to 20Db. If we use TDLD30-650 to instead of TDLA30-650, the performance is further improved.  Proposal 3: Use cases in following table for PUSCH requirements definition:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **Test metric** | | 120 | 100 | 4 | TDLA30-650 | 1x2 Low | 70% of maximum TP | | 2x2 Low | 70% of maximum TP | | 120 | 100 | 16 | TDLA30-650 | 1x2 Low | 70% of maximum TP | | TDLD30-650 | 2x2 Low | 70% of maximum TP | | 120 | 100 | 20 | TDLA30-200 | 1x2 Low | 70% of maximum TP | | 2x2 Low | 70% of maximum TP | | 480 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP | | 2x2 Low | 70% of maximum TP | | 480 | 400 | 16 | TDLA10-650 | 1x2 Low | 70% of maximum TP | | 2x2 Low | 70% of maximum TP | | 480 | 400 | 20 | TDLD10-200 | 1x2 Low | 70% of maximum TP | | 2x2 Low | 70% of maximum TP | | P1: 2-1-1  P2: 2-2-2  P3: 2-3-1 |
| [**R4-2216022**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216022.zip) | Huawei,HiSilicon | Simulation results on FR2-2 PUSCH demodulation requirements |  |
| [**R4-2216570**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216570.zip) | Nokia, Nokia Shanghai Bell | Discussion on PUSCH demodulation requirements for the extension to 71 GHz  Proposal 1: Define PUSCH demodulation requirements using 960 kHz SCS.  Observation 3: In BS RF room use of AWGN offset was agreed for BS demod requirements.  Observation 4: AWGN offset configuration can be used as a method for improving the link budget in test scenarios when TE output power level would be too high.  Proposal 2: RAN4 to define demodulation requirements for CBW = 400 MHz and CBW = 1600 MHz for 480 kHz SCS.  Proposal 3: RAN4 to define demodulation requirements for CBW = 400 MHz and CBW = 2000 MHz for 960 kHz SCS. | P1: 2-1-1  P2: 2-1-3  P3: 2-1-4 |
| [**R4-2216571**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216571.zip) | Nokia, Nokia Shanghai Bell | PUSCH simulation results for the extension to 71 GHz | Simulation alignment |
| [**R4-2216691**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216691.zip) | Samsung | View on BS demodulation requirement for NR extended to 71GHz  Proposal 1: RAN4 applies only 120KHz and 480KHz SCS for UL requirements definition.  Proposal 2: RAN4 applies only 100MHz CBW with 120KHz SCS, 400MHz CBW with 480KHz SCS for PUSCH requirement. | P1: 1-1-1 2-1-1  P2: 2-1-2 |
| [**R4-2216694**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216694.zip) | Samsung | Initial simulation results on PUSCH demodulation requirement for Rel-17 71GHz | Simulation alignment |

## 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 Channel bandwidth and SCS

**Issue 2-1-1: Sub-carrier spacings for PUSCH requirements**

* Proposals
  + Option 1: 120 Hz and 480 kHz
  + Option 2: 120 kHz, 480 kHz and 960 kHz
* Recommended WF
  + Discuss your preferences among the options having in mind the parallel discussion in the general issue

**Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS**

* Proposals
  + Option 1: 120 kHz SCS with 100 MHz
  + Option 2: 120 kHz SCS with 100 MHz and 400 MHz
* Recommended WF
  + Discuss your preferences among the options.

**Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS**

* Proposals
  + Option 1: 480 kHz SCS with 400 MHz
  + Option 2: 480 kHz SCS with 400 MHz and 1600 MHz
* Recommended WF
  + Discuss your preferences among the options.

**Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS**

* Proposals
  + Option 1: 960 kHz SCS with 400 MHz
  + Option 2: 960 kHz SCS with 400 MHz and 2000 MHz
* Recommended WF
  + Discuss your preferences among the options.

### Sub-topic 2-2 Configuration and test cases PUSCH demodulation requirements

In the last RAN4 meeting we reached the following agreements regarding MCS and Tx/Rx branches for PUSCH requirements R4-2214388:

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| **MCS and number Tx/Rx branches for PUSCH requirements**  **<Agreement>** Define PUSCH demodulation requirements for   * + MCS 4 with 1T2R Low and 2T2R Low   + MCS 16 with 1T2R Low and 2T2R Low   **<Way forward>** Options for the 3rd MCS   * + Option 3-1: MCS 18 with 1T2R Low and 2T2R Low   + Option 3-2: MCS 20 with 1T2R Low     - Note: If the final link budget agreement indicate 20Db SNR limit could be applied for FR2-2   + Option 3-3: MCS 20 with 1T2R Low and MCS 18 with 2T2R Low     - Note: If the final link budget agreement indicate 20Db SNR limit could be applied for FR2-2 |

**Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements**

In the previous meeting we meet agreements regarding MCS and Tx/Rx branches for QPSK and 16 QAM requirements. In this issue the proposals are discussed regarding 64 QAM.

* Proposals
  + Option 1: MCS 20 with 1T2R Low and MCS 18 with 2T2R Low
    - Note: If the final link budget agreement indicate 20Db SNR limit could be applied for FR2-2
  + Option 2: MCS20 with 1T2R and 2T2R Low
* Recommended WF
  + Discuss your preferences and indicate if Option 1 is agreeable

**Issue 2-2-2: PTRS configuration**

* Proposals:
  + Option 1: Disabled PTRS for QPSK for both CP-OFDM and DFT-S-OFDM.
  + Option 2 (new): PTRS is always enabled
  + Other options
* Recommended WF
  + Please comment Option 1 indicating if it is agreeable.

### Sub-topic 2-3 Channel models for PUSCH test cases

**Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements**

During the last RAN4 meeting we reached the following agreement on channel models used for PUSCH requirements [R4-2214388]:

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| **TDL model used for PUSCH requirements**  **<Agreement>** TDL model used for PUSCH requirements   * + Use MCS 4 and 16 with TDL-A and 64 QAM MCS with TDL-D.   **Delay spread used for the channel model for PUSCH requirements**  **<Agreement>** Define PUSCH requirements with 10ns RMS delay spread.  **Doppler spread for PUSCH requirements**  **<Agreement >**: Following agreements for general part, adopt the following channel models   * For channel bandwidth larger than 200 MHz, TDLA 10-650 and TDLD 10-200 * For channel bandwidth smaller or equal to 200 MHz, TDLA 30-650 and TDLD 30-200 |

As part of the contributions during this meeting, a suggestion for modification of channel model for MCS 16 was proposed. Please consider the following options:

* Proposals:
  + Option 1: Update channel model for MCS 16 with 120 kHz SCS as
    - For 1x2 Low, use TDLA30-650
    - For 2x2 Low, use TDLA30-650
  + Option 2: Update channel model for MCS 16 with 120 kHz SCS as
    - For 1x2 Low, use TDLA30-650
    - For 2x2 Low, use TDLD30-650
  + Option 3: Update channel model for MCS 16 with 120 kHz SCS as
    - For 1x2 Low, use TDLA30-650
    - For 2x2 Low, use TDLD30-200
  + Other options
* Recommended WF
  + Please comment whether channel model should be updated for this configuration.

### Sub-topic 2-4 List of PUSCH test cases

In the last RAN4 meeting we reached the following agreements regarding MCS and Tx/Rx branches for PUSCH requirements R4-2214388:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameters for PUSCH requirements**  **< Agreement>**:  **Proposed simulation assumptions for FR2-2 PUSCH**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **70% of max TP** | | 120 | 100 | 4 | TDLA30-650 | 1x2 Low |  | | 2x2 Low |  | | 120 | 100 | 16 | TDLA30-650 | 1x2 Low |  | | 2x2 Low |  | | 120 | 100 | 20 | TDLD30-200 | 1x2 Low |  | | 480 | 400 | 4 | TDLA10-650 | 1x2 Low |  | | 2x2 Low |  | | 480 | 400 | 16 | TDLA10-650 | 1x2 Low |  | | 2x2 Low |  | | 480 | 400 | 20 | TDLD10-200 | 1x2 Low |  | | NOTE: To be updated in case further agreements on CBW, antenna configuration, and SCS are reached | | | | | | |

**Issue 2-4-1: List of test cases**

* Proposals
  + Option 1: Update list of test cases as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **Test metric** |
| 120 | 100 | 4 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 100 | 16 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| TDLD30-650 | 2x2 Low | 70% of maximum TP |
| 120 | 100 | 20 | TDLA30-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 16 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 20 | TDLD10-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |

* + Option 2: Update list of test cases as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **Test metric** |
| 120 | 100 | 4 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 100 | 16 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| TDLD30-200 | 2x2 Low | 70% of maximum TP |
| 120 | 100 | 20 | TDLD30-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 16 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 20 | TDLD10-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |

* Recommended WF
  + Please comment on the inclusion of TDLD30 for MCS16 and 120 kHz SCS, 2T2R.
  + Wait for conclusions on other PUSCH issues and update test cases list in the second round.

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 Channel bandwidth and SCS

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-1-1: Sub-carrier spacings for PUSCH requirements  Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS  Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS  Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS |
| Nokia | Issue 2-1-1: Sub-carrier spacings for PUSCH requirements  Option 2, consider all SCS for BS demodulation requirements.  We understand 960 kHz is an important feature added as part of the work in FR2-2, and we would like that to be included in the requirements.  Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS  Option 2  We should test 120 kHz SCS with minimum and at least another CBW.  There is no reason to preclude 400 MHz for 120 kHz SCS requirements.  Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS  Option 2  We want to test 480 kHz with minimum CBW and maximum CBW. If we are open to consider 800 MHz for the second CBW as well.  Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS  Option 2  We would like to test 960 kHz SCS with minimum CBW and maximum CBW. We are open to discuss another option for the second CBW, such as 800 MHz and 1600 MHz. |
| Ericsson | Issue 2-1-1: Sub-carrier spacings for PUSCH requirements  Option 1.  Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS  We slightly tend to Option 2 for 120kHz. According to RF session, it seems 400MHz CBW could be possible for the OTA UL tests. In that case, it would be better to cover 400MHz for 120kHz SCS.  Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS  We support Option 1.  Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS  Depend on the decision of 2-1-1. |
| Samsung | Issue 2-1-1: Sub-carrier spacings for PUSCH requirements  Option1, we would like to prioritize the requirement for UE with supported SCS for both data and initial access,  Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS  Option 1, although both 100 KHz and 400KHz are mandatory CBW, we would like to prefer the define the requirement with typical CBW. The minimum CBW can meet the test purpose for baseband processing. If 400Hz is feasible from OTA test aspect, we are open to further discuss  Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS  Option 1, based on the core requirement discussion, 1600MHz for 480KHz is UE optional.  Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS  Option 1 if 960 KHz SCS is considered, based on the core requirement discussion, 2000MHz for 960KHz are UE optional. |
| Moderator (Nokia) | Update after GTW on 11th October.  Issue 2-1-1: Sub-carrier spacings for PUSCH requirements  Considering agreement on Issue 1-1-1, no further discussion is needed.  Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS   * Agreement: 120kHz SCS with 100MHz and/or [400MHz]   + 400MHz introduction pending on further confirmation of the test feasibility   + Further discuss test applicable rules considering the mandatory CHBW sets for BS   Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS   * Agreement: For 480kHz SCS at least 400MHz   + FFS for 800MHz and/or 1600MHz     - Test applicable rules can be considered if larger CHBW introduced besides 400MHz   Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS  Considering agreement on Issue 1-1-1, no further discussion is needed. |
| Huawei | **Issue 2-1-1: Sub-carrier spacings for PUSCH requirements**  According to R4-2214374, it is feasible to test 400MHz bandwidth:    Therefore we are OK to introduce 400MHz requirements  The applicability rules can be reused from existing rules:  For each subcarrier spacing declared to be supported, the test requirements for a specific channel bandwidth shall apply only if the BS supports it (see D.7 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 for the closest channel bandwidth lower than this widest supported bandwidth; the tested PRBs shall then be centered in this widest supported channel bandwidth.  Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS  We support option 1. We don’t see the need to define the requirements for 1600MMHz considering it is optional. Furthermore, RF didn’t confirm testability of such bandwidth  Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS  .We support option 1. Same views as 480kHz |
| Ericsson 2 | **Issue 2-1-1: Sub-carrier spacings for PUSCH requirements**  We share same view as Huawei. Both 100MHz and 400MHz CBW are mandatory for 120kHz SCS. The testability on 400MHz is confirmed by RF session, then 400MHz requirements should be introduced. The available applicability rule on CBW could be reused.  **Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS**  We support Option 1. Only 400MHz CBW is mandatory for 480kHz SCS. The testability on larger CBW is not clear for now on RF, we don’t see it is feasible to introduce requirement for it. |

Sub topic 2-2 Configuration and test cases PUSCH demodulation requirements

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements  Issue 2-2-2: PTRS configuration |
| Nokia | Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements  We are fine with both options.  We should just keep some flexibility in case we need to reduce the MCS due to exceeding the 20 dB SNR limit.  Issue 2-2-2: PTRS configuration  We prefer Option 2 (new).  Always configure PTRS. |
| Ericsson | Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements  We need to check MCS20 for 2Tx2Rx results. If the results are less than 15dB, we think it might be OK for the requirements.  Issue 2-2-2: PTRS configuration  We are fine with Option 1. |
| Samsung | Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements  Based on our initial results, we prefer MCS 20 with 1T2R only, the target SNR for MCS 18 with 2T2R is larger than 20dB. In FR2-1, we also have MCS 20 for 1T2R, considering the test limitation  Issue 2-2-2: PTRS configuration  Considering the phase noise impact in FR2-2 compared with FR2-1, we slightly support option 2 |
| Huawei | Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements  Based on our simulation results, the target SNR for MCS20,2T2R is around 15 dB, we think it is feasible to define such requirements.  We propose to define MCS 20 instead of MCS18 considering MCS20 is testable.  If we  Issue 2-2-2: PTRS configuration  We support option 1. Our simulation results show phase noise has no impact on performance for QPSK. However, PTRS enabled will reduce the resource utilization,. Hence we think BS always disable PTRS in reality. |

Sub topic 2-3 Channel models for PUSCH test cases

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements |
| Nokia | Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements  We don’t understand that well why this is needed for 120 kHz SCS only.  Maybe we could also wait for some better simulation alignment to check whether it is needed?  We are also waiting for simulation results to confirm that. |
| Ericsson | Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements  First of all, it was agreed to use TDLD30-200 for LOS channel model. For MCS16, our simulation results show that the target SNR would be ~15dB for 2Tx2Rx with TDLA30-650. We think it could be OK for the requirement, but we are open for the further discussion based on companies’ double check. |
| Samsung | Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements  We prefer to follow the agreement in the last meeting, since TDLA 30-650 is feasible for MCS 16. We do not think it is reasonable to define one MCS requirement for different antenna configuration with different channel model in typical scenario. |
| Huawei | Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements  Our simulation show that the target SNR is 19.6dB for this case, which is closed to 20dB, but all other companies don’t see this problem, we can double check our simulations and further discuss next meeting |

Sub topic 2-4 List of PUSCH test cases

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-4-1: List of test cases |
| Nokia | Issue 2-4-1: List of test cases  Final list depends on the outcome of the other issues. |
| Ericsson | Issue 2-4-1: List of test cases  Depend on the decisions of issue 2-2 and 2-3. |
| Samsung | Issue 2-4-1: List of test cases  We prefer to follow the agreement in the last meeting, since TDLA 30-650 is feasible for MCS 16. We do not think it is reasonable to define one MCS requirement for different antenna configuration with different channel model in typical scenario |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2215694**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215694.zip) | Nokia: To include 120 kHz SCS with 400 MHz CBW as per GTW agreement  Should we add FR2-2 instead of FR2 in the title of the table? |
| Company B |
|  |
| [**R4-2215695**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215695.zip) | Nokia: To include 120 kHz SCS with 400 MHz CBW as per GTW agreement  Should we add FR2-2 instead of FR2 in the title of the table? |
| Company B |
|  |
| [**R4-2216020**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216020.zip) | Ericsson: The start part of the change looks confused. Would Huawei clarify it? |
| Nokia: We agree with Ericsson.  The start of the CR contains some change that is repeated in the end of the CR for 8.2.1.5.2. Also 8.2.1.5.2 appears two times, Please remove that.  Please include 120 kHz SCS with 400 MHz CBW as per GTW agreement  Please include also test cases with transform precoding.  In the title of 8.2.1.5.2 you have a typo,   * Test requirement for *BS type 2-O for opeating in FR2-1*   should be   * Test requirement for *BS type 2-O operating in FR2-1*   We would prefer that instead of creating a new clause 8.2.1.5.3 you simply add the tables related to FR2-2 in the clause 8.2.1.5.2.  Table 8.2.1.5.3-1 and Table 8.2.1.5.3-2 have sizes larger thant he page border. Please try to fix the table size accordingly.  All the læines in Table 8.2.1.5.3-1 and Table 8.2.1.5.3-2 include DMRS configuration pos1, it should have pos0 and pos1 |
|  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#2-1** | Issue 2-1-1: Sub-carrier spacings for PUSCH requirements  Considering agreement on Issue 1-1-1, no further discussion is needed for this issue.  *Recommendations for 2nd round:*   * No further discussion needed   Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS  One agreement was reached in the GTW leaving 400 MHz as pending depending on whether it is optional UE feature and feasibility of the feature. Considering comments after GTW session, it is proposed that we agree on the inclusion of 400 MHz for 120 kHz SCS.  *Agreements in GTW:*   * Agreement: 120kHz SCS with 100MHz and/or [400MHz]   + 400MHz introduction pending on further confirmation of the test feasibility   + Further discuss test applicable rules considering the mandatory CHBW sets for BS   *Tentative agreement:*   * Agreement: 120kHz SCS with 100MHz and 400MHz   + Further discuss test applicable rules considering the mandatory CHBW sets for BS   *Recommendations for 2nd round:*   * Confirm if tentative agreement is ok or if we should keep the version from the GTW session   Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS  Considering the majority support of 400 MHz for 480 kHz SCS, it is proposed to agree on 400 MHz for the BS demodulation performance requirements.  *Agreements in the GTW:*   * Agreement: For 480kHz SCS at least 400MHz   + FFS for 800MHz and/or 1600MHz     - Test applicable rules can be considered if larger CHBW introduced besides 400MHz   *Tentative agreement:*   * Define PUSCH BS demodulation requirements for 480kHz SCS with 400MHz   *Recommendations for 2nd round:*   * Confirm tentative agreement   Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS   * Considering agreement on Issue 1-1-1, no further discussion is needed |
| **Sub-topic#2-2** | Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements  One comment was in favour of each option, therefore, issue remains open.  *Tentative agreements:*   * None   *Candidate options:*   * Option 1: MCS 20 with 1T2R Low and MCS 18 with 2T2R Low   + Note: If the final link budget agreement indicate 20dB SNR limit could be applied for FR2-2 * Option 2: MCS20 with 1T2R and 2T2R Low   *Recommendations for 2nd round:*   * Continue discussion   Issue 2-2-2: PTRS configuration companies expressed preference to Option 1, while one company expressed clear preference for Option 2, and another has slight preference for Option 2. Considering that it is proposed to attempt agreement on Option 1. *Tentative agreements:*   * Disabled PTRS for QPSK for both CP-OFDM and DFT-S-OFDM.   *Recommendations for 2nd round:*   * Confirm the tentative agreement |
| **Sub-topic#2-3** | Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements  *Tentative agreements:*   * None   *Candidate options:*   * Option 1: Update channel model for MCS 16 with 120 kHz SCS as   + For 1x2 Low, use TDLA30-650   + For 2x2 Low, use TDLA30-650 * Option 2: Update channel model for MCS 16 with 120 kHz SCS as   + For 1x2 Low, use TDLA30-650   + For 2x2 Low, use TDLD30-650 * Option 3: Update channel model for MCS 16 with 120 kHz SCS as   + For 1x2 Low, use TDLA30-650   + For 2x2 Low, use TDLD30-200   *Recommendations for 2nd round:*   * Continue discussion |
| **Sub-topic#2-4** | Issue 2-4-1: List of test cases  List is pending agreements from the first round. Options are to be updated considering the agreements. |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2215694 | *to be revised* |
| R4-2215695 | *to be revised* |
| R4-2216020 | *to be revised* |

## Discussion on 2nd round

### Sub-topic 2-1 Channel bandwidth and SCS

**Issue 2-1-1: Sub-carrier spacings for PUSCH requirements**

* Issue closed in the 1st round

**Issue 2-1-2: Channel bandwidth for PUSCH requirements with 120 kHz SCS**

One agreement was reached in the GTW leaving 400 MHz as pending depending on whether it is optional UE feature and feasibility of the feature. Considering comments after GTW session, it is proposed that we agree on the inclusion of 400 MHz for 120 kHz SCS.

* Tentative agreement: Define PUSCH BS demodulation requirements for 120kHz SCS with 100MHz and 400MHz
  + Further discuss test applicable rules considering the mandatory CHBW sets for BS
* Recommended WF
  + Please confirm if the tentative agreement is acceptable.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with tentative agreement |
| Ericsson | Fine with tentative agreement. |
| Huawei | Fine with tentative agreement |

**Issue 2-1-3: Channel bandwidth for PUSCH requirements with 480 kHz SCS**

Considering the majority support of 400 MHz for 480 kHz SCS, it is proposed to agree on 400 MHz for the BS demodulation performance requirements.

* Tentative agreement: Define PUSCH BS demodulation requirements for 480kHz SCS with 400MHz
* Recommended WF
  + Please confirm if the tentative agreement is acceptable.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with tentative agreement |
| Ericsson | We support tentative agreement. |
| Huawei | We support tentative agreement |

**Issue 2-1-4: Channel bandwidth for PUSCH requirements with 960 kHz SCS**

* Issue closed in the 1st round

### Sub-topic 2-2 Configuration and test cases PUSCH demodulation requirements

**Issue 2-2-1: MCS and number Tx/Rx branches for PUSCH requirements**

In the previous meeting we meet agreements regarding MCS and Tx/Rx branches for QPSK and 16 QAM requirements. In this issue the proposals are discussed regarding 64 QAM.

* Proposals
  + Option 1: MCS 20 with 1T2R Low and MCS 18 with 2T2R Low
    - Note: If the final link budget agreement indicate 20Db SNR limit could be applied for FR2-2
  + Option 2: MCS20 with 1T2R and 2T2R Low
* Recommended WF
  + Discuss your preferences

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | From the latest simulation results, Option 1 seems better. Option 2 is too exceeding SNR limit in some cases. |
| Ericsson | We tend to Option 1 for now and need some time on simulation for MCS20 on 2T2R. |
| Huawei | We support option 2. We support to define MCS20 instead of MCS18. Based on our simulation results, the target SNR for MCS20,2T2R is around 15Db, which seems to be feasible. We can wait for other companies’ analysis. |

**Issue 2-2-2: PTRS configuration**

* Tentative agreement:
  + Disabled PTRS for QPSK for both CP-OFDM and DFT-S-OFDM.
* Recommended WF
  + Please confirm the tentative agreement.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Our preference is to enable PTRS, but we are ok to compromise with tentative agreement. |
| Ericsson | We are fine with tentative agreement. |
| Huawei | We are fine with tentative agreement |

### Sub-topic 2-3 Channel models for PUSCH test cases

**Issue 2-3-1: Channel model for 16 QAM for PUSCH requirements**

* Proposals:
  + Option 1: Update channel model for MCS 16 with 120 kHz SCS as
    - For 1x2 Low, use TDLA30-650
    - For 2x2 Low, use TDLA30-650
  + Option 2: Update channel model for MCS 16 with 120 kHz SCS as
    - For 1x2 Low, use TDLA30-650
    - For 2x2 Low, use TDLD30-650
  + Option 3: Update channel model for MCS 16 with 120 kHz SCS as
    - For 1x2 Low, use TDLA30-650
    - For 2x2 Low, use TDLD30-200
  + Option 4: Update channel model for MCS 16 with 120 kHz SCS and 480kHz SCS:
    - For 1x2 Low, use TDLA30-650 for 100MHz CBW, TDLA10-650 for 400MHz CBW.
    - For 2x2 Low, use TDLD30-200 for 100MHz CBW, TDLD10-200 for 400MHz CBW.
  + Other options
* Recommended WF
  + Please comment whether channel model should be updated for this configuration.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | If we make this change we think it should be also for 480 kHz.  From our latest simulation results it might be needed to to use TDLD for MCS16 with 2x2 configuration for both 120 kHz and 480 kHz SCS. |
| Ericsson | We also observed the high SNR for MCS16 on 2T2R cases. Considering the 400MHz is also applied, we are fine to use LOS channel for 2T2R case on MCS16 or higher modulation to avoid the risk of testability.  For the LOS channel model, we need to follow previous agreement that use 30ns DS for 100MHz CBW and 10ns for >=400MHz CBW case. In that case, we add Option 4 for further discussion. |
| Huawei | Fine with option 2/3 and option 4. |

### Sub-topic 2-4 List of PUSCH test cases

**Issue 2-4-1: List of test cases**

* Proposals
  + Option 1: Update list of test cases as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **Test metric** |
| 120 | 100 | 4 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 100 | 16 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| TDLD30-650 | 2x2 Low | 70% of maximum TP |
| 120 | 100 | 20 | TDLA30-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 16 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 20 | TDLD10-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |

* + Option 2: Update list of test cases as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **Test metric** |
| 120 | 100 | 4 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 100 | 16 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| TDLD30-200 | 2x2 Low | 70% of maximum TP |
| 120 | 100 | 20 | TDLD30-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 16 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 20 | TDLD10-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |

* + Option 3: Update list of test cases as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SCS (kHz)** | **CBW**  **(MHz)** | **MCS** | **Channel model** | **Antenna configuration** | **Test metric** |
| 120 | 100 | 4 | TDLA30-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 100 | 16 | TDLA30-650Note 1 | 1x2 Low | 70% of maximum TP |
|  | 2x2 Low | 70% of maximum TP |
| 120 | 100 | 20 Note 2 | TDLD30-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 120 | 400 | 16 | TDLA10-650 Note 1 | 1x2 Low | 70% of maximum TP |
|  | 2x2 Low | 70% of maximum TP |
| 120 | 400 | 20 Note 2 | TDLD10-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 4 | TDLA10-650 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 16 | TDLA10-650 Note 1 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| 480 | 400 | 20 Note 2 | TDLD10-200 | 1x2 Low | 70% of maximum TP |
| 2x2 Low | 70% of maximum TP |
| NOTE 1: Confirmation on the channel model for MCS16 with 2x2 is pending  NOTE 2: Confirmation on the use of MCS18 of MCS20 with 2x2 is pending | | | | | |

* Recommended WF
  + Can we agree on Option 3 for simulation alignment?

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Ok with Option 3. |
| Ericsson | OK with Option 3 with modification. |
| Huawei | Support option 3 with following change:  For MCS 16, TDLA30-650 is used for 1T2R and TDLD30-200 is used for 2T2R.  Not introduce requirements for MCS18 |

# Topic #3: PUCCH requirements

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **Issue mapping** |
| [**R4-2215692**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215692.zip) | Ericsson | Simulation results for FR2-2 PUCCH | Simulation alignment |
| [**R4-2216023**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216023.zip) | Huawei,HiSilicon | Discussions and simulation results on FR2-2 PUCCH demodulation requirements  Proposal 1: Not consider 960kHz SCS for PUCCH requirements definition. | Simulation alignment  P1: 3-1-1 |
| [**R4-2216024**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216024.zip) | Huawei,HiSilicon | Draft CR Introduction of FR2-2 PUCCH performance requirements in TS 38.104 | CR |
| [**R4-2216572**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216572.zip) | Nokia, Nokia Shanghai Bell | Discussion on PUCCH demodulation requirements for the extension to 71 GHz  Proposal 1: Define PUCCH demodulation requirements using 960 kHz SCS.  Observation 1: Existing FR2-1 requirements for PUCCH format 3 include test cases with  a. 14 OFDM symbols and DMRS configurations 1+1 and 1+0  b. 4 OFDM symbols and DMRS configuration 1+0  Proposal 2: RAN4 to align DRMS configuration of PUCH format 3 in FR2-2 with the existing configuration for FR2-1.  Proposal 3: Adopt DRMS configuration 1+1 and 1+0 for PUCCH format 3 with 14 OFDM symbols.  Proposal 4: Adopt DRMS configuration 1+1 for PUCCH format 3 with 4 OFDM symbols. | P1: 3-1-1  P2-4: 3-2-1 |
| [**R4-2216573**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216573.zip) | Nokia, Nokia Shanghai Bell | PUCCH simulation results for the extension to 71 GHz | Simulation alignment |
| [**R4-2216t695**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216695.zip) | Samsung | Initial simulation results on PUCCH demodulation requirement for Rel-17 71GHz |  |

## Open issues summary

### Sub-topic 3-1 Channel bandwidth and SCS

**Issue 3-1-1: Sub-carrier spacings for PUCCH requirements**

* Proposals
  + Option 1: 120 Hz and 480 kHz
  + Option 2: 120 kHz, 480 kHz and 960 kHz
* Recommended WF
  + Discuss your preferences among the options having in mind the parallel discussion in the general issue

### Sub-topic 3-2 PUCCH format 3

Previous agreement on the format 3 is:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Issue 2-4-2: DMRs configuration for PUCCH format 3**  **Agreement: Define PUCCH format 3 test cases with DMRS 1+0 and 1+1.**  **Issue 2-4-3: Test configurations for PUCCH format 3**  **Agreement: Take following table as FR2-2 PUCCH format 3 configurations.**   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Number of TX  antennas | Number of demodulation  branches | Modulation order | Propagation conditions and correlation matrix | SCS  (kHz) | CBW  (MHz) | Number of OFDM  symbols | Number of PRB | Number  of bits | Hopping | Additional  DMRS  configuration | Test metric | |  | | 1 | 2 | QPSK | TDLA30-650 Low | 120 | 100 | 14 | 1 | 16 | Enabled | 1+0 and  1+1 | Prob(UCI BLER)<1% | | 4 | 3 | 16 | Enabled | 1+0 and  1+1 | Prob(UCI BLER)<1% | | TDLA10-650 Low | 480 | 400 | 14 | 1 | 16 | Enabled | 1+0 and  1+1 | Prob(UCI BLER)<1% | | 4 | 3 | 16 | Enabled | 1+0 and 1+1 | Prob(UCI BLER)<1% | | [960]\* | [400] | 14 | 1 | 16 | Enabled | 1+0 and  1+1 | Prob(UCI BLER)<1% | | 4 | 3 | 16 | Enabled | 1+0 and 1+1 | Prob(UCI BLER)<1% | | \*To be revisited after agreements on SCS. | | | | | | | | | | | | |

**Issue 3-2-1: DMRs configuration for PUCCH format 3**

* Proposals
  + Proposal 1: RAN4 to align DRMS configuration of PUCH format 3 in FR2-2 with the existing configuration for FR2-1.
  + Proposal 2: Adopt DRMS configuration 1+1 and 1+0 for PUCCH format 3 with 14 OFDM symbols.
  + Proposal 3: Adopt DRMS configuration 1+1 for PUCCH format 3 with 4 OFDM symbols.
  + Proposal 3a: Adopt DRMS configuration 1+0 for PUCCH format 3 with 4 OFDM symbols.
* Recommended WF
  + Discuss among the proposals

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1 Channel bandwidth and SCS

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 3-1-1: Sub-carrier spacings for PUCCH requirements |
| Nokia | Issue 3-1-1: Sub-carrier spacings for PUCCH requirements  Option 2, consider all SCS for BS demodulation requirements.  We understand 960 kHz is an important feature added as part of the work in FR2-2, and we would like that to be included in the requirements. |
| Ericsson | Issue 3-1-1: Sub-carrier spacings for PUCCH requirements  Option 1. |
| Samsung | Issue 3-1-1: Sub-carrier spacings for PUCCH requirements  Option 1, same as PUSCH requirements |
| Moderator (Nokia) | Update after GTW on 11th October.  Issue 3-1-1: Sub-carrier spacings for PUCCH requirements  Considering GTW agreement on 1-1-1, no further discussion is needed for this issue. |
|  |  |

Sub topic 3-2 PUCCH format 3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 3-2-1: DMRs configuration for PUCCH format 3 |
| Nokia | Issue 3-2-1: DMRs configuration for PUCCH format 3  We agree with proposals 1, 2 and 3a  We made a typo on our original proposal 3.  We brought this proposal after noting that the current agreement want exactly matching the FR2-1 requirements.  The main difference of the proposals in comparison to the previous agreement is that 1+1 is only used for the configuration with 14 OFDM symbols, not the one with 4 OFDM symbols. |
| Ericsson | Issue 3-2-1: DMRs configuration for PUCCH format 3  We are fine with proposal 1 to align with FR2-1. |
| Samsung | Issue 3-2-1: DMRs configuration for PUCCH format 3  Support option 1, option 2 and option 3a, since DMRS configuration 1+0 is only available for 4 OFDM symbols |
| Moderator (Nokia) | Update after GTW on 11th October.  Issue 3-2-1: DMRs configuration for PUCCH format 3   * + RAN4 to align DRMS configuration of PUCH format 3 in FR2-2 with the existing configuration for FR2-1.     - Adopt DRMS configuration 1+1 and 1+0 for PUCCH format 3 with 14 OFDM symbols.     - Adopt DRMS configuration 1+0 for PUCCH format 3 with 4 OFDM symbols. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2216024**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216024.zip) | Nokia: We would personally prefer to include the requirements as separate tables, not with a new clause 11.3.2.3. We can try to align with other companies on their preferences.  All the tables for 480 kHz SCS are for 100 MHz, but it should be 400 MHz.  All the tables have “**number of Rx antennas**” for FR2 we use “**number of demodulation branches**”  Table 11.3.2.7.1-1 don’t need TBD on first symbol, We can use the same as in FR2-1, 13 for 1 symbol  12 for 2 symbols  Table 11.3.2.7.2-2 should be for 400 mHz not, 100 MHz  Tables 11.3.2.8.1.2-1 11.3.2.8.1.2-2 don’t have the correct parameters according to our agreement. For example we use 14 symbols for PF1. And the case for 480 kHz SCS should be for 400 MHz  In clause 11.3.2.8.2.2, you have a typo   * + The ACK miss probability * Should be   + The ACK missed detection probability   Table 11.3.2.9.1.2-1 and Table 11.3.2.9.1.2-2 not in line with previous agreements. Also only one row is necessary since we have only 1 symbol for that case.  Table 11.3.2.9.2.2-1 and Table 11.3.2.9.2.2-2 need only 2 OFDM symbols line |
| Company B |
|  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#3-1** | Issue 3-1-1: Sub-carrier spacings for PUCCH requirements  Considering agreement on Issue 1-1-1, no further discussion is needed for this issue.  *Recommendations for 2nd round:*   * No further discussion needed |
| **Sub-topic#3-2** | Issue 3-2-1: DMRs configuration for PUCCH format 3  *GTW agreements:*   * RAN4 to align DRMS configuration of PUCH format 3 in FR2-2 with the existing configuration for FR2-1.   + Adopt DRMS configuration 1+1 and 1+0 for PUCCH format 3 with 14 OFDM symbols.   + Adopt DRMS configuration 1+0 for PUCCH format 3 with 4 OFDM symbols.   *Recommendations for 2nd round:*   * No further discussion is needed |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2216024 | *to be revised* |

## Discussion on 2nd round

### Sub-topic 3-1 Channel bandwidth and SCS

**Issue 3-1-1: Sub-carrier spacings for PUCCH requirements**

* Issue closed in the 1st round

### Sub-topic 3-2 PUCCH format 3

**Issue 3-2-1: DMRs configuration for PUCCH format 3**

* Issue closed in the 1st round

# Topic #4: PRACH requirements

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **Issue mapping** |
| [**R4-2215693**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215693.zip) | Ericsson | Simulation results for FR2-2 PRACH | Simulation alignment |
| [**R4-2216025**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216025.zip) | Huawei,HiSilicon | Discussions on FR2-2 PRACH demodulation requirements  Proposal 1: RAN 4 to define the PRACH requirements with 120kHz SCS and 480kHz SCS.  Proposal 2: Use following configurations as time error tolerance:   |  |  |  | | --- | --- | --- | | **SCS** | **Channel model** | **Time error tolerance (ns)** | | 120 | AWGN | 70 | |  |  | |  | TDLA10-650 | 120 | | 480 | AWGN | 18 | |  |  | |  | TDLA10-650 | 68 | | P1: 4-1-1  P2: 4-2-2 4-2-3 |
| [**R4-2216026**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216026.zip) | Huawei,HiSilicon | Simulation results on FR2-2 PRACH demodulation requirements | Simulation alignment |
| [**R4-2216574**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216574.zip) | Nokia, Nokia Shanghai Bell | Discussion on PRACH demodulation requirements for the extension to 71 GHz   1. Channel model agreement for 120 kHz SCS is contradicting agreement for PRACH demodulation requirements. 2. RAN4 to define PRACH demodulation requirements using AWGN and TDL-A 30-650 channel model for 120 kHz SCS and using AWGN and TDL-A 10-650 channel model for other SCSs. 3. Define PRACH demodulation requirements using 960 kHz SCS. 4. The parameters used for FR2 requirements (Ncs=69) are the ones that provide the maximum coverage area for LRA=139. 5. The LRA=139 and Ncs=69 provide a similar coverage area to LRA=571 and Ncs=285 and LRA=1151 and Ncs=575. 6. RAN4 to define PRACH demodulation performance requirements using the following Ncs parameters:  -For requirements with LRA=139 use NCS=69  -For requirements with LRA=571 use NCS=285  -For requirements with LRA=1151 use NCS=575   Rel 16 NR-U requirements are defined such that PRACH time error tolerance is larger or equal to TAC resolution.   1. Not to define time error tolerance that is smaller than the minimum possible step for the timing advance command.   Rel 15 and Rel 16 requirements are defined such that PRACH time error tolerance with fading channel is the AWGN tolerance combined with the second last tap used for the requirement.   1. Reuse calculation of PRACH time error tolerance for fading channel from Rel 15 and Rel 16 as the AWGN tolerance combined with the second last tap used for the requirement. 2. Reuse calculation of PRACH time error tolerance for 120 kHz SCS requirements with AWGN and TDLA30. 3. RAN4 to define time error tolerance of PRACH timing with 480 kHz SCS and TDLA10 as 18 ns for AWGN and 68 ns for TDLA10. 4. RAN4 to define time error tolerance of PRACH timing with 960 kHz SCS and TDLA10 as 9 ns for AWGN and 59 ns for TDLA10. 5. Use the table below for the test cases and parameters related to PRACH demodulation requirements: | P1: 4-1-2  P2: 4-1-1  P3: 4-1-3  P4: 4-2-1  P5: 4-2-1  P6: 4-2-2  P7: 4-2-3  P8: 4-2-4  P9: 4-3-1 |
| [**R4-2216575**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216575.zip) | Nokia, Nokia Shanghai Bell | PRACH simulation results for demodulation requirements for the extension to 71 GHz | Simulation alignment |
| [**R4-2216576**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216576.zip) | Nokia, Nokia Shanghai Bell | Draft CR 38.104: PRACH requirements for FR2-2 | CR |
| [**R4-2216577**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216577.zip) | Nokia, Nokia Shanghai Bell | Draft CR 38.141-2: PRACH requirements for FR2-2 | CR |
| [**R4-2216692**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216692.zip) | Samsung | Draft CR on annex for PRACH requirement for TS 38.104 | CR |
| [**R4-2216693**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216693.zip) | Samsung | Draft CR on annex for PRACH requirement for TS 38.141-2 | CR |
| [**R4-2216696**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216696.zip) | Samsung | Initial simulation results on PRACH demodulation requirement for Rel-17 71GHz | Simulation alignment |

## Open issues summary

### Sub-topic 4-1 PRACH configurations

**Issue 4-1-1: SCS for PRACH requirements**

* Proposals
  + Option 1: Define requirements for PRACH using 120 kHz, 480 kHz and 960 kHz SCS
  + Option 2: Define requirements for PRACH using 120 kHz and 480 kHz SCS.
* Recommended WF
  + Please discuss your preferences among Option 1 and Option 2 having in mind the parallel discussion in the general Issue 1-1-1

**Issue 4-1-2: Channel model for PRACH requirements**

During the last RAN4 meeting, we reached agreement on AWGN and TDL-A 10 for PRACH requirements. However, a general agreement was reached for using TDLA30 for 120 kHz with 100 MHz CBW.

Previous agreements are R4-2214389:

|  |
| --- |
| Sub-topic 1-3: Channel Model **Way forward**: need to be confirm   * RAN4 to define PRACH demodulation requirements using AWGN and TDL-A 10-650 channel model. |

And form the general WF R4-2214655:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **RMS delay spread**   * Adopt channel model according to the channel bandwidth as:  |  |  |  |  |  | | --- | --- | --- | --- | --- | | SCS [kHz] | CBW [MHz] | Applicable channel models | Tap resolution [ns] | Tap number | | 120 | 100 | TDLA30-650  TDLD30-200 | 5 | 12 | | 120  480  [960] | ≥400 | TDLA10-650  TDLD10-200 | 2 | 16 | |

Considering that, please consider the proposals on that issue:

* Proposals:
  + Option 1: RAN4 to define PRACH demodulation requirements using AWGN and TDL-A 30-650 channel model for 120 kHz SCS and using AWGN and TDL-A 10-650 channel model for other SCSs.
  + Option 2: Keep the PRACH agreement with AWGN and TDL-A 10-650 for all SCSs.
* Recommended WF:
  + Please consider the previous agreements on PRACH and general WFs, and indicate which option is agreeable.

**Issue 4-1-3: Ncs, logical sequence index combinations**

* Proposals:
  + Proposal 1: RAN4 to define PRACH demodulation performance requirements using the following Ncs parameters:
    - For requirements with LRA=139 use NCS=69
    - For requirements with LRA=571 use NCS=285
    - For requirements with LRA=1151 use NCS=575
* Recommended WF:
  + Please comment if Proposal 1 is agreeable.

### Sub-topic 4-2 Accuracy and test procedure

**Issue 4-2-1: PRACH time error tolerance general aspects**

* Proposals
  + Proposal 1: Not to define time error tolerance that is smaller than the minimum possible step for the timing advance command.
  + Proposal 2: Reuse calculation of PRACH time error tolerance for fading channel from Rel 15 and Rel 16 as the AWGN tolerance combined with the second last tap used for the requirement.
* Recommended WF
  + Please discuss if proposal 1 and proposal 2 are agreeable

**Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS**

* Proposals
  + Option 1: Use following configurations as time error tolerance:

|  |  |  |
| --- | --- | --- |
| **SCS** | **Channel model** | **Time error tolerance (ns)** |
| 120 | AWGN | 70 |
|  |  |
|  | TDLA10-650 | 120 |

* + Option 2: Reuse calculation of PRACH time error tolerance for 120 kHz SCS requirements with AWGN and TDLA30.
* Recommended WF
  + Discuss options 1 and 2 having in mind relation to channel model issue 4-1-2.

**Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS**

* Proposals
  + Option 1: Use following configurations as time error tolerance:

|  |  |  |
| --- | --- | --- |
| **SCS** | **Channel model** | **Time error tolerance (ns)** |
| 480 | AWGN | 18 |
|  |  |
|  | TDLA10-650 | 68 |

* Recommended WF
  + Comment on option 1 and indicate if it is agreeable.

**Issue 4-2-4: PRACH time error tolerance for 960 kHz SCS**

* Proposals
  + Option 1: RAN4 to define time error tolerance of PRACH timing with 960 kHz SCS and TDLA10 as 9 ns for AWGN and 59 ns for TDLA10.
* Recommended WF
  + Depends on the outcome of the Issue 4-1-1.

### Sub-topic 4-3 Test cases

**Issue 4-3-1: List of test cases for PRACH demodulation requirements**

* Proposals:
  + Option 1: Use the table below for the test cases and parameters related to PRACH demodulation requirements:

| **Format** | **SCS** | **Prach sequence length** | **Ncs** | **Propagation condition** | **Frequency Offset (Hz)** | **Time estimation tolerance** |
| --- | --- | --- | --- | --- | --- | --- |
| A2 | 120kHz | 139 | 69 | AWGN | 0 | 70 ns |
| B4 | 120kHz | 139 | 69 | AWGN | 0 | 70 ns |
| C2 | 120kHz | 139 | 69 | AWGN | 0 | 70 ns |
| A2 | 120kHz | 139 | 69 | TDLA30-650 | 7100 | 220 ns |
| B4 | 120kHz | 139 | 69 | TDLA30-650 | 7100 | 220 ns |
| C2 | 120kHz | 139 | 69 | TDLA30-650 | 7100 | 220 ns |
| A2 | 120kHz | 571 | 285 | AWGN | 0 | 70 ns |
| B4 | 120kHz | 571 | 285 | AWGN | 0 | 70 ns |
| C2 | 120kHz | 571 | 285 | AWGN | 0 | 70 ns |
| A2 | 120kHz | 571 | 285 | TDLA30-650 | 7100 | 220 ns |
| B4 | 120kHz | 571 | 285 | TDLA30-650 | 7100 | 220 ns |
| C2 | 120kHz | 571 | 285 | TDLA30-650 | 7100 | 220 ns |
| A2 | 120kHz | 1151 | 575 | AWGN | 0 | 70 ns |
| B4 | 120kHz | 1151 | 575 | AWGN | 0 | 70 ns |
| C2 | 120kHz | 1151 | 575 | AWGN | 0 | 70 ns |
| A2 | 120kHz | 1151 | 575 | TDLA30-650 | 7100 | 220 ns |
| B4 | 120kHz | 1151 | 575 | TDLA30-650 | 7100 | 220 ns |
| C2 | 120kHz | 1151 | 575 | TDLA30-650 | 7100 | 220 ns |
| A2 | 480kHz | 139 | 69 | AWGN | 0 | 18 ns |
| B4 | 480kHz | 139 | 69 | AWGN | 0 | 18 ns |
| C2 | 480kHz | 139 | 69 | AWGN | 0 | 18 ns |
| A2 | 480kHz | 139 | 69 | TDLA10-650 | 7100 | 68 ns |
| B4 | 480kHz | 139 | 69 | TDLA10-650 | 7100 | 68 ns |
| C2 | 480kHz | 139 | 69 | TDLA10-650 | 7100 | 68 ns |
| A2 | 480kHz | 571 | 285 | AWGN | 0 | 18 ns |
| B4 | 480kHz | 571 | 285 | AWGN | 0 | 18 ns |
| C2 | 480kHz | 571 | 285 | AWGN | 0 | 18 ns |
| A2 | 480kHz | 571 | 285 | TDLA10-650 | 7100 | 68 ns |
| B4 | 480kHz | 571 | 285 | TDLA10-650 | 7100 | 68 ns |
| C2 | 480kHz | 571 | 285 | TDLA10-650 | 7100 | 68 ns |
| A2 | 960kHz | 139 | 69 | AWGN | 0 | 9 ns |
| B4 | 960kHz | 139 | 69 | AWGN | 0 | 9 ns |
| C2 | 960kHz | 139 | 69 | AWGN | 0 | 9 ns |
| A2 | 960kHz | 139 | 69 | TDLA10-650 | 7100 | 59 ns |
| B4 | 960kHz | 139 | 69 | TDLA10-650 | 7100 | 59 ns |
| C2 | 960kHz | 139 | 69 | TDLA10-650 | 7100 | 59 ns |

* Recommended WF
  + The list should be updated in the 2nd round after more agreements on other issues.

## Companies views’ collection for 1st round

### Open issues

Sub topic 4-1 PRACH configurations

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 4-1-1: SCS for PRACH requirements  Issue 4-1-2: Channel model for PRACH requirements  Issue 4-1-3: Ncs, logical sequence index combinations |
| Nokia | Issue 4-1-1: SCS for PRACH requirements  Option 1. We prefer to include all the SCSs.  We understand 960 kHz is an important feature added as part of the work in FR2-2, and we would like that to be included in the requirements  Issue 4-1-2: Channel model for PRACH requirements  Option 1.  If we keep Option 2 that would force the TE vendors to implement TDL10 channel model with updated tap delay resolution also for 100 MHz test cases. So it is better to keep the general agreement and adopt TDLA30 for 120 kHz which could be using 100 MHz CBW.  Issue 4-1-3: Ncs, logical sequence index combinations  Option 1.  The Ncs proposals didn’t really have objection during the last meeting, so we brough this proposal based on the previous WF focusing only on NCS and LRA combinations.  These values were calculated in our paper considering how to keep the coverage area for each LRA/Ncs combination. |
| Ericsson | Issue 4-1-1: SCS for PRACH requirements  Option 2.  Issue 4-1-2: Channel model for PRACH requirements  We are OK with Option 1 to align channel model agreement.  Issue 4-1-3: Ncs, logical sequence index combinations  We are OK with Proposal 1. |
| Samsung | Issue 4-1-1: SCS for PRACH requirements  Option 2 , same as PUSCH and PUCCH  Issue 4-1-2: Channel model for PRACH requirements  Option2, we prefer to keep the previous agreement as AWGN and TDL-A 10-650 for all SCSs., similar as FR2-1, there is no different processing. Meanwhile, the test coverage of different channel is covered by PUSCH,  Issue 4-1-3: Ncs, logical sequence index combinations  Ok with option 1 |
| Moderator (Nokia) | Update after GTW session on 11th of October.  Issue 4-1-1: SCS for PRACH requirements  No need for further discussion considering GTW agreement on Issue 1-1-1.  Issue 4-1-2: Channel model for PRACH requirements   * Tentative agreement: Option 1.   Issue 4-1-3: Ncs, logical sequence index combinations  Considering comments on the 1st round, can we agree on Option 1? |
| Huawei | Issue 4-1-3: Ncs, logical sequence index combinations  Option 1 is OK |

Sub topic 4-2 Accuracy and test procedure

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 4-2-1: PRACH time error tolerance general aspects  Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Issue 4-2-4: PRACH time error tolerance for 960 kHz SCS |
| Nokia | Issue 4-2-1: PRACH time error tolerance general aspects  We agree with Proposal 1 and Proposal 2.  Proposal 1 is following assumptions also used in other WIDs such as NR-U.  Proposal 2 is how we understand the time error tolerance was calculated so far.  Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  We agree with option 2.  If we agree with using TDLA30 for 120 kHz SCS, we can reuse the time error tolerance from FR2-1.  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Option 1.  This fits our calculations considering the updated channel model taps agreed during the last RAN4 meeting.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **SCS** | **Channel model** | **LRA** | **Min PRACH resolution (ns)** | **TAC resolution (ns)** | **11th tap (ns)** | **TAC resol + 11th tap** | **Time error tolerance (ns)** | | 480 | AWGN | 139 | 15.0 | 16.3 | 0 | 16.3 | 18 | |  | AWGN | 571 | 3.6 | 16.3 | 0 | 16.3 | 18 | |  | TDLA10-650 | 139 | 15.0 | 16.3 | 50 | 66.3 | 68 | |  | TDLA10-650 | 571 | 3.6 | 16.3 | 50 | 66.3 | 68 |   Issue 4-2-4: PRACH time error tolerance for 960 kHz SCS  Option 1.  This fits our calculations considering the updated channel model taps agreed during the last RAN4 meeting.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **SCS** | **Channel model** | **LRA** | **Min PRACH resolution (ns)** | **TAC resolution (ns)** | **11th tap (ns)** | **TAC resol + 11th tap** | **Time error tolerance (ns)** | | 960 | AWGN | 139 | 7.5 | 8.1 | 0 | 8.1 | 9 | |  | TDLA10-650 | 139 | 7.5 | 8.1 | 50 | 58.1 | 59 | |
| Ericsson | Issue 4-2-1: PRACH time error tolerance general aspects  We are fine with Proposal 1 and 2. Maybe more clarification could be added that using following formula:  Time error tolerance = max(AWGN\_tolerance + 2nd last tap delay, minimum timing advance command step).  Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Depend on the decision of Issue 4-1-2.  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  We are OK with Option 1. |
| Samsung | Issue 4-2-1: PRACH time error tolerance general aspects  Ok with option1 and option 2, for time error tolerance for fading channel, we prefer to apply the AWGN tolerance combined with the last tap delay, considering the power of last tap is close to the 2nd last tap delay  Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Option1, same channel model for different SCS , as FR2-1  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Option 1 |
| Nokia | Update after GTW session on the 11th of October.  Issue 4-2-1: PRACH time error tolerance general aspects   * + Proposal 1 agreed   + Reuse calculation of PRACH time error tolerance for fading channel from Rel 15 and Rel 16   Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Please consider if we can agree on Option 2 considering the outcome of 4-1-2 and 4-2-1?  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Please consider if we can agree on Option 1 considering the outcome of 4-2-1?  Issue 4-2-4: PRACH time error tolerance for 960 kHz SCS  No further discussion needed given the GTW agreement on Issue 1-1-1. |
| Huawei | Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Option 2  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Option 1 |
| Ericsson 2 | Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Agree with Option 2.  Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Agree with Option 1. |

Sub topic 4-3 Test cases

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 4-3-1: List of test cases for PRACH demodulation requirements |
| Nokia | Issue 4-3-1: List of test cases for PRACH demodulation requirements  To be updated pending the agreements on the previous issues. |
| Ericsson | Issue 4-3-1: List of test cases for PRACH demodulation requirements  Depend on the decisions from issues above. |
| Samsung | Issue 4-3-1: List of test cases for PRACH demodulation requirements  Pending on the decisions of previous issues |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2216576**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216576.zip) | Nokia  We noticed that some channel models are not according to our agreements in the tables. We would like a revision for that. |
| Company B |
|  |
| [**R4-2216577**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216577.zip) | Nokia  Removal of mention to 960 kHz is needed |
| Company B |
|  |
| [**R4-2216692**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216692.zip) | Nokia  It is good that the channel models are included.  I think it is not necessary to redevined TDLA30, since it is already there for FR2-1. We also don’t need to distinguish FR2-1 and FR2-2 in my view. So the new tables could be in G.2.1.2 without need for new clause.  Why do we need to create a “A” table like Table A.6-2A? Cant we just continue the normal numbering, like Table A.6-8? |
| Company B |
|  |
| [**R4-2216693**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216693.zip) | Nokia  It is good that the channel models are included.  I think it is not necessary to redevined TDLA30, since it is already there for FR2-1. We also don’t need to distinguish FR2-1 and FR2-2 in my view. So the new tables could be in G.2.1.2 without need for new clause.  Why do we need to create a “A” table like Table A.6-2A? Cant we just continue the normal numbering, like Table A.6-8? |
| Company B |
|  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#4-1** | Issue 4-1-1: SCS for PRACH requirements  Considering agreement on Issue 1-1-1, no further discussion is needed for this issue.  *Recommendations for 2nd round:*   * No further discussion needed   Issue 4-1-2: Channel model for PRACH requirements  *Tentative agreements:*   * RAN4 to define PRACH demodulation requirements using AWGN and TDL-A 30-650 channel model for 120 kHz SCS and using AWGN and TDL-A 10-650 channel model for other SCSs.   *Recommendations for 2nd round:*   * Confirm tentative agreement   Issue 4-1-3: Ncs, logical sequence index combinations  Considering 1st round discussions, Option 1 seems agreeable  *Tentative agreements:*   * RAN4 to define PRACH demodulation performance requirements using the following Ncs parameters:   + For requirements with LRA=139 use NCS=69   + For requirements with LRA=571 use NCS=285   + For requirements with LRA=1151 use NCS=575   *Recommendations for 2nd round:*   * Confirm tentative agreement |
| **Sub-topic#4-2** | Issue 4-2-1: PRACH time error tolerance general aspects  *GTW agreement:*   * Proposal 1 agreed * Reuse calculation of PRACH time error tolerance for fading channel from Rel 15 and Rel 16   *Recommendations for 2nd round:*   * No further discussion needed   Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS  Considering agreements and comments after GTW, option 2 is agreeable.  *Tentative agreements:*   * Reuse calculation of PRACH time error tolerance for 120 kHz SCS requirements with AWGN and TDLA30.   *Recommendations for 2nd round:*   * Confirm tentative agreement   Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS  Option 1 – Ericsson Huawei  *Tentative agreements:*   * Use following configurations as time error tolerance:  |  |  |  | | --- | --- | --- | | **SCS** | **Channel model** | **Time error tolerance (ns)** | | 480 | AWGN | 18 | |  |  | |  | TDLA10-650 | 68 |   *Recommendations for 2nd round:*   * Confirm tentative agreement   Issue 4-2-4: PRACH time error tolerance for 960 kHz SCS  Agreement on Issue 1-1-1, no further discussion needed. |
| **Sub-topic#4-3** | Issue 4-3-1: List of test cases for PRACH demodulation requirements  Considering the agreements in the previous issues, the Table in Issue 4-3-1 can be adapted and agreed  *Tentative agreements:*   * Please look at table in the issue for discussion on the 2nd round. Not included here due to formatting issues   *Recommendations for 2nd round:*   * Confirm agreement on table with test cases |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2216576 | *to be revised* |
| R4-2216577 | *to be revised* |
| R4-2216692 | *to be revised* |
| R4-2216693 | *to be revised* |

## Discussion on 2nd round

### Sub-topic 4-1 PRACH configurations

**Issue 4-1-1: SCS for PRACH requirements**

* Issue closed in the 1st round

**Issue 4-1-2: Channel model for PRACH requirements**

* Tentative agreement:
  + RAN4 to define PRACH demodulation requirements using AWGN and TDL-A 30-650 channel model for 120 kHz SCS and using AWGN and TDL-A 10-650 channel model for other SCSs.
* Recommended WF:
  + Confirm tentative agreement

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with agrement |
| Huawei | Fine with agreement |

**Issue 4-1-3: Ncs, logical sequence index combinations**

* Tentative agreement:
  + RAN4 to define PRACH demodulation performance requirements using the following Ncs parameters:
    - For requirements with LRA=139 use NCS=69
    - For requirements with LRA=571 use NCS=285
    - For requirements with LRA=1151 use NCS=575
* Recommended WF:
  + Confirm tentative agreement

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with agreement |
| Huawei | Fine with agreement |

### Sub-topic 4-2 Accuracy and test procedure

**Issue 4-2-1: PRACH time error tolerance general aspects**

* Agreement during GTW; no further discussion needed

**Issue 4-2-2: PRACH time error tolerance for 120 kHz SCS**

* Tentative agreement
  + Reuse calculation of PRACH time error tolerance for 120 kHz SCS requirements with AWGN and TDLA30.
* Recommended WF
  + Confirm the tentative agreement.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with tentative agreement |
| Huawei | Fine with tentative agreement |

**Issue 4-2-3: PRACH time error tolerance for 480 kHz SCS**

* Proposals
  + Use following configurations as time error tolerance:

|  |  |  |
| --- | --- | --- |
| **SCS** | **Channel model** | **Time error tolerance (ns)** |
| 480 | AWGN | 18 |
|  |  |
|  | TDLA10-650 | 68 |

* Recommended WF
  + Confirm the tentative agreement.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with tentative agreement |
| Huawei | Fine with tentative agreement |

**Issue 4-2-4: PRACH time error tolerance for 960 kHz SCS**

Agreement on Issue 1-1-1, no further discussion needed.

### Sub-topic 4-3 Test cases

**Issue 4-3-1: List of test cases for PRACH demodulation requirements**

* Tentative agreement:
  + Use the table below for the test cases and parameters related to PRACH demodulation requirements:

| **Format** | **SCS** | **Prach sequence length** | **Ncs** | **Propagation condition** | **Frequency Offset (Hz)** | **Time estimation tolerance** |
| --- | --- | --- | --- | --- | --- | --- |
| A2 | 120kHz | 139 | 69 | AWGN | 0 | 70 ns |
| B4 | 120kHz | 139 | 69 | AWGN | 0 | 70 ns |
| C2 | 120kHz | 139 | 69 | AWGN | 0 | 70 ns |
| A2 | 120kHz | 139 | 69 | TDLA30-650 | 7100 | 220 ns |
| B4 | 120kHz | 139 | 69 | TDLA30-650 | 7100 | 220 ns |
| C2 | 120kHz | 139 | 69 | TDLA30-650 | 7100 | 220 ns |
| A2 | 120kHz | 571 | 285 | AWGN | 0 | 70 ns |
| B4 | 120kHz | 571 | 285 | AWGN | 0 | 70 ns |
| C2 | 120kHz | 571 | 285 | AWGN | 0 | 70 ns |
| A2 | 120kHz | 571 | 285 | TDLA30-650 | 7100 | 220 ns |
| B4 | 120kHz | 571 | 285 | TDLA30-650 | 7100 | 220 ns |
| C2 | 120kHz | 571 | 285 | TDLA30-650 | 7100 | 220 ns |
| A2 | 120kHz | 1151 | 575 | AWGN | 0 | 70 ns |
| B4 | 120kHz | 1151 | 575 | AWGN | 0 | 70 ns |
| C2 | 120kHz | 1151 | 575 | AWGN | 0 | 70 ns |
| A2 | 120kHz | 1151 | 575 | TDLA30-650 | 7100 | 220 ns |
| B4 | 120kHz | 1151 | 575 | TDLA30-650 | 7100 | 220 ns |
| C2 | 120kHz | 1151 | 575 | TDLA30-650 | 7100 | 220 ns |
| A2 | 480kHz | 139 | 69 | AWGN | 0 | 18 ns |
| B4 | 480kHz | 139 | 69 | AWGN | 0 | 18 ns |
| C2 | 480kHz | 139 | 69 | AWGN | 0 | 18 ns |
| A2 | 480kHz | 139 | 69 | TDLA10-650 | 7100 | 68 ns |
| B4 | 480kHz | 139 | 69 | TDLA10-650 | 7100 | 68 ns |
| C2 | 480kHz | 139 | 69 | TDLA10-650 | 7100 | 68 ns |
| A2 | 480kHz | 571 | 285 | AWGN | 0 | 18 ns |
| B4 | 480kHz | 571 | 285 | AWGN | 0 | 18 ns |
| C2 | 480kHz | 571 | 285 | AWGN | 0 | 18 ns |
| A2 | 480kHz | 571 | 285 | TDLA10-650 | 7100 | 68 ns |
| B4 | 480kHz | 571 | 285 | TDLA10-650 | 7100 | 68 ns |
| C2 | 480kHz | 571 | 285 | TDLA10-650 | 7100 | 68 ns |

* Recommended WF
  + Please confirm the tentative agreement.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Fine with tentative agreement |
| Huawei | Fine with tentative agreement |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on general aspects for FR2-2 demodulation requirements | Huawei,HiSilicon |  |
|  | WF on PUSCH demodulation requirements for FR2-2 | Nokia, Nokia Shanghai Bell |  |
|  | WF on PUCCH demodulation requirements for FR2-2 | Ericsson |  |
|  | WF on PRACH demodulation requirements for FR2-2 | Samsung |  |
|  | Simulation results collection for FR2-2 BS demod | Huawei,HiSilicon |  |
|  | Draft CR 38.104: PUSCH requirements for FR2-2 | Nokia, Nokia Shanghai Bell, Intel |  |
|  | Draft CR 38.141-2: PUCCH requirements for FR2-2 | Nokia, Nokia Shanghai Bell, Intel |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2215690 |  | Discussion on general and PUSCH issue for FR2-2 BS demodulation | Ericsson | Noted |  |
| R4-2215691 |  | Simulation results for FR2-2 PUSCH | Ericsson | Noted |  |
| R4-2215694 |  | draftCR for TS38.104 introduce FRC tables for FR2-2 PUSCH requirements | Ericsson | Revised |  |
| R4-2215695 |  | draftCR for TS38.141-2 introduce FRC tables for FR2-2 PUSCH requirements | Ericsson | Revised |  |
| R4-2216020 |  | Draft CR: Introduction of FR2-2 PUSCH radiated conformance testing requirements in TS 38.141-2 | Huawei,HiSilicon | Revised |  |
| R4-2216021 |  | Discussions on FR2-2 PUSCH demodulation requirements | Huawei,HiSilicon | Revised |  |
| R4-2216022 |  | Simulation results on FR2-2 PUSCH demodulation requirements | Huawei,HiSilicon | Revised |  |
| R4-2216570 |  | Discussion on PUSCH demodulation requirements for the extension to 71 GHz | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2216571 |  | PUSCH simulation results for the extension to 71 GHz | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2216691 |  | View on BS demodulation requirement for NR extended to 71GHz | Samsung | Noted |  |
| R4-2216694 |  | Initial simulation results on PUSCH demodulation requirement for Rel-17 71GHz | Samsung | Noted |  |
| R4-2215692 |  | Simulation results for FR2-2 PUCCH | Ericsson | Noted |  |
| R4-2216023 |  | Discussions and simulation results on FR2-2 PUCCH demodulation requirements | Huawei,HiSilicon | Revised |  |
| R4-2216024 |  | Draft CR Introduction of FR2-2 PUCCH performance requirements in TS 38.104 | Huawei,HiSilicon | Revised |  |
| R4-2216572 |  | Discussion on PUCCH demodulation requirements for the extension to 71 GHz | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2216573 |  | PUCCH simulation results for the extension to 71 GHz | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2216695 |  | Initial simulation results on PUCCH demodulation requirement for Rel-17 71GHz | Samsung | Noted |  |
| R4-2215693 |  | Simulation results for FR2-2 PRACH | Ericsson | Noted |  |
| R4-2216025 |  | Discussions on FR2-2 PRACH demodulation requirements | Huawei,HiSilicon | Revised |  |
| R4-2216026 |  | Simulation results on FR2-2 PRACH demodulation requirements | Huawei,HiSilicon | Revised |  |
| R4-2216574 |  | Discussion on PRACH demodulation requirements for the extension to 71 GHz | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2216575 |  | PRACH simulation results for demodulation requirements for the extension to 71 GHz | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2216576 |  | Draft CR 38.104: PRACH requirements for FR2-2 | Nokia, Nokia Shanghai Bell | Revised |  |
| R4-2216577 |  | Draft CR 38.141-2: PRACH requirements for FR2-2 | Nokia, Nokia Shanghai Bell | Revised |  |
| R4-2216692 |  | Draft CR on annex for PRACH requirement for TS 38.104 | Samsung | Revised |  |
| R4-2216693 |  | Draft CR on annex for PRACH requirement for TS 38.141-2 | Samsung | Revised |  |
| R4-2216696 |  | Initial simulation results on PRACH demodulation requirement for Rel-17 71GHz | Samsung | Noted |  |

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** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
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. Do not include hyper-links in the documents