**3GPP TSG-RAN WG4 Meeting # 104-e R4-22XXXXX**

**Electronic Meeting, 15– 26 August 2022**

**Agenda item:** 9.7.4

**Source:** Moderator (Samsung)

**Title:** Email discussion summary for [104-e][320] NR\_HST\_FR2\_Demod

**Document for:** Information

# Introduction

In RAN Plenary #89-e, the RAN4-led work item of NR support for high speed train (HST) scenario in FR2 has been approved [RP-202118] (which has been further revised to [RP-210800] with editorial revisions and updates on time schedule).

In this email thread, the following agenda items will be discussed:

* 9.7.4.1 UE demodulation requirements
* 9.7.4.2 BS demodulation requirements

It is suggested to have the following target of 1st and 2nd round email discussion

* 1st round: Finalize all the remaining issue, including CR discussion
* 2nd round: draft CR discussion and revised

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Samsung (Moderator) | Yunchuan Yang | yc0301.yang@samsung.com |
| Ericsson | Kazuyoshi Uesaka | kazuyoshi.uesaka@ericsson.com |
| Huawei | Zehan Zhao | zhaozehan@hisilicon.com |
| CATT | Yanze Fu | [fuyanze@catt.cn](mailto:fuyanze@catt.cn) |
| Nokia, Nokia Shanghai Bell | Dimitri Gold | [dimitri.gold@nokia-bell-labs.com](mailto:dimitri.gold@nokia-bell-labs.com) |

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: UE demodulation

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2213658 | Samsung | Simulation results summary for Rel-17 FR2 HST UE demod |
| R4-2213660 | Samsung | Big CR on FR2 HST UE demodulation requirement for TS 38.101-4 |
| R4-2213844 | Huawei, HiSilicon | Draft CR on minimum requirements for FR2 PDSCH HST-DPS requirements (38.101-4, Rel-17) |
| R4-2213962 | Qualcomm | CR for the introduction of FR2 HST Doppler Trajectory |

## Open issues summary

### Sub-topic 1-1

**Issue 1-1-1: TBA**

* Proposals
  + Option 1: TBA
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 1-1-1 |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2213844  (Huawei, HiSilicon, Draft CR on minimum requirements for FR2 PDSCH HST-DPS requirements (38.101-4, Rel-17)) | Qualcomm: we are ok with the change, see below regarding CR merge; |
| Samsung: add the note for requirement is only applied for FR2-1 |
| Huawei: The changes about capturing “only apply for FR2-1” will be applied in the revised version. |
| R4-2213962  (Qualcomm, CR for the introduction of FR2 HST Doppler Trajectory) | Qualcomm: @Moderator: is the formal CR format okay or should we add in this thread a Tdoc request to convert this change to draft CR and capture it in the Big CR below?  Another possibility would be to merge the changes from R4-2213844 in this formal CR. |
| Samsung: My understanding it can be captured into the Big CR directly, I can check the guideline of MCC |
| Huawei: It is fine for us to merge the changes from both R4-2213844 and R4-2213962 into the big CR reserved by Samsung before the meeting. |
| R4-2213660  (Samsung, Big CR on FR2 HST UE demodulation requirement for TS 38.101-4) | Moderator: not available, email approve after meeting |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

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

### CRs/TPs

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

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| 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)

# Topic #2: BS demodulation

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2211654 | CATT | Proposal 1: G-FR2-A10-1 to G-FR2-A10-6 can be used for UL TA for FR2 HST.  Proposal 2: To update FRCs for FR2 HST using parameters of following tables. |
| R4-2211655 | CATT | Draft CR for TS 38.104, Introduce performance requirements for UL TA for FR2 HST |
| R4-2211656 | CATT | Draft CR for TS 38.141-2, Introduce performance requirements for UL TA for FR2 HST |
| R4-2213389 | Nokia, NSB | Observation 1: Current definition of operating bands and channel arrangements in TS 38.104, Clause 5.1 assumes that HST FR2 requirements are applicability both in FR2-1 and FR2-2. However, in the HST FR2 WI only target applicable frequencies up to 30GHz were considered.  Proposal 1: RAN4 to limit the HST FR2 BS demodulation performance requirements to FR2-1 band only.  Proposal 2: Add an exception to operating bands and channel arrangement (Clause 5.1 of TS 38.104) that HST FR2 requirements are applicable to FR2-1 only.  Observation 2: Manufacturer’s declaration of high speed train scenario support D.109 in TS 38.141-2 was not extended to BS type 2-O.  Observation 3: There is no manufacturer’s declaration for the supported PRACH formats for HST FR2.  Proposal 3: RAN4 to apply manufacturer’s declaration D.111 (PRACH format for high-speed train) also to BS type 2-O, i.e. for HST FR2.  Observation 4: Applicability rule 8.1.2.3.1 specifies that PRACH requirement tests shall apply only for each PRACH format declared to be supported but it references only declaration D.103.  Proposal 4: Extend applicability rule 8.1.2.3.1 to specify that RACH requirement tests shall apply only for each high speed train PRACH format declared to be supported with declaration D.111. |
| R4-2213390 | Nokia, NSB | draftCR to TS 38.104 on HST FR2 FRCs |
| R4-2213391 | Nokia, NSB | draftCR to TS 38.141-2 on HST FR2 FRCs |
| R4-2213392 | Nokia, NSB | draftCR to TS 38.141-2 on HST FR2 Manufacturer's Declarations |
| R4-2213659 | Samsung | Simulation results summary for Rel-17 FR2 HST BS demod |
| R4-2213661 | Samsung | Big CR on FR2 HST BS demodulation requirement for TS 38.104 |
| R4-2213845 | Huawei, HiSilicon | Draft CR on PRACH minimum requirements for high speed train (38.104, Rel-17) |
| R4-2213846 | Huawei, HiSilicon | Draft CR on PRACH test requirement for high speed train (38.141-2, Rel-17) |

## Open issues summary

List of open issues

* Sub-topic 2-1: General
  + Issue 2-1-1: Applicability of FR2 HST demod requirement
  + Issue 2-1-2: BS manufacturer’s declaration and PRACH applicability rule
  + Issue 2-1-3: FRC

### Sub-topic 2-1 General

**Issue 2-1-1: Applicability of FR2 HST demod requirement**

* Observations
  + Observation 1 (Nokia, NSB): Current definition of operating bands and channel arrangements in TS 38.104, Clause 5.1 assumes that HST FR2 requirements are applicability both in FR2-1 and FR2-2. However, in the HST FR2 WI only target applicable frequencies up to 30GHz were considered.
* Proposals
  + Option 1 (Nokia, NSB):
    - RAN4 to limit the HST FR2 BS demodulation performance requirements to FR2-1 band only.
    - Add an exception to operating bands and channel arrangement (Clause 5.1 of TS 38.104) that HST FR2 requirements are applicable to FR2-1 only.
* Recommended WF
  + Encourage comments if any

**Issue 2-1-2: BS manufacturer’s declaration and PRACH applicability rule**

* Observations
  + Observation 1 (Nokia, NSB):
    - Manufacturer’s declaration of high speed train scenario support D.109 in TS 38.141-2 was not extended to BS type 2-O.
    - There is no manufacturer’s declaration for the supported PRACH formats for HST FR2.
    - Applicability rule 8.1.2.3.1 specifies that PRACH requirement tests shall apply only for each PRACH format declared to be supported but it references only declaration D.103.
* Proposals
  + Option 1 (Nokia, NSB):
    - RAN4 to apply manufacturer’s declaration D.111 (PRACH format for high-speed train) also to BS type 2-O, i.e. for HST FR2.
    - Extend applicability rule 8.1.2.3.1 to specify that RACH requirement tests shall apply only for each high speed train PRACH format declared to be supported with declaration D.111.
* Recommended WF
  + Encourage comments if any

**Issue 2-1-3: FRC**

* Proposals
  + Option 1 ( CATT):
    - G-FR2-A10-1 to G-FR2-A10-6 can be used for UL TA for FR2 HST
    - To update FRCs for FR2 HST using parameters of following tables

Table A.10-1: FRC parameters for FR2 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos0 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-1 | G-FR2-A10-2 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 32 | 132 |
| CP-OFDM Symbols per slot (Note 1) | 9 | 9 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 10504 | 43032 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 |
| Number of code blocks - C | 2 | 6 |
| Code block size including CRC (bits) (Note 2) | 5288 | 7200 |
| Total number of bits per slot without PT-RS | 20736 | 85536 |
| Total number of bits per slot with PT-RS (Note 3) | 19872 | 81972 |
| Total symbols per slot without PT-RS | 3456 | 14256 |
| Total symbols per slot with PT-RS (Note 3) | 3312 | 13662 |
| NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration = single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos0* with *l0*= 0 as per Table 6.4.1.1.3-3 of TS 38.211 [9].  NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15].  NOTE 3: PT-RS configuration *KPT-RS =2, LPT-RS =1*. | | |

Table A.10-2: FRC parameters for FR2 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos1 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-3 | G-FR2-A10-4 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 32 | 132 |
| CP-OFDM Symbols per slot (Note 1) | 8 | 8 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 9224 | 37896 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 |
| Number of code blocks - C | 2 | 5 |
| Code block size including CRC (bits) (Note 2) | 4648 | 7608 |
| Total number of bits per slot without PT-RS | 18432 | 76032 |
| Total number of bits per slot with PT-RS (Note 3) | 17664 | 72864 |
| Total symbols per slot without PT-RS | 3072 | 12672 |
| Total symbols per slot with PT-RS (Note 3) | 2944 | 12144 |
| NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration = single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos1* with *l0*= 0 and *l* =8 as per Table 6.4.1.1.3-3 of TS 38.211 [9].  NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15].  NOTE 3: PT-RS configuration *KPT-RS =2, LPT-RS =1*. | | |

Table A.10-3: FRC parameters for FR2 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos2 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-5 | G-FR2-A10-6 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 32 | 132 |
| CP-OFDM Symbols per slot (Note 1) | 7 | 7 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 8064 | 33816 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | 0 | 24 |
| Number of code blocks - C | 1 | 5 |
| Code block size including CRC (bits) (Note 2) | 8088 | 6792 |
| Total number of bits per slot without PT-RS | 16128 | 66528 |
| Total number of bits per slot with PT-RS (Note 3) | 15456 | 63756 |
| Total symbols per slot without PT-RS | 2688 | 11088 |
| Total symbols per slot with PT-RS (Note 3) | 2576 | 10626 |
| NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration = single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos2* with *l0*= 0 and *l* =4,8 as per Table 6.4.1.1.3-3 of TS 38.211 [9].  NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15].  NOTE 3: PT-RS configuration *KPT-RS =2, LPT-RS =1*. | | |

* Recommended WF
  + Encourage comments if any

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-1-1  Issue 2-1-2  Issue 2-1-3 |
| Ericsson | Issue 2-1-1: We share the view that it should be restricted to FR2-1. Since the requirements were only derived for 30GHz, it should be specified for bands below 30GHz too (in the note)  Issue 2-1-2: Option 1 OK  Issue 2-1-3: OK |
| Huawei | Issue 2-1-1: Applicability of FR2 HST demod requirement  It is needed to limit FR2 HST requirements to FR2-1 as per WID.  Issue 2-1-2: BS manufacturer’s declaration and PRACH applicability rule  We are OK with Option 1.  Issue 2-1-3: FRC  The FRC updates for PUSCH performance are correct from both CATT and Nokia, but the FRC for UL TA from Nokia is correct based on our calculation. |
| CATT | Issue 2-1-1: same comment with Ericsson.  Issue 2-1-2: Support Option 1.  Issue 2-1-3: The FRCs for UL TA need to be aligned with FRCs proposed by Nokia’s CR. The other FRCs in our proposals are the same as that in Nokia’s CR. |
| Nokia | **Issue 2-1-1: Applicability of FR2 HST demod requirement**  We agree to clarify in the note that the requirements were derived for bands below 30GHz in addition to restriction to FR2-1.  **Issue 2-1-3: FRC**  We agree with the updated values for FRCs G-FR2-A10-1 - G-FR2-A10-6 from CATT. They exactly match the paramters provided by us.  However, RB allocation in the Test parameters for testing UL timing adjustment are two times smaller than in the regular PUSCH tests.  Therefore, G-FR2-A10-1 - G-FR2-A10-6 cannot be used for UL timing adjustment requirements. We have introduced additional FRCs G-FR2-A10-7 - G-FR2-A10-12 in our draftCRs R4-2213390 and R4-2213391. |
| Samsung | **Issue 2-1-1: Applicability of FR2 HST demod requirement**  We are ok to add a note to limit the requirement only applied to FR2-1  **Issue 2-1-2: BS manufacturer’s declaration and PRACH applicability rule**  Ok with option 1,  **Issue 2-1-3: FRC**  Ok with option 1, CR updated is required |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2211655  (CATT, Draft CR for TS 38.104, Introduce performance requirements for UL TA for FR2 HST) | CATT:  We need to align the FRCs for UL TA with FRCs proposed by Nokia’s CR. |
| Nokia  Different FRCs shall be used for Minimum requirements for high speed train (Table 11.2.2.8.1-1) because RB allocation is two time less than for PUSCH requirements. These FRCs are introduced in R4-2213390. |
| Samsung,  The category should be Cat F  Add the note for UL timing adjustment is only applied for FR2-1 or  Modified the table as “Table 11.2.2.8.1-1 Test parameters for testing UL timing adjustment for FR2-1”  To align with FR1 HST,  Channel bandwidth indicated |
| R4-2211656  (CATT, Draft CR for TS 38.141-2, Introduce performance requirements for UL TA for FR2 HST) | CATT:  We need to align the FRCs for UL TA with FRCs proposed by Nokia’s CR. |
| Nokia,  The same comment as above, FCSs in the Table 8.2.5.5a shall be updated. |
| Samsung  Same comments as above |
| R4-2213390  (Nokia, draftCR to TS 38.104 on HST FR2 FRCs) | Ericsson  1. Refereed table numbers are wrong. See the correction below.  A picture containing text  Description automatically generated  2. In Table A.10-4, Total resource elements per slot without PT-RS should be 1728.  In Table A.10-4, Total resource elements per slot with PT-RS should be 1656  Timeline  Description automatically generated |
| CATT: Same comment with Ericsson. |
| Nokia,  Agree with the comments provided by Ericsson. |
| R4-2213391  (Nokia, draftCR to TS 38.141-2 on HST FR2 FRCs) | Ericsson:  Same comment as R4-2213390. |
| CATT: Same comment with Ericsson. |
| Nokia,  Agree with the comments provided by Ericsson. |
| R4-2213392 (Nokia, draftCR to TS 38.141-2 on HST FR2 Manufacturer's Declarations) | CATT: OK. |
| Samsung: OK with this change |
|  |
| R4-2213845 (Huawei, Draft CR on PRACH minimum requirements for high speed train (38.104, Rel-17)) | Samsung: add the note for requirement is only applied for FR2-1 |
| Huawei: The changes about capturing “only apply for FR2-1” will be applied in the revised version. |
|  |
| R4-2213846  (Huawei, Draft CR on PRACH test requirement for high speed train (38.141-2, Rel-17)) | Samsung: add the note for requirement is only applied for FR2-1 |
| Huawei: The changes about capturing “only apply for FR2-1” will be applied in the revised version. |
|  |
| R4-2213661  (Samsung, Big CR on FR2 HST BS demodulation requirement for TS 38.104) | Moderator: Not available, email approve after meeting  Big CR for 141-2 should also be reserved  Draft CR for PUSCH requirement in 38.104/141-2 should be also be reserved to update and remove [] accordingly. |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

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

### 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)

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

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  | Big CR on FR2 HST BS demodulation requirement for TS 38.141-2 | Nokia, Nokia Shanghai Bell |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

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