**3GPP TSG-RAN WG4 Meeting #94-e R4-20xxxxx**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 8.17.2.2

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

**Title:** Email discussion summary for RAN4#94e\_#94\_NR\_HST\_Demod\_BS

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

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

* 1st round: TBA
* 2nd round: TBA

## Background and scope

Following the assessment of the situation with the 2019 coronavirus spread, the RAN TSG and WG leadership (in close co-ordination with the SA and CT leadership) has made the decision that all 2020/Q1 RAN WG meetings (scheduled for February) and RAN#87 (scheduled for March) will be converted to E-meetings.

This T-doc will be used to guide the email discussion for the topic of Rel-16 NR HST BS demodulation requirements (AI 8.17.2.2), with the email thread identifier(s) “RAN4#94e\_#94\_NR\_HST\_Demod\_BS”.

The scope of this email discussion are Rel-16 NR HST BS demodulation requirements, and in particular the agenda items:

8.17.2.2 BS demodulation requirements (38.104)

8.17.2.2.1 PUSCH requirements

8.17.2.2.2 PRACH requirements

8.17.2.2.3 UL timing adjustment requirements

The first iteration of this email discussion summary document identifies key open issues, summarizes proposals, recommends topics/questions to be handled via email discussions, and proposes way forwards wherever adequate.  
Later iterations of this T-doc will summarize the 1st and 2nd round discussions of the various open issues and will recommend CRs/TP status updates.

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

* 1st round:
  + Collect company views on the issues and options listed in this summary.
  + Collect company views and proposed corrections on the submitted CRs.
  + Align on open fundamental directions for HST requirements, e.g.
    - Whether to split requirements for 350 kph and 500 kph.
    - Inclusion of 1T1R in HST PUSCH.
  + Agree on the many undisputed test parameters.
* 2nd round:
  + Finish spill-over from 1st round.
  + Discuss and find suitable compromises to agree on the remaining test parameters.
  + Finish the CRs.

## Email discussion guidelines

In addition to following the RAN4#94 E-meeting Arrangements and Guidelines V1.2” of which some important passages are reproduced below, we would request the companies participating in RAN4#94e\_#94\_NR\_HST\_Demod\_BS, to follow the additional guidelines outlined here:

* Deadline for 1st round email discussion is **Wednesday 5pm UTC Feb. 26**.
* Deadline for 2nd round email discussion is **Thursday 5pm UTC Mar. 5**.
* Emails sent and company views uploaded after the deadline will not be taken into account for the summary of the respective round.
* The preferred method of commenting is to add/update your company’s view directly in this email summary document (use change marks if appropriate) and upload it to the RAN4#94e\_#94\_NR\_HST\_Demod\_BS draft folder. This is based on the Chair’s emails on this topic; reproduced further below.
  + Draft folder: <ftp://www.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_e/Inbox/Drafts/%2394_NR_HST_Demod_BS>
  + It is expected delegates will download the newest version (including other companies’ versions) of the summary document, insert comments and upload it back.  
    To ensure the comments are captured timely and correctly, the delegate is encouraged to:
    - Rename the file by adding your company name.
    - Send an email on the reflector informing that comments are made with the correct file name.
    - Please account for possibly updated base document versions, before uploading your updates.
  + Moderators are encouraged to merge all comments once a day and at the end of phase 1/2.
    - This new revision should then be used for any new commenting.
    - The moderator may ask for 1-2 hours of no new contents to perform merging, if the reflector is particularly busy.
    - In case of strong desynchronization, the moderator might provide an additional new revision outside the one a day cycle. Please check before uploading.
  + Company views can be updated, e.g., based on comments from other companies
    - The revised comments should be easy to identify, for example, by marking them as “after seeing comments from …/ or intermediate proposal, our position/comment now is …”, while the initial comments remain unchanged in the template file.
  + Comments only received by email will merged into the summary document by the moderator on a best effort basis.
* In case a discussion outside of updating your company’s view is necessary, please use the email thread identifier (RAN4#94e\_#94\_NR\_HST\_Demod\_BS) and clearly mark the subtopic either in the subject (not aligned with chair guidance) or in the beginning of the email text.
  + Please do not forget to update your company view in this T-doc, if you make comments on a specific issue per email.
* If no company shows their concern on a particular issue until the deadline, the related contents will be considered stable.

In the shared draft of the “RAN4#94 E-meeting Arrangements and Guidelines V1.1”, available on the reflector and ultimately uploaded as [R4-2000001], the RAN4 Chair and Vicechairs have given the following guidance and the email discussion procedures and timeline:

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| * **Week before the E-meeting (Feb. 17 - 21)**   + Monday (Feb. 17): email discussion moderators will be announced by session chairs (aligned template will be provided and used)   + Tuesday – Friday (Feb. 18-21): moderators prepare summary materials for email discussion     - Moderators shall identify key open issues, summarize proposals and recommend topics/questions to be handled via email discussions * **E-meeting (Feb. 24 – Mar. 6)**    + Stage 0: Session chairs announce the set of email threads (no later than Monday 8am UTC, Feb. 24)   + Stage 1: Moderators trigger email discussion (Monday Feb. 24)   + Stage 2: Companies provide comments for the 1st round (Feb. 24 – Wednesday 5pm UTC Feb. 26)   + Stage 3: Moderators summarize the status and possible proposals, recommending what decisions can be made for 1st round. A formal t-doc will be used (Thursday 5pm UTC, Feb. 27)   + Stage 4: After receiving the summary from moderators, session chair may approve documents, make agreements or assign new CRs, WFs, LSs, etc. Then, session chair announces 2nd round discussion with tdoc status update (no later than Monday 8am UTC, March 2)   + Stage 5: Companies provide comments for 2nd round and moderators provide second round summary (Monday Mar. 2 – Thursday 5pm UTC Mar. 5)     - Note: Formal version of stable tdocs shall be uploaded to the Inbox (except Cat A CRs) before Stage 6   + Stage 6: Session Chair announces conclusions (no later than 5pm UTC, March 6) |

Furthermore, useful notes/tips on the email discussion were provided:

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| * Delegates are strongly encouraged to provide comments/concerns asap   + Silence within a reasonable timeframe means no objection * It is strongly encouraged that each company/delegate consolidate their comments/views and send them out in one email for each email thread * Each email thread needs to use a clear and consistent thread title for easy tracking (the title for each thread is to be announced)   + - * E.g., if not done appropriately, after a while an email thread may become something like:         + RE: xxxx         + RE: RE: xxxx         + 回复:RE: xxxx         + [External] RE: xxxx         + Etc.   which makes it very hard to track. PLEASE fix it to RE: xxxx! |

Please be also advised to follow the requests by MCC on the email reflector on the logistics of this e-meeting:

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| * It is important to refrain from sending attachments [on the reflector] because they slow down the delivery of emails and thereby, they have an adverse impact on the already ongoing e-meetings. Draft documents can be shared by creating subfolders to Inbox/Drafts folder. * there is now a facility on RAN4#94-e Inbox and Inbox/Drafts folders on the public server to allow you to upload your documents using a web browser\*.   + Open your browser and navigate to RAN4#94-e Inbox folder,   + <https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Inbox>   + or Inbox/Drafts folder,   + <https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_94_e/Inbox/Drafts>   + Click the green button to log in using your EOL account. |

As well as the guidelines given by the chair on how the commenting process is expected to take place (previous guidelines are aligned with chair guidance):

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| After the summary is uploaded to the ftp site by the moderator, what is the procedure to send comments? Should one download the document, insert comments and upload the file back to the ftp site? Or will the summary be included in one e-mail in which companies will include their comments?  [Steven] As each moderator will provide their initial summary in the shared template file that resides in the corresponding thread folder under <ftp://3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_e/Inbox/Drafts/>, it is expected delegates will download the document, insert comments and upload it back. To ensure the comments are captured timely, the delegate is encouraged to do:  The file name is renamed by adding your company name Send an email on the reflector informing that comments are made with the correct file name  Also, if the file or e-mail thread is updated at the same time by multiple companies, what would the procedure be? Should the moderator merge all comments right away or only at the end of phase 1/2?  [Steven] As said above, when making a comment, please rename the file to facilitate identification. Moderators are encouraged to merge all comments once a day and at the end of phase 1/2.  And another thing, is it possible to revise the comments? Based on what some companies comments, it is possible that more people would agree to some “intermediate” proposal or the comments might change based on some clarification question.  [Steven] Yes. I also hope the revised comments can be easily identified, such as “after seeing comments from …/ or intermediate proposal, our position/comment now is …”, while the initial comments remain unchanged in the template file. In this way, other delegates will be able to track the whole discussion. |

and

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| Perhaps it is useful to share the thinking from RAN4 leadership first:   1. This e-meeting, with its many email threads, is an uncharted territory for all the delegates, moderators, session chairs, and MCC. As such, there will be new issues/problems, despite the fact that we are trying to provide many guidelines to properly structure and guide the process. And frankly speaking, in many cases, there is no perfect solution. Rather, it is a choice after weighing the pros and cons of different options. 2. We do want to leave some flexibilities to moderators, because 1) moderators are the active delegates in their topic areas 2) different threads have different scopes and thus may require different ways of handling 3. When making comments, please do so as soon as possible and consolidate them as much as possible 4. Be nice and be patient, knowing email discussions will have delays and cause misunderstanding 5. When facing uncertainty or new issues, please ask moderators, session chairs and MCC, and we will help.   Next, please find my answers to your questions:  1. If all the companies comment on their own document, how do we reply/comment on other companies’ comments? Do we copy/paste their comments on my own document, and add comments below it?  [Steven] when you provide a comment, always try to use the latest version of the summary document from moderator. For comments on comments, make it clear that you are responding to which comment.  2. When we want to add more comments/reply after the first version of document with comment is uploaded, do we use a new template file and add the additional comment, or we append the additional comments on the first version and upload? Do you have guidelines for naming different versions with additional comments?  [Steven] See above. Always work on the latest version of the summary document from moderator. And rename the file for easy identification, with some suffix such as “\_QC\_0214” (0224 meaning Feb. 24)  3. For moderator, after merging the comments each day, do we upload the merged comments to ftp? If yes, after moderator uploaded the merged document, should delegates comment on the new merged document, or still use the original template?  [Steven] We encourage moderators to merge the comments and upload the summary once a day to the ftp server. |

# Topic #1: General BS demodulation requirements (8.17.2.2)

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

This section contains T-docs with corresponding proposals and observations submitted to the agenda item “8.17.2.2 BS demodulation requirements (38.104)”, which could not be exclusively matched to any of the lower level agenda items.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| *R4-20xxxxx* | *Company A* | *Proposal 1:*  *Observation 1:* |
| R4-2000613 | CATT | N/A |
| R4-2001689 | Nokia, Nokia Shanghai Bell | Applicability to base station types  Proposal 8: RAN4 to capture “these requirements shall only be applied to Wide Area Base Stations [insert reference to corresponding manufacturer declaration]” in the test specifications. The requirement specification [TS 38.104], does not need to make this distinction.  Requirements for 350 kph and 500 kph  Proposal 9: RAN4 to consider splitting requirements and tests for 350kph and 500kph.  Proposal 10: RAN4 to consider letting BS declare support for 350kph or 500kph, and testing conformance with the declared  Proposal 11: Assuming the 350kph FRCs and configurations are a true subset of the 500kph FRCs and configurations, passing 500kph also covers the 350kph conformance. If this assumption does not hold, both cases need to be tested independently. |

## 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: High speed BS demodulation requirement applicability with respect to BS types

*Sub-topic description:*

This sub-topic deals with the open issue of whether or not to limit the high speed BS demodulation requirements to certain BS types. The topic initially came to light during email discussions on CRs to introduce HST PUSCH UL TA requirements, where a restriction of requirements was observed in the LTE specification, but a lack of discussion on this issue for NR was recognized.

In TS 36.104 V16.4.0, the sections

* 8.2.2 (PUSCH >) Requirements for UL timing adjustment
* 8.2.3 (PUSCH >) Requirements for high speed train
* 8.4.2.1 (PRACH detection requirements >) Minimum requirements

Carry statements of “[t]his requirement shall not be applied to Local Area BS and Home BS.”

In TS 38.104 V16.2.0, the defined BS classes in NR are captured as

* For BS type 1-O and 2-O, BS classes are defined as “Wide Area Base Stations”, “Medium Range Base Stations”, and “Local Area Base Stations”.
* For BS type 1-C and 1-H, BS classes are defined as “Wide Area Base Stations”, “Medium Range Base Stations”, and “Local Area Base Stations”.

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

**Issue 1-1-1: Limit the applicability of high speed demodulation requirements with respect to BS types**

* Proposals
  + Option 1 (Nokia, Samsung, Huawei, ): PUSCH HST, PRACH HST, PUSCH UL TA requirements shall only be applied to Wide Area Base Stations.
  + Option 2 (): Do not limit the applicability to wide are base stations.
* Recommended WF
  + Follow the LTE approach and limit requirements for PUSCH UL timing adjustment, requirements for PUSCH high speed train, and requirements for PRACH in high speed scenarios to only Wide Area Base Stations.

### Sub-topic 1-2: High speed BS demodulation requirement applicability with respect to speed

*Sub-topic description:*

This sub-topic deals with the open issue of whether or not to split high speed BS demodulation requirements in general along the 350kph and 500kph lines, and allow declaration, testing, etc. along those sub-groupings.

This topic initially came to light during email discussions on CRs to introduce HST PUSCH UL requirements.

Note that this topic is also discussed in the “PUSCH requirements” section, with the distinction that the discussion here covers PUSCH, UL TA, and PRACH in general, while the other topic covers PUSCH exclusively.

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

**Issue 1-2-1: Organisation of high speed train requirement sections in specifications**

* Proposals
  + Option 1 (Nokia, Ericsson, Huawei, ): Split requirements and tests for 350 kph and 500 kph in separate sections.
  + Option 2 (Samsung, ): Do not make a section difference between 350 kph and 500 kph.
  + Option 3 (Samsung, ): Follow LTE approach, separate requirement table within the same section for HST.  
    [Moderator question: The current CRs for PUSCH HST introduce new sub-sections for HST, which seems aligned with the LTE approach for those sections. Are those CRs challenged by this option?]
  + Option 4 (CMCC, ): Requirements for 350km/h and 500km/h need to be split, but separate section or separate tables is both acceptable.
* Recommended WF
  + Comments need to be collected during 1st round of online meeting.

**Issue 1-2-2: High speed support declaration**

* Proposals
  + Option 1 (Nokia, Samsung, Ericsson, Huawei, ): Allow BS to declare support for 350kph or 500kph and to test requirements accordingly.
* Recommended WF
  + Comments need to be collected during 1st round of online meeting.

**Issue 1-2-3: High speed implicit test pass**

* Proposals
  + Option 1 (Nokia, Ericsson, ): Assuming the 350kph FRCs and configurations are a true subset of the 500kph FRCs and configurations, passing 500kph also covers the 350kph conformance. If this assumption does not hold, both cases need to be tested independently.
  + Option 3 (Samsung, ): No implicit test passing. Test cases pertaining to declared speed need to be passed.
  + Option 4 (Huawei, ): 350km/h and 500km/h should have the same test configurations except the Max Doppler shift, in such configuration, BS only needs to pass either 350km/h or 500km/h related requirements as per BS declaration.
* Recommended WF
  + Comments need to be collected during 1st round of online meeting.

**Issue 1-2-4: High speed support declaration interplay with previous applicability rules and test coverage**

* Agreements in RAN4#92-bis (WF R4-1912729)
* PRACH format
  + For 350km/h velocity, use PRACH format 0
  + For 500km/h velocity, use PRACH format A2/B4/C2
    - FFS if PRACH format 0 shall be used
* Agreements in RAN4#93 (WF R4-1915914)
* PRACH format
  + For 500km/h velocity, use PRACH format A2/B4/C2
  + For 500km/h velocity, no extra requirements for PRACH format 0
* Condition
  + This issue only arises, if BS declaration of support for 350 kph and 500 kph is agreed to be introduced (Issue 1-2-2) and applied to PRACH requirements.
* Proposals
  + (CMCC, ): Decide, if a BS needs to pass short PRACH sequence test, given the BS declares to only support 350 kph.  
    It was agreed that PRACH format A2/B4/C2 are used for 500km/h. Considering that BS can declare supported speed of either 350km/h or 500km/h and the applicability rule for different speed is under discussion, do we need to introduce short sequence format for 350km/h?
  + Option 2 (Nokia, Huawei, ): A BS declaring to only support 350 kph does not need to test short sequences. A BS declaring to support only support 500 kph does not need to test long sequences.
  + Option 3 (Samsung, ): No application rule for PRACH, If BS declares 500km/h, it should use PRACH format A2/B4/C2 to test. As for which format is used to test, it can be declared with BS.
  + Option 4 (Ericsson, ): Use separate sections for long format and short format HST PRACH, then BS can choose any one of them according to its declaration no matter it supports 500km/h or not.
  + Option 5 (CMCC, ): Define requirements with short format for 350km/h. Test apply based on declaration of supported PRACH formats.
* Recommended WF
  + Comments need to be collected during 1st round of online meeting.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| *XXX* | *Sub topic 1-1-1:*  *Sub topic 1-2-1:*  *….*  *Others:* |
| Nokia, Nokia Shanghai Bell | 1-1-1: Agree with WF. Limit to macro BS. HST does only make sense for macro.  1-2-1: Remain with previous proposal as captured in option 1. Will allow BS vendors to easily certify products that are optimised for certain use cases (350 or 500 kph max trains).  1-2-2: Remain with previous proposal as captured in option 1. Will allow BS vendors to easily certify products that are optimised for certain use cases (350 or 500 kph max trains).  1-2-3: Remain with previous proposal as captured in option 1. For example, a BS declaring support for 500kph would still need to test the long sequences at 350kph, making sure that higher speed does not mean lack of lower speed features.  1-2-4: In alignment with Issue 1-2-3 (“no true subset”), it is our opinion that a BS declaring to only support 350 kph does not need to test short sequences. No such requirements need to be introduced. |
| Samsung | Sub topic 1-1:  Issue 1-1-1: Limit the applicability of high speed demodulation requirements with respect to BS types  Prefer option 1: Requirements shall only be applied to Wide Area Base Stations  Follow LTE approach, the limit requirements for PUSCH UL timing adjustment, requirements for PUSCH high speed train, and requirements for PRACH in high speed scenarios to only Wide Area Base Stations.  Sub topic 1-2:  Issue 1-2-1: Organisation of high speed train requirement sections in specifications  Prefer option 2: Do not make a section difference between 350 kph and 500 kph  Follow LTE approach, separate requirement table within the same section for HST is preferred.  Issue 1-2-2: High speed support declaration  Prefer option 1  Issue 1-2-3: High speed implicit test pass  Prefer option 2: The test case can be declared with BS, no implicit test [Moderator: The reasoning given here for choosing option 2 is not in line with my intention when writing option 2. I have created option 3 to capture your comment. Please check if this is acceptable.]  Issue 1-2-4: High speed support declaration interplay with previous applicability rules and test coverage  Prefer no application rule for PRACH, If BS declares 500km/h, it should use PRACH format A2/B4/C2 to test. As for which format is used to test, it can be declared with BS. |
| Ericsson | Issue 1-2-1: We support option 1  Issue 1-2-2: We support option 1  Issue 1-2-3: We generally support option 1; in any for these issues about 350/500 though apart from splitting the sections it is not critical to agree this meeting as we only introduce 350km/h for now.  Issue 1-2-4: We suggest using a separate section for requirements of HST PRACH because different BS declarations may need different requirements. Taking HST PRACH as an example, if we use separate sections for long format and short format, then BS can choose any one of them according to its declaration no matter it supports 500km/h or not. |
| Huawei, HiSilicon | Issue 1-1-1: We prefer Option 1. Requirements shall only be applied to Wide Area Base Stations.  Issue 1-2-1: Option 1 is fine for us. Actually splitting the requirements and tests for 350 kph and 500 kph in separate sections or separate tables both are ok for us..  Issue 1-2-2: We view is that BS just needs to pass either 350km/h or 500km/h related requirements as per BS declaration. UE passing 500km/h requirements does not need to additionally pass the 350km/h requirements.  Issue 1-2-3: As per the comments from Nokia, Samsung and Ericsson, we think that company has different understanding for Option 1 and Option 2, we need to make the option more clear. Our understanding about Option 1: 350km/h and 500km/h should have the same test configurations except the Max Doppler shift, in such configuration, BS only needs to pass either 350km/h or 500km/h related requirements as per BS declaration.  Issue 1-2-4: We should respect the agreement reached before, i.e.:   * For 350km/h velocity, use PRACH format 0 * For 500km/h velocity, use PRACH format A2/B4/C2   + For 500km/h velocity, no extra requirements for PRACH format 0   It clear that no extra performance requirements for format 0 for 500km/h.  For BS declared to support 350km/h only, it only needs to pass the requirements for PRACH format 0. For BS declared to support 500km/h, it only needs to pass the requirements for PRACH format A2/B4/C2, RAN4 cannot constrain BS supporting 500km/h with short sequence to additionally support long sequence format 0 just to support lower speed 350km/h. |
| CMCC | Issue 1-2-1: key point is to split the requirements for 350km/h and 500km/h, as for in the separate section or in the separate table, we do not have strong opinion.  Issue 1-2-4: we prefer to define requirements with short format for 350km/h.  If BS declares it only supports 350km/h，which PRACH requirement tests shall apply can be based on its declaration on which PRACH formats (short and/or long format) are supported. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| No CRs | N/A |
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## 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.*

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|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: PUSCH requirements (8.17.2.2.1)

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

This section contains T-docs with corresponding proposals and observations submitted to the agenda item “8.17.2.2.1 PUSCH requirements”, and PUSCH requirement relevant observations and proposals submitted to other agenda items.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| *R4-20xxxxx* | *Company A* | *Proposal 1:*  *Observation 1:* |
| R4-2000306 | Samsung | Antenna configuration  Proposal 1: Only define HST requirement with 1x2 antenna configuration for tunnel scenario.  Test parameters  Proposal 2: The Slots in which PUSCH is transmitted is proposed as follow   |  |  | | --- | --- | | Slots in which PUSCH is transmitted | For FDD : slot #0 and #8 in radio frames for which SFN mod 4 = 0 slot #6 in radio frames for which SFN mod 4 = 1 slot #4 in radio frames for which SFN mod 4 = 2 slot #2 in radio frames for which SFN mod 4 = 3  For TDD in 15KHz SCS: slot #4 in each radio frames  For TDD in 30KHz SCS slot #8 and slot#10 in radio frames |   PUSCH mapping type A  Observation 1: L0=3 with 1+1+ 1 DMRS configuration has better compared with L0=2 with 1+1+1 DMRS configuration with large Doppler value.  Proposal 3: Define the HST requirement with PUSCH mapping type A under L0=3.  MCS  Proposal 4: HST requirement with tunnel scenario with MCS 2 and MCS 16 can be defined. |
| R4-2000404 | Ericsson | Observation 1: From the simulation results, we showed that it is feasible to achieve reasonable PUSCH demodulation performance at 350 km/h with both MCS = 2 and MCS = 16 for both open space and tunnel scenarios. |
| R4-2000405 | Ericsson | Observation 1: From the simulation results, we showed that it is feasible to achieve reasonable PUSCH demodulation performance at 500 km/h with both MCS = 2 and MCS = 16 for both open space and tunnel scenarios. |
| R4-2000608 | CATT | Front loaded DMRS start symbol  Proposal 1: The performance difference between l0=2 and l0=3 is minor, and the performance gain of l0=2 relative to l0=3 is within the range of 0~0.5dB. |
| R4-2000609 | CATT | Antenna configuration  Proposal 1: To introduce both 1x1 and 1x2 antenna configuration for the tunnel scenario.  MCS  Proposal 2: Both MCS2 and MCS16 should be supported in the tunnel scenario with 500km/h. |
| R4-2000610 | CATT | N/A |
| R4-2000633 | CMCC | N/A |
| R4-2000807 | ZTE Wistron Telecom AB | N/A |
| R4-2001195 | NTT DOCOMO, INC. | Antenna configuration  Proposal 1: Introduce conducted PUSCH requirements with 1x1 antenna configuration for HST.  Applicability  Proposal 2: Study performance difference between 350km/h and 500km/h HST test, and then whether BS supporting 500km/h HST can skip 350km/h HST test. |
| R4-2001458 | Huawei, HiSilicon | l0 for PUSCH mapping type A  Observation 1: There is almost no performance difference between l0=2 and 3 for PUSCH mapping type A.  Proposal 1: Define one set of performance requirements for l0 = 2 and 3.  Antenna configuration  Proposal 2: Do not consider antenna configuration 1x1 for tunnel scenario.  MCS  Observation 2: MCS 16 has a good performance in tunnel scenario for 500 km/h.  Proposal 3: Define MCS 16 in tunnel scenario for 500 km/h. |
| R4-2001459 | Huawei, HiSilicon | N/A |
| R4-2001687 | Nokia, Nokia Shanghai Bell | N/A |
| R4-2001689 | Nokia, Nokia Shanghai Bell | PUSCH tunnel scenario 1T1R  Observation 1: 1T1R antenna configurations use single polarization for transmission and reception, which poses challenges for polarization alignment between TE and DUT in a test environment.  Proposal 1: RAN4 to introduce 1T1R requirements and to use the same test setup for 1T1R as already specified TS 38.141-2, with a test procedure that includes polarization alignment.  PUSCH 500kph MCS  Observation 2: Both MCS 2 and MCS 16 are feasible and have SNR values in practically relevant ranges.  Proposal 2: RAN4 to consider MCS 16 as a feasible requirement FRC for 500kph PUSCH.  PUSCH l0 value simulation alignment  Observation 3: Choosing l0=2 and l0=3 result in identical SNR requirements for 350 kph PUSCH.  Proposal 3: RAN4 to consider allowing to freely choose either l0=2 or l0=3 to align simulation results and deliver performance requirement input for HST PUSCH.  Email discussion on TDD/FDD/radio frame patterns  Proposal 4: RAN4 to consider reusing TDD/FDD/radio frame patterns from non-HST performance requirements in the HST PUSCH requirements. |
| R4-2001184 | Ericsson | [CR] Introducting of conformance tests for 350km/h HST |
| R4-2001185 | Ericsson | [CR] Introduction of HST 350km/h FRCs and channel model |
| R4-2001690 | Nokia, Nokia Shanghai Bell | [CR] CR for 38.104: HST PUSCH demodulation requirements introduction |
| R4-2001691 | Nokia, Nokia Shanghai Bell | [CR] CR for 38.104: HST PUSCH demodulation Annex including both FRC and channel model |
| R4-2001802 | NTT DOCOMO, INC. | [CR] CR for TS 38.141-1: Introduction of NR PUSCH performance requirements for HST |
| R4-2001803 | NTT DOCOMO, INC. | [CR] CR for TS 38.141-1: Introduction of NR PUSCH performance Annex including both FRC and channel model for HST |

## 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: Antenna Configuration

*Sub-topic description:*

This sub-topic deals with open issues related to the antenna configuration.

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

**Issue 2-1-1: Introduce 1T1R requirements for the tunnel scenario**

* Proposals
  + Option 1 (CATT, DCM, Nokia, ): Introduce 1T1R requirements for the tunnel scenario
  + Option 2 (Samsung, Huawei, ): Do not introduce 1T1R requirements for the tunnel scenario
  + Option 3 (Ericsson, ): Introduce 1T1R requirements for the tunnel scenario, and limit tests to not cover OTA.
* Recommended WF
  + Requires further discussion. Please start discussion already in 1st round.

**Issue 2-1-2: 1T1R requirement configuration**

* Condition
  + Agreements to this issue can only be made in case 1T1R introduction is agreed in Issue 2-1-1.
* Proposals
  + Option 1 (Nokia, Ericsson, ): Re-use the 1T2R requirement configuration.
  + Option 2 (Samsung, ): No 1T1R requirement.
* Recommended WF
  + Wait for progress on Issue 2-1-1.

**Issue 2-1-3: 1T1R test setup and procedure**

* Condition
  + Agreements to this issue can only be made in case 1T1R introduction is agreed in Issue 2-1-1.
* Proposals
  + Option 1 (Nokia, ): Same test setup for 1T1R as already specified TS 38.141-2, with a test procedure that includes polarization alignment.
  + Option 2 (Ericsson, Samsung, ): No OTA testing, hence no polarization alignment required.
* Recommended WF
  + Wait for progress on Issue 2-1-1.

### Sub-topic 2-2: Test parameters for testing PUSCH

*Sub-topic description:*

Some test parameter details for testing PUSCH are still undecided. This sub-topic collects all relevant proposals.

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

**Issue 2-2-1: Slot allocation for PUSCH transmission in radio frames**

* Agreements in RAN4#93 (WF R4-1915886)
* TDD configuration
  + Reuse the existing TDD configurations for 15 kHz SCS and 30 kHz SCS as baseline, i.e.
    - 15 kHz SCS: 3D1S1U, S=10D:2G:2U
    - 30 kHz SCS: 7D1S2U, S=6D:4G:4U
* Proposals
  + Option 1 (Samsung, Huawei, ):

For FDD :

slot #0 and #8 in radio frames for which SFN mod 4 = 0

slot #6 in radio frames for which SFN mod 4 = 1

slot #4 in radio frames for which SFN mod 4 = 2

slot #2 in radio frames for which SFN mod 4 = 3

For TDD in 15KHz SCS:

slot #4 in each radio frames

For TDD in 30KHz SCS

slot #8 and slot#18 in radio frames

* + Option 2 (Nokia, Ericsson, ): Reuse TDD/FDD/radio frame patterns from non-HST performance requirements in the HST PUSCH requirements.

For FDD:

All slots.

For TDD in 15KHz SCS:

Slot #4 and slot #9 in each radio frame

For TDD in 30KHz SCS

Slot #8, slot #9, slot #18, and slot #19 in each radio frame

* + Option 3 (Ericsson, ): Only capture to use TDD pattern according to the previous agreement.
* Recommended WF
  + Collect views from further companies.

**Issue 2-2-2: L0 for PUSCH mapping type A for both 350 kph and 500 kph**

* Agreements in RAN4#92bis (WF R4-1912809)
* Provide the simulation results for 350km/h and 500km/h and evaluate the following configurations and make decision:
  + Option 1: *l0* = 3
  + Option 2: *l0* = 2
* Same value for both 350km/h and 500km/h can be considered
* Agreements in RAN4#93 (WF R4-1915886)
* l0 for PUSCH mapping type A
  + *l0* = 2 (For simulation alignment)
    - If no performance different between *l0* = 2 and *l0* = 3, define performance requirements based on *l0* = 2
    - *l0* value for testing is based on BS declaration
* Proposals
  + Option 1 (Samsung, Huawei, ): Define the HST requirement with PUSCH mapping type A under L0=3.
  + Option 2 (Huawei, Nokia, Ericsson, ): Allow to freely choose either l0=2 or l0=3 to align simulation results and deliver performance requirements.
  + Option 3 (CATT, ): The performance difference between l0=2 and l0=3 is minor, and the performance gain of l0=2 relative to l0=3 is within the range of 0~0.5dB. Follow the previous agreement for the case of no performance difference, i.e., l0=2.
  + Option 4 (Nokia, ): Make distinction between 350 kph and 500 kph. For 350 kph, choose l0=2. For 500 kph, allow to freely choose either l0=2 or l0=3 to align simulation results and deliver performance requirements.
* Recommended WF

**Issue 2-2-3: Addition of MCS 16 in 500kph tunnel scenario**

* Proposals
  + Option 1 (Samsung, Nokia, CATT, Huawei, Ericsson, ): Both MCS 2 and MCS 16
* Recommended WF
  + Include MCS 16 in 500 kph tunnel scenario.

### Sub-topic 2-3: Applicability rules for PUSCH high speed train requirements

*Sub-topic description*

During email discussions the question arose, if passing the tests for 500 kph should implicitly count as having passed the tests for 350 kph. This section treats the implicit test passing proposals for PUSCH requirements.

Note that topic #1 is also treating this question for the general case (not PUSCH only as below).

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

**Issue 2-3-1: PUSCH HST 350kph test omission**

* Proposals
  + Option 1 (DCM, ): First study performance difference between 350km/h and 500km/h HST test, and then whether BS supporting 500km/h HST can skip 350km/h HST test.
  + Option 2 (Ericsson, ): No need to discuss in this meeting.
* Recommended WF
  + Study performance difference between 350km/h and 500km/h HST test, and then whether BS supporting 500km/h HST can skip 350km/h HST test. Companies are encourages to discuss this in the next meeting.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CATT | Issue 2-1-1: 1x1 antenna configuration has the deployment scenario in practical tunnel scenario proposed by operator. If only 2Rx requirement will be defined, 1Rx performance cannot be guaranteed. For the conducted test for 1x1 antenna configuration, the SNR value of demodulation can be acceptable based on the simulation results.  Issue 2-2-2: We support option 2 based on our simulation results.  Issue 2-2-3: The performance difference for MCS16 is minor between the tunnel and open space scenarios. So MCS16 should be also supported in the tunnel scenario with 500km/h.  Sub topic 2-1:  Sub topic 2-2:  ….  Others: |
| Nokia, Nokia Shanghai Bell | 2-1-1: Remain with previous proposal as captured in option 1. 1T1R is an operator requested use case and technical implementation is straightforward; only OTA test setup needs to be minorly adapted and could also be foregone completely.  2-1-2: Wait for progress on Issue 2-1-1.  2-1-3: Wait for progress on Issue 2-1-1.  2-2-1: Remain with previous proposal as captured in option 2. Reduces testing time and allows to see the impact of optimisations that require more frequent PUSCH slots.  2-2-2: Agree with WF. Make distinction between 350 kph and 500 kph. For 350 kph, choose l0=2. For 500 kph, allow to freely choose either l0=2 or l0=3. Most companies agree that l0=2 and l0=3 has negligible performance difference, thus this freedom has no practical implications. |
| Samsung | Sub topic 2-1:  Issue 2-1-1: Introduce 1T1R requirements for the tunnel scenario  Prefer option 2: No 1T1R requirements for the tunnel scenario  In LTE, the 1x1 antenna configuration for tunnel scenario is chosen with the realistic operation, reusing the deployment for W-CDMA BS. In LTE Rel-8, the typical antenna configuration is uniform linear antenna array (ULA ) structure with one polarization, due to the number of antenna is limited to 4, the antenna size is acceptable.  In terms of testing, LTE can support conducted test, it is easy to connect with one antenna (polarization) for testing. While for NR, excepting for conducted test for BS type 1-C, OTA testing is supported for BS type 1-O. In case of OTA testing, the different polarization of test antennas may result in performance different with certain isolation  As indicated in eAAS spec, only 2RX BS performance requirements apply when OTA AAS BS supports and is tested with dual polarization. Dual polarization antenna structure should be the typical deployment in NR and also in LTE with considering antenna size and polarization diversity.  With considering the test effort and realistic operation, we prefer to only define the HST requirement with 1x2 antenna configuration for tunnel scenario  Issue 2-1-2: 1T1R requirement configuration  Prefer : No 1T1R requirements for the tunnel scenario  Issue 2-1-3: 1T1R test setup and procedure  Prefer : No 1T1R requirements for the tunnel scenario  Sub topic 2-2:  Issue 2-2-1: Slot allocation for PUSCH transmission in radio frames  Prefer option 1: For TDD with 30KHz, our proposal should be typo with slot#8 and slot#10. It should be slot#8 and slot#18 in one radio frame based on our contribution.  The subframes in which PUSCH is transmitted is related with HARQ process, which can allow a maximum of 4 transmissions. In FDD, the feedback delay is 8ms, and 10ms in TDD with UL-DL configuration 2.  For FDD, the uplink with considering 8 HARQ process, slot 0, slot 8 ,slot 16, slot 24, slot 32 are available for UL  For TDD, current TDD configuration pattern is DDDSUDDDSU for 15KHz SCS and 7D1S2U for 30KHz, considering the 10 HARQ process, slot #5 is available for UL in one radio frame with 15KHz SCS, and slot #8 and slot#18 are available for UL with in each radio frame with 30KHz.  To reduce the test effort, it is not necessary to transmit PUSCH in every available UL slots. Follow the LTE approach.  Ericsson: Wouldn’t the same configuration be applied to other test cases (i.e. normal PUSCH test cases and HST test cases)? Why Samsung need to make a distinction for UL TA?  Issue 2-2-2: L0 for PUSCH mapping type A for both 350 kph and 500 kph  Prefer option 1: Define the HST requirement with PUSCH mapping type A under L0=3  Based on our results, under 1740Hz Frequency offset with 15KHz SCS, L0=3 is better than L0=2. The performance gain is obvious with 1740Hz compare with 3334Hz Frequency offset, since this value is close to frequency estimation range of DMRS tracking ability 1750Hz under 15KHz. DMRS configuration with l0=3 can verify the extremity condition for HST.  Meanwhile, in terms of implementation, with l0=3, it can reduce the delay for process delay with half slot updated Doppler estimation. Also, with l0=3, DMRS 3, 7 and 11 with equal symbol interval can be used for frequency offset estimation with average operation. The estimation performance can be improved with improved accuracy of frequency offset estimation.  In term of both performance and implementation process delay, we do see the benefit of l0=3.  Issue 2-2-3: Addition of MCS 16 in 500kph tunnel scenario  Prefer option 1: MCS2 and MCS16 are feasible for HST with tunnel scenario with 500Km/h |
| Ericsson | Issue 2-1-1: We’re OK for conducted 1T1R requirements if operators see it as important. We do not see the need for OTA (see issue 2-1-3).  Issue 2-1-2: Agree with option 1.  Issue 2-1-3: We don’t think we need OTA requirement for 1T1R. Such a BS would not be an AAS.  Issue 2-2-1: We are OK with TDD pattern in option 2. Should we only consider TDD pattern according to the previous agreement? And for all Rel-15 requirement, only TDD pattern are specified and FDD is considered as the same performance as TDD. If we introduce FDD pattern, do we need to test the same scenario for twice?  Issue 2-2-2: We prefer option 2 since there is no difference between l0=2 and 3, and l0=2 is for all other requirements.  Issue 2-2-3: We are also OK with option1.  Issue 2-3-1: We don’t need to discuss it in this meeting. |
| Huawei, HiSilicon | Issue 2-1-1: We prefer Option 2. RAN 4 has defined 1x2 antenna configuration as it is more practical and popular deployment mode. Since there is only 'single' tap which is belongs to AWGN model, two receive antennas receive same signals, and it is expected that the performance of antenna configuration 1x2 is about 3dB better than that of antenna configuration 1x1. That is to say, performance of antenna configuration 1x1 can be inferred from that of antenna configuration 1x2. So it is enough to define antenna configuration 1x2 and no need to consider antenna configuration 1x1 for tunnel scenario. Also as pointed by company for the dual polarization issue, it is not feasible to test 1x1 OTA test.  Issue 2-2-1: We prefer Option 1. Only test 1 HARQ process of all to reduce test complexity. It is no needed to transmit PUSCH in all available slots.  Issue 2-2-2: We prefer Option 1 or Option 2. Based on our simulation results, there is almost no performance difference between l0=2 and 3 for PUSCH mapping type A, also other companies have the similar observations. In the real testing, it is up to BS choice to use l0=2 or l0=3 for testing, no any limitation should be specified in the specification to use l0=2 or l0=3. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| R4-2001184 |  |
|  |
|  |
| R4-2001185 |  |
|  |
|  |
| R4-2001690 | Ericsson: Scenario name in propagation condition is not aligned with R4-2001691 which is CR for Annex. We think the name used in R4-2001691 is fine. |
| MCC: "CR" in the CR no. should be removed in the Cover sheet. |
|  |
| R4-2001691 | MCC: "CR" in the CR no. should be removed in the Cover sheet. |
|  |
|  |
| R4-2001802 |  |
|  |
|  |
| R4-2001803 |  |
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|  |

## 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** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### 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** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: PRACH requirements (8.17.2.2.2)

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

This section contains T-docs with corresponding proposals and observations submitted to the agenda item “8.17.2.2.2 PRACH requirements”, and PRACH requirement relevant observations and proposals submitted to other agenda items.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| *R4-20xxxxx* | *Company A* | *Proposal 1:*  *Observation 1:* |
| R4-2000307 | Samsung | N/A |
| R4-2000407 | Ericsson | N/A |
| R4-2000408 | Ericsson | N/A |
| R4-2000611 | CATT | N/A |
| R4-2000612 | CATT | N/A |
| R4-2000809 | ZTE Wistron Telecom AB | N/A |
| R4-2001471 | Huawei, HiSilicon | N/A |
| R4-2001472 | Huawei, HiSilicon | N/A |
| R4-2001688 | Nokia, Nokia Shanghai Bell | Proposal 1: RAN4 to include TDL-C-100 fading channel requirements with frequency offset of 400Hz for all agreed PRACH preamble formats. |
| R4-2001473 | Huawei, HiSilicon | [CR] CR for TS 38.104: Introduction of PRACH demodulation requirements for NR HST |
| R4-2001474 | Huawei, HiSilicon | [CR] CR for TS 38.141-1: Introduction of PRACH performance requirements for NR HST |
| R4-2001475 | Huawei, HiSilicon | [CR] CR for TS 38.141-2: Introduction of PRACH performance requirements for NR HST |

## 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: TDLC300-100 propagation condition

*Sub-topic description:*

The results collection template lists the TDLC300-100 propagation condition as FFS for sort PRACH formats. This topic is to clarify the status of the propagation condition.

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

**Issue 3-1-1: Introduce requirements for TDLC300-100 propagation conditions for short preamble formats**

* Agreements in RAN4#92-bis (WF R4-1912729)
* Channel model
  + AWGN
  + TDL-C fading channel, Frequency offset is 400Hz
* Proposals
  + Option 1 (Nokia, ): Include TDLC300-100 fading channel with frequency off of 400Hz requirements with frequency offset of 400Hz for all agreed PRACH preamble formats.
  + Option 2 (Samsung, ): Do not introduce TDLC300-100 fading channel with frequency off of 400Hz requirements for short preamble formats. They are already defined in “normal mode” PRACH.
* Recommended WF
  + Do not introduce TDLC300-100 fading channel with frequency off of 400Hz requirements for short preamble formats, as they are already defined in “normal mode” PRACH. Remove the cases from the simulation result summary template.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |
| Nokia, Nokia Shanghai Bell | 3-1-1: Agree with WF: Include TDL-C-100 fading channel requirements with frequency offset of 400Hz for all agreed PRACH preamble formats. |
| Samsung | Sub topic 3-1:  Issue 3-1-1: Introduce requirements for TDLC300-100 propagation conditions for short preamble formats  Prefer option2 : Do not introduce TDL-C-100 fading channel requirements for short preamble formats  Follow the previous WF. For short format with TDL-C100 400Hz requirement is already defined with same preamble test parameters. |
| Huawei | We prefer Option 2. No need to introduce additional TDLC100-400 related performance requirements. |
| CMCC | Issue 3-1-1: we have one question for clarification. Since the description of this issue is for short preamble format. We are wondering the issue on TDLC300-100 only exists for shot preamble format? Or both long format and short format need to consider it? |

### 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** |
| XXX | Company A |
| Company B |
|  |
| R4-2001473 | Nokia, Nokia Shanghai Bell:  C1: Cover sheet: The reason for change implies that both 300 and 500kph are introduced, but only 350 is introduced.  >>Huawei: The intention of this CR is to introduce requirements for 350km/h since requirements for 500km/h are still a little bit far from alignment, i.e., fading channel is undetermined. The description of 500km/h has been removed.  C2: We would prefer to align with the structure of the other HST requirement section, i.e., to have and new PRACH section "for high speed train".  >>Huawei: Since NR BS has no HST part before, this CR reuse the template from section 8.4.2 in 36.104, in which the HST requirement had been added into the original section rather than having a new section "for high speed train".  C3: It is not explicitly mentioned that HST related PRACH requirements/tests are optional. The "only valid" text is ambiguous.  >>Huawei: We suggest to remove the word "only"  C4: The terminology of “High speed Mode” is new to NR. It is neither used in RAN1, nor RAN2, nor any other RAN4 specification. Can we call just call it “restricted set”?  >>Huawei: We reused the terminology of "High speed Mode" from section 8.4.2 in 36.104. If we agree to add HST part into section 8.4.2.2, then this terminology is useful for distinguishing from tables of Normal Mode. But if we finally agree to have a new section, i.e., 8.4.2.3, then we can remove the terminology of "High speed Mode" and call it "restricted set" instead.  C5: Some headings use upper and lower case letters inconsistently, e.g., “PRACH missed detection requirements for **H**igh speed **M**ode restricted set type A, 1.25 kHz SCS”.  >>Huawei: We will double check the wording.  C6: Why is the msg1-FrequencyStart parameter missing for HST? This would still need to be defined for consistent testing in fading environments.  >>Huawei: The description for msg1-FrequencyStart parameter has been added.  >>Huawei: For all the comments, thanks a lot for Nokia’s careful review. |
| Ericsson: We suggest use separate section for different HST PRACH formats to suit for different BS declarations. Such as an BS supports 350km/h can choose the PRACH requirement according to its declarations.  >>Huawei: Since this CR intents to only bring requirements for 350km/h and format 0 is the only format that has been agreed to use, we think table 8.4.2.2.2-4 and 8.4.2.2-5 are clear enough. If requirements for 500km/h is also agreed to be introduced into this CR well then separate sections for different formats are very much needed.  >>Huawei: For all the comments, thanks a lot for Ericsson’s careful review. |
|  |
| R4-2001474 | Nokia, Nokia Shanghai Bell:  Same comments as for R4-2001473. |
| Ericsson: Same comments as R4-2001473. |
|  |
| R4-2001475 | Nokia, Nokia Shanghai Bell:  Same comments as for R4-2001473. |
| Ericsson: Same comments as R4-2001473. |
|  |

## 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** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: UL timing adjustment requirements (8.17.2.2.3)

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

This section contains T-docs with corresponding proposals and observations submitted to the agenda item “8.17.2.2.3 UL timing adjustment requirements”, as well as, UL timing adjustment requirement relevant observations and proposals submitted to other agenda items.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| *R4-20xxxxx* | *Company A* | *Proposal 1:*  *Observation 1:* |
| R4-2000308 | Samsung | SRS configuration  Proposal 1: SRS bandwidth configuration is proposed as C\_SRS = 11, B\_SRS =0, for 40RB C\_SRS = 21, B\_SRS =0, for 80RB  Proposal 2: SRS transmission comb is proposed as K\_TC: 2  Proposal 3: SRS transmission periodicity is proposed as TSRS =10.  SRS slot configuration  Proposal 4: Keep the same SRS parameters specified in 38.104/141-1/141-2 for requirements and testing.  Moving propagation conditions  Proposal 5: The timing difference between moving UE and stationary UE should be scaled with 15KHz SCS: Δτ - (TA -31)x16\*64Tc 30KHz SCS: Δτ - (TA -31)x16\*32Tc |
| R4-2000406 | Ericsson | Observation 1: Under scenario Y, comparable performance can be achieved with both PUSCH mapping type A and mapping type B.  Observation 2: It is unclear why PUSCH mapping type B was introduced for UL timing adjustment under HST condition while PUSCH mapping type B has not be considered for HST PUSCH demodulation performance. With PUSCH mapping type B, (1+1+1) DM-RS symbols and 14 OFDM symbols may be suitable for UL timing adjustment where UE is travelling at 500 km/h. However, it should be noted that with the same PUSCH mapping type B configuration, it would not be able to achieve satisfactory demodulation performance with a basic receiver, as the maximum unambiguous sampling frequency = 1400 Hz and 2800 Hz for SCS = 15 kHz and SCS = 30 kHz, respectively.  Proposal 1: Remove PUSCH mapping type B assumptions and requirements for UL timing adjustment to align them to PUSCH HST demodulation requirements. |
| R4-2000808 | ZTE Wistron Telecom AB | N/A |
| R4-2001460 | Huawei, HiSilicon | SRS transmission  Observation 1: There is inconsistence in TS 36.104 and TS 36.141 for SRS configuration, and TS 36.141 needs to be corrected.  Observation 2: Adjustment of TA value is not frequently, transmitting SRS signal one slot per radio frame is sufficient in current model.  Proposal 1: Transmit SRS (optional) for uplink timing advance requirement in:  – FDD  • Slot #1 in radio frames  – TDD  • The last symbol in the special slot  – 15kHz SCS: last symbol in slot #3 in radio frames  – 30kHz SCS: last symbol in slot #7 in radio frames  Other parameters  Proposal 2: Adopt parameters in Table 2.2-1 for UL timing adjustment.  Table 2.2-1 Parameters needed to be determined  Parameter Value  DMRS type type1  symbols length 14 for both PUSCH type A and B  start symbol index 0 for both PUSCH type A and B  resource allocation type type 1  SRS bandwidth configuration BSRS=0, CSRS=11 for 40RBs  BSRS=0, CSRS=21 for 80RBs  SRS transmission comb 2 |
| R4-2001687 | Nokia, Nokia Shanghai Bell | N/A |
| R4-2001689 | Nokia, Nokia Shanghai Bell | Previous observations about UL TA testing  Observation 4: In LTE UL TA performance requirements, there is one stationary UE that is not configured to have a timing error and does not receive TA commands from the BS. Furthermore, there is a moving UE whose timing error follows the chosen scenarios and receives TA commands via an error-free side link. The TPUT is only measured for the moving UE.  Observation 5: The Doppler shift of the moving UE is not considered for the high-speed scenarios in LTE UL TA.  UL TA and Doppler shift  Proposal 5: RAN4 to not consider Doppler shift in UL TA scenarios with 350 kph and 500 kph UE speed.  UL TA choice of KPI  Observation 6: Synthetic UL TA implementation errors are not detected with 70% TPUT requirements. A value of >90% is required.  Proposal 6: RAN4 to consider changing the test metric to SNR@95% of maximum throughput for the moving UE.  UL TA SRS placement  Proposal 7: RAN4 to consider placing the SRS in the second to last symbol to avoid transient period issues. |
| R4-2000805 | ZTE Wistron Telecom AB | [CR] CR for 38.104: introduction of UL timing adjustment |
| R4-2000806 | ZTE Wistron Telecom AB | [CR] CR for 38.104: Appendix for UL timing adjustment |

## 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 4-1: SRS configuration

*Sub-topic description:*

This sub-topic deals with open issues related to SRS configuration details.

The following agreements from previous meetings are of relevance to this sub-topic:

Agreements in RAN4#93 (WF R4-1915886):

* Allocated RBs for SRS
  + 10 MHz CBW / 15 kHz SCS: 40 contiguously allocated RBs starting from RPB index 0
  + 40 MHz CBW / 30 KHz SCS: 80 contiguously allocated RBs starting from PRB index 0
* SRS transmission (optional)
  + FDD
    - Slot #1 in radio frames
  + TDD
    - The last symbol in the special slot (Further check is needed)
      * 15kHz SCS: last symbol in slot #3 in radio frames
      * 30kHz SCS: last symbol in slot #7 in radio frames

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

**Issue 4-1-1: SRS bandwidth configuration TBA**

* Proposals
  + Option 1: (Samsung, Huawei, Nokia, ): C\_SRS = 11, B\_SRS =0, for 40RB and C\_SRS = 21, B\_SRS =0, for 80RB.
* Recommended WF
  + Choose C\_SRS = 11, B\_SRS =0, for 40RB and C\_SRS = 21, B\_SRS =0, for 80RB.

**Issue 4-1-2: SRS transmission comb**

* Proposals
  + Option 1 (Samsung, Huawei, Nokia, ): KTC=2.
* Recommended WF
  + Choose KTC=2.

**Issue 4-1-3: SRS transmission periodicity**

* Proposals
  + Option 1 (Samsung, Huawei, ): TSRS =10.
  + Option 2 (Nokia, ): Match the repetition periodicity of the special slot of the ultimately chosen TDD pattern.
* Recommended WF
  + Collect companies’ inputs in 1st round.

**Issue 4-1-4: SRS slot configuration differences between TS 38.104 and TS 38.141**

* Proposals
  + Option 1 (Samsung, Huawei, Nokia, ): Same SRS slot configuration specified in 38.104/141-1/141-2 for requirements and testing.
  + Option 2 (): Follow current LTE specifications and have different SRS transmission slot configurations.
* Recommended WF
  + Use same SRS slot configuration for both requirements and test.

**Issue 4-1-5: SRS transmit slot configuration**

* Proposals
  + Option 1 (Huawei, Samsung, ): As previously captured in WF as FFS

– FDD

• Slot #1 in radio frames

– TDD

• 15kHz SCS: Slot #3 in radio frames

• 30kHz SCS: Slot #7 in radio frames

* + Option 2 (Nokia, ): Match all occurrences of the special slot of the ultimately chosen TDD pattern.
* Recommended WF
  + Collect companies’ input

**Issue 4-1-6: SRS symbol placement within slot for TDD**

* Proposals
  + Option 1 (Huawei, Samsung, ): The last symbol in the special slot.
  + Option 2 (Nokia, ): Second to last symbol in the special slot.
* Recommended WF
  + Collect companies’ input.

**Issue 4-1-7: SRS symbol placement within slot for FDD**

* Proposals
  + Option 1 (Nokia, ): Second to last symbol in chosen SRS slot.
  + Option 2 (Samsung, Huawei, ): Last symbol in chosen SRS slot.
  + Option 3 (Samsung, ): Follow agreement from SRS placement within slot for TDD.
* Recommended WF
  + Chose option 3.

### Sub-topic 4-2: Moving propagation conditions

*Sub-topic description:*

This sub-topic deals with previously undiscussed open issues related to propagation condition details.

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

**Issue 4-2-1: Timing difference between moving UE and stationary UE scaling by TA command**

* Proposals
  + Option 1 (Samsung, Huawei, ):

15KHz SCS: Δτ - (TA -31)x16\*64Tc  
30KHz SCS: Δτ - (TA -31)x16\*32Tc

* + Option 2 (Nokia, ): Use the technical content from option 1, but write using TS.
  + Other options not precluded.
* Recommended WF
  + Chose option 1.

**Issue 4-2-2: Applying Doppler shift into account**

* Proposals
  + Option 1 (Nokia, Samsung, Ericsson, Huawei, ): Do not consider Doppler shift in UL TA scenarios with 350 kph and 500 kph UE speed (as in LTE).
  + Option 2 (): Apply Doppler shift to the moving UE. FFS on value.
* Recommended WF
  + Do not consider Doppler shift in UL TA scenarios with 350 kph and 500 kph UE speed.

### Sub-topic 4-3: Test metric

*Sub-topic description:*

This sub-topic deals with previously undiscussed open issues related to the test metric.

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

**Issue 4-3-1: Test metric**

* Agreements in RAN4#93 (WF R4-1915886)
* Test metric
  + Reuse LTE test metric
    - Maximum throughput for an FRC equals to the payload size\* the number of uplink subframes per second in which PUSCH is transmitted
    - SNR@70% of maximum throughput for the moving UE
* Proposals
  + Option 1 (Huawei, Samsung, ): Keep previous agreement.
  + Option 2 (Nokia, ): Use SNR@95% of maximum throughput for the moving UE.
* Recommended WF
  + Use option 1.

### Sub-topic 4-4: UL TA PUSCH configuration

*Sub-topic description:*

This sub-topic deals with open issues related to UL TA PUSCH configuration details.

The following agreements from previous meetings are of relevance to this sub-topic:

Agreements in RAN4#93 (WF R4-1915886):

* PUSCH mapping type
  + Type A and Type B
  + *l0* = 2

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

**Issue 4-4-1: UL TA PUSCH mapping type B**

* Proposals
  + Option 1 (Ericsson, Nokia, Samsung, ): Remove PUSCH mapping type B assumptions and requirements.
  + Option 2 (Huawei, ): Keep previous agreement, and use applicability rule to test only one.
* Recommended WF
  + Collect companies’ input.

**Issue 4-4-2: UL TA PUSCH time domain resource allocation**

* Proposals
  + Option 1 (Huawei, Samsung, Ericsson, Nokia, ): start=0, length=14, type 1.
* Moderator remark:
  + No other companies explicitly disclosed these parameters in their simulation delivery T-docs.
* Recommended WF
  + Choose option 1: start=0, length=14, type 1.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |
| Nokia, Nokia Shanghai Bell | 4-1-1: Nokia would like to support option1/WF.  4-1-2: Nokia would like to support option1/WF.  4-1-3: This discussion should be dependent on the TDD pattern discussion. For FDD we can agree with option 1, for TDD we want to set the periodicity to match the repetition periodicity of the special slot of the ultimately chosen TDD pattern.  4-1-4: Nokia would like to support option1/WF.  4-1-5: We want to align with our proposal (option 2) in Issue 2-2-1. Transmit SRS in every special slot of the ultimately chosen TDD pattern. Otherwise TOE (timing offset estimation) implementations that rely mostly on SRS will not be viable. RAN4 should not force specific implementations and close avenues for optimisations.  4-1-6: Remain with previous proposal as captured in option 2. Leaving a symbol gap to the PUSCH transmission avoid issues with transient periods.  4-1-7: Same as 4-1-6.  4-2-1: From a technical point of view, we agree with option 1. Though, we prefer to capture the relationship in the CR using TS instead of TC. This aligns the formula with LTE and highlights differences to LTE.  4-2-2: Remain with previous proposal as captured in option 1. Align with LTE tests.  4-3-1: Remain with previous proposal as captured in option 2. 70%TPUT is not a sensitive enough test to show implementation errors. Same shortcoming observed in LTE.  4-4-1: Nokia wants to support option 1. It is unclear how the type B inclusion came to be, since “normal” PUSCH discussions were clearly limited to type A only.  4-4-2: Nokia would like to support option1/WF. Nokia re-used the PUSCH HST TDRA (time domain resource allocation) for evaluations in UL TA, which coincides with option 1. |
| Samsung | Sub topic 4-1:  Issue 4-1-1: SRS bandwidth configuration TBA  Prefer option 1: Use the same terminology with RAN1 spec for SRS configuration parameters C\_SRS = 11, B\_SRS =0, for 40RB and C\_SRS = 21, B\_SRS =0, for 80RB.  Issue 4-1-2: SRS transmission comb  Prefer option 1: To align with SRS configuration for LTE  Issue 4-1-3: SRS transmission periodicity  Prefer option 1: To align with SRS configuration for LTE, since the SRS transmission periodicity is 10ms, only 1 slot is for SRS transmission in radio frame  Issue 4-1-4: SRS slot configuration differences between TS 38.104 and TS 38.141  Prefer option 1: Same SRS slot configuration specified in 38.104/141-1/141-2 for requirements and testing  Issue 4-1-5: SRS transmit slot configuration  Prefer option 1: Follow previous WF  Issue 4-1-6: SRS symbol placement within slot for TDD  Prefer option 1: Follow previous WF. Based on RAN1 design, if one SRS symbol configured, the location should be the last symbol in current slot.  Issue 4-1-7: SRS symbol placement within slot for FDD  Prefer option 1 and 3: Follow previous WF. Based on RAN1 design, if one SRS symbol configured, the location should be the last symbol in current slot. [Moderator: Should this read “ Prefer option 2 and 3”?]  Sub topic 4-2:  Issue 4-2-1: Timing difference between moving UE and stationary UE scaling by TA command  Prefer option 1  Issue 4-2-2: Applying Doppler shift into account  Prefer option 1: Follow LTE approach, there is no Doppler shift into account for AWGN with moving UE and stationary UE. The test purpose of UL timing is to verify the impact of timing offset.  Sub topic 4-3:  Issue 4-3-1: Test metric  Prefer option 1: Keep previous agreement  Sub topic 4-4:  Issue 4-4-1: UL TA PUSCH mapping type B  Prefer option 2: To reduce the test effort, type A is enough. [Moderator: Should this read “Prefer option 2”? Having only type A is option 1. I have recorded Samsung as supporting option 1, please comment if this is wrong.]  Issue 4-4-2: UL TA PUSCH time domain resource allocation  Prefer option 1: Keep previous agreement |
| Ericsson | Issue 4-2-2: We prefer option1 that do not consider Doppler shift for UE with 350km/h and 500km/h speed.  Issue 4-3-1: We see that 95% in this case makes a more meaningful requirement. On the other hand, not all companies have provided results for this meeting, so it is not clear if there is sufficient time to change the metric. If we would agree to change it, we should also agree that it is not automatically assumed that we use 95% in case other scenarios with multipath channel are introduced in the future, as it is not clear if the results would be stable in such cases.  Issue 4-4-1: We prefer option1 to remove type B assumption and requirements.  Issue 4-4-2: We agree with option1. |
| Huawei, HiSilicon | Issue 4-1-1: We agree Option 1.  Issue 4-1-2: We agree Option 1.  Issue 4-1-3: We agree Option 1. As per the agreements reached in last meeting, SRS is transmitted once per radio frame.  Issue 4-1-4: We prefer Option 1. Same SRS slot configuration specified in 38.104/141-1/141-2 for requirements and testing.  Issue 4-1-5: We agree Option 1. This proposal is just used to confirm the agreement reached in last meeting.  Issue 4-1-6: We prefer Option 1. After long discussion during Rel-15, RAN4 agreed that no transient period needs to be considered in RAN4 demodulation requirements definition.  Issue 4-1-7: We prefer Option 2. After long discussion during Rel-15, RAN4 agreed that no transient period needs to be considered in RAN4 demodulation requirements definition.  Issue 4-2-1: We agree Option 1. We prefer to use Tc that is aligned with NR core specification.  Issue 4-2-2: We prefer Option 1. Do not consider Doppler shift in UL TA scenarios with 350 kph and 500 kph UE speed (as in LTE).  Issue 4-3-1: We prefer Option 1. Keep previous agreement.  Issue 4-4-1: We prefer Option 2. Keep previous agreement. Define both PUSCH mapping type A and B, and the application rule can be introduced as the existing normal performance requirements to test only one.  Issue 4-4-2: We agree Option 1. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| R4-2000805 |  |
|  |
|  |
| R4-2000806 |  |
|  |
|  |

## 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** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |